Vernier

If the edge of the vernier scale, which is in a line with the index coincides exactly with a division on the line of inches, that division expresses the height of the index from the surface of the Mercury in the Cistern in inches tenths of inches. But 2dly if the foregoing edge does not coincide with any division you must look for that division of the vernier which coincides with a division in the line of inches, & the number on the vernier shews how many tenth part of the ten hundredth part the index's edge has passed the last decimal division. Thus for Example. Suppose the edge of the vernier was to point somewhere between 29 inches 8 tenths & 29 inches 9 tenths, then if by looking at the vernier you observe the coincidence at 5 it shews the altitude to be 29 inches 8 tenths & five part of one tenth, or 29.85. — —

THE

ENGLISH ENCYCLOPÆDIA.

LONDON:
Printed by T. Davison,
White-Friars.

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VOL. VII.

LONDON:

PRINTED FOR G. KEARSLEY, FLEET-STREET.

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NIMROD, the ſixth ſon of Cuſh, and in all appearance much younger than any of his brothers: for Moſes mentions the ſons of Raamah, his fourth brother, before he ſpeaks of him. What the ſacred hiſtorian ſays of him is ſhort; and yet he ſays more of him than of any other of the poſterity of Noah, till he comes to Abraham. He tells us, that "Nimrod began to be a mighty one in the earth;" that he was a "mighty hunter before the Lord," even to a proverb; and that "the beginning of his kingdom was Babel, and Erech, and Accad, and Calneh, in the land of Shinaar."

From this account he is ſuppoſed to have been a man of extraordinary ſtrength and valour. Some repreſent him as a giant; all conſider him as a great warrior. It is generally thought, that by the words a *mighty hunter* is to be underſtood, that he was a great tyrant; but ſome of the rabbins interpret thoſe words favourably, ſaying, that Nimrod was qualified by a peculiar dexterity and ſtrength for the chace, and that he offered to God the game which he took; and ſeveral of the moderns are of opinion, that this paſſage is not to be underſtood of his tyrannical oppreſſions, or of hunting of men, but of beaſts. It muſt be owned, that the phraſe *before the Lord* may be taken in a favourable ſenſe, and as a commendation of a perſon's good qualities; but in this place the generality of expoſitors underſtand it otherwiſe.

Hunting muſt have been one of the moſt uſeful employments in the times juſt after the diſperſion, when all countries were overrun with wild beaſts, of which it was neceſſary they ſhould be cleared, in order to make them habitable; and therefore nothing ſeemed more proper to procure a man eſteem and honour in thoſe ages, than his being an expert hunter. By that exerciſe, we are told, the ancient Perſians fitted their kings for war and government; and hunting is ſtill, in many countries, conſidered as one part of a royal education.

There is nothing in the ſhort hiſtory of Nimrod which carries the leaſt air of reproach, except his name, which ſignifies a *rebel*; and that is the circumſtance which ſeems to have occaſioned the injurious opinions which have been entertained of him in all ages. Commentators, being prepoſſeſſed in general, that the curſe of Noah fell upon the poſterity of Ham, and finding this prince ſtigmatized by his name, have interpreted every paſſage relating to him to his diſadvantage. They repreſent him as a rebel againſt God, in perſuading the deſcendants of Noah to diſobey the divine command to diſperſe, and in ſetting them to build the tower of Babel, with an impious deſign of ſcaling heaven. They brand him as an ambitious uſurper, and an inſolent oppreſſor; and make him the author of the adoration of fire, of idolatrous worſhip given to men, and the firſt perſecutor on the ſcore of religion. On the other hand ſome account him a virtuous prince, who, far from adviſing the building of Babel, left the country, and went into Aſſyria, becauſe he would not give his conſent to that project.

Nimrod is generally thought to have been the firſt king after the flood; though ſome authors, ſuppoſing a plantation or diſperſion prior to that of Babel, have made kings in ſeveral countries before his time. Mizraim is thought by many who contend for the antiquity of the Egyptian monarchy, to have begun his reign much earlier than Nimrod; and others, from the uniformity of the languages ſpoken in Aſſyria, Babylonia, Syria, and Canaan, affirm thoſe countries to have been peopled before the confuſion of tongues.

The four cities Moſes gives to Nimrod conſtituted a large kingdom in thoſe early times, when few kings had more than one: only it muſt be obſerved, that poſſeſſions might at firſt have been large, and afterwards divided into ſeveral parcels; and Nimrod being the leader of a nation, we may ſuppoſe his ſubjects ſettled within thoſe limits: whether he became poſſeſſed of thoſe cities by conqueſt or otherwiſe, does not appear; it is moſt probable he did not build Babel, all the poſterity of Noah ſeeming to have been equally concerned in that affair: nor does it appear that he built the other three, though the founding of them, and many more, with other works, are attributed to him by ſome authors. It may ſeem alſo a little ſtrange, that Nimrod ſhould be preferred to the regal dignity, and enjoy the moſt cultivated part of the earth then known, rather than any other of the elder chiefs or heads of nations, even of the branch of Ham. Perhaps it was conferred on him for his dexterity in hunting; or it may be he did not aſſume the title of king till after his father Cuſh's death, who might have been ſettled there before him, and left him the ſovereignty; but we incline to think, that he ſeized Shinaar from the deſcendants of Shem, driving out Aſhur, who from thence went and founded Nineveh and other cities in Aſſyria.

The ſcripture does not inform us when Nimrod began his reign. Some date it before the diſperſion; but ſuch a conjecture does not ſeem to ſuit with the Moſaical hiſtory: for before the diſperſion we read of no city but Babel; nor could there well be more, while all mankind were yet in a body together; but when Nimrod aſſumed the regal title, there ſeem to have been other cities; a circumſtance which ſhows it was a good while after the diſperſion. The learned writers of the Univerſal Hiſtory place the beginning of his reign 30 years from that event, and in all likelihood it ſhould be placed rather later than earlier.

Authors have taken a great deal of pains to find Nimrod in

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profane hiſtory: ſome have imagined him to be the ſame with Belus, the founder of the Babyloniſh empire; others take him to be Ninus, the firſt Aſſyrian monarch. Some believe him to have been Evechous, the firſt Chaldean king after the deluge; and others perceive a great reſemblance between him and Bacchus, both in actions and name. Some of the Mohammedan writers ſuppoſe Nimrod to have been Zohak, a Perſian king of the firſt dynaſty; others contend for his being Cay Caus, the ſecond king of the ſecond race; and ſome of the Jews ſay he is the ſame with Amraphel, the king of Shinaar, mentioned by Moſes. But there is no certainty in theſe conjectures, nor have we any knowledge of his immediate ſucceſſors.

The ſcripture mentions nothing as to the death of Nimrod; but authors have taken care that ſuch an eſſential circumſtance in his hiſtory ſhould not be wanting. Some of the rabbins pretend he was ſlain by Eſau, whom they make his contemporary. There is a tradition that he was killed by the fall of the tower of Babel, which was overthrown by tempeſtuous winds. Others ſay, that as he led an army againſt Abraham, God ſent a ſquadron of gnats, which deſtroyed moſt of them; and particularly Nimrod, whoſe brain was pierced by one of thoſe inſects.

NINE, the laſt of the radical numbers or characters; from the combination of which any definite number, however large, may be produced. "It is obſerved by arithmeticians (ſays Hume), that the products of 9 compoſe always either 9 or ſome leſſer products of 9, if you add together all the characters of which any of the former products is compoſed: thus of 18, 27, 36, which are products of 9, you make 9, by adding 1 to 8, 2 to 7, 3 to 6: Thus 369 is a product alſo of 9; and if you add 3, 6, and 9, you make 18, a leſſer product of 9." See *Hume's Dialogues on Nat. Relig.* p. 167, 168, &c. 2d. edit.

NINEVEH (anc. geog.), the capital city of Aſſyria, founded by Aſhur the ſon of Shem (Gen. x. 11.); or, as others read the text, by Nimrod the ſon of Cuſh. However this be, yet it muſt be owned, that Nineveh was one of the moſt ancient, the moſt famous, the moſt potent, and largeſt cities of the world. It is very difficult exactly to aſſign the time of its foundation; but it cannot be long after the building of Babel. It was ſituated upon the banks of the Tigris; and in the time of the prophet Jonas, who was ſent thither under Jeroboam II. king of Iſrael, and, as Calmet thinks, under the reign of Pul, father of Sardanapalus, king of Aſſyria, Nineveh was a very great city, its circuit being three days journey (Jonah iii. 3.) Diodorus Siculus, who has given us the dimenſions of it, ſays it was 480 ſtadia in circumference, or 47 miles; and that it was ſurrounded with lofty walls and towers; the former being 200 feet in height, and ſo very broad that three chariots might drive on them abreaſt; and the latter 200 feet in height, and 1500 in number; and Strabo allows it to have been much greater than Babylon. Diodorus Siculus was, however, certainly miſtaken, or rather his tranſcribers, as the authors of the Univerſal Hiſtory think, in placing Nineveh on the Euphrates, ſince all hiſtorians as well as geographers who ſpeak of that city, tells us in expreſs terms that it ſtood on the Tigris. At the time of Jonah's miſſion thither, it was ſo populous, that it was reckoned to contain more than ſix ſcore thouſand perſons, who could not diſtinguiſh their right hand from their left (Jon. iv. 11.), which is generally explained of young children that had not yet attained to the uſe of reaſon; ſo that upon this principle it is computed that the inhabitants of Nineveh were then above 600,000 perſons.

Nineveh was taken by Arbaces and Beleſis, in the year of the world 3257, under the reign of Sardanapalus, in the time of Amas king of Judah, and about the time of the foundation of Rome. It was taken a ſecond time by Aſtyages and Nabopolaſſar from Chynaladanus king of Aſſyria in the year 3378. After this time, Nineveh no more recovered its former ſplendor. It was ſo entirely ruined in the time of Lucianus Samoſatenſis, who lived under the emperor Adrian, that no footſteps of it could be found, nor ſo much as the place where it ſtood. However, it was rebuilt under the Perſians, and deſtroyed again by the Saracens about the ſeventh age.

Modern travellers ſay, that the ruins of ancient Nineveh may ſtill be ſeen on the eaſtern banks of the Tigris, oppoſite to the city Moſul or Mouſul: (ſee MOUSUL). Profane hiſtorians tell us, that Ninus firſt founded Nineveh; but the ſcripture aſſures us, that it was Aſhur or Nimrod. The ſacred authors make frequent mention of this city; and Nahum and Zephaniah foretold its ruin in a very particular and pathetic manner.

NINIA, or NINIAN, commonly called *St. Ninian*, a holy man among the ancient Britons. He reſided at or near a place called by Ptolemy *Leucopibia* and by Bede *Candida Raſa*; but the Engliſh and Scotch called it *Whitherne*. We mention him, becauſe he is ſaid to have been the firſt who converted the Scots and Picts to the Chriſtian faith; which he did during the reign of Theodoſius the Younger. Bede informs us, that he built a church dedicated to St. Martin, in a ſtyle unknown to the Britons of that time; and adds, that during his time the Saxons held this province (*Gallovidia* now *Galloway*), and that, as in conſequence of the labours of this ſaint the converts to Chriſtianity increaſed, an epiſcopal ſee was eſtabliſhed there. Dr. Henry, conſidering that "few or none of the writings of the moſt ancient fathers of the Britiſh church are now extant, and ſince little being ſaid of them by their cotemporaries, we can know little of their perſonal hiſtory and of the extent of their erudition," gives a ſhort account of ſome of them. Of St. Ninian he ſays, "he was a Briton of noble birth and excellent genius. After he had received as good an education at home as his own country could afford, he travelled for his further improvement, and ſpent ſeveral years at Rome, which was then the chief ſeat of learning as well as of empire. From thence he returned into Britain, and ſpent his life in preaching the goſpel in the moſt uncultivated parts of it with equal zeal and ſucceſs." There is a ſmall town called *St. Ninian* about a mile ſouth of Stirling. Its church had been occupied by the rebels in 1745 as a powder-magazine; who on their return blew it up in ſuch haſte, as to deſtroy ſome of their own people and about fifteen ſpectators.

NING-PO FOU, called by the Europeans *Liampo*, is an excellent port, on the eaſtern coaſt of China, oppoſite to Japan. Eighteen or twenty leagues from this place is an iſland called *Tcheou-chan*, where the Engliſh firſt landed on their arrival at China. The ſilks manufactured at Ning-po are much eſteemed in foreign countries, eſpecially in Japan, where the Chineſe exchange them for copper, gold, and ſilver. This city has four others under its jurisdiction, beſides a great number of fortreſſes.

NINON L'ENCLOS, a celebrated lady in the court of France, was of a noble family, and born at Paris in the year 1615; but rendered herſelf famous by her wit and gallantries. Her mother was a lady of exemplary piety; but her father early inſpired her with the love of pleaſure. Having loſt her parents at 14 years of age, and finding herſelf miſtreſs of her own actions, ſhe reſolved never to marry: ſhe had an income of 10,000 livres a year; and, according to the leſſons ſhe had received from her father, drew up a plan of life and gallantry, which ſhe purſued till her death. Never delicate with reſpect to the number, but always in the choice, of her pleaſures, ſhe ſacrificed nothing to intereſt; but loved only while her taſte for it continued; and had among her admirers the greateſt lords of the court. But though ſhe was light in her amours, ſhe had many virtues.—She was conſtant in her friendſhips, faithful to what are called the *laws of honour*, of ſtrict veracity, diſintereſted, and more particularly remarkable for the exacteſt probity. Women of the moſt reſpectable characters were proud of the honour of

having her for their friend; at her houſe was an aſſemblage of every thing moſt agreeable in the city and the court; and mothers were extremely deſirous of ſending their ſons to that ſchool of politeneſs and good taſte, that they might learn ſentiments of honour and probity, and thoſe other virtues that render men amiable in ſociety. But the illuſtrious Madame de Sevigné with great juſtneſs remarks in her letters, that this ſchool was dangerous to religion and the Chriſtian virtues; becauſe Ninon L'enclos made uſe of ſeducing maxims, capable of depriving the mind of thoſe invaluable treaſures. Ninon was eſteemed beautiful even in old age; and is ſaid to have inſpired violent paſſions at 80. She died at Paris in 1705. This lady had ſeveral children; one of whom, named *Chevalier de Villiers*, occaſioned much diſcourſe by the tragical manner in which he ended his life. He became in love with Ninon, without knowing that ſhe was his mother; and when he diſcovered the ſecret of his birth, ſtabbed himſelf in a fit of deſpair. There have been publiſhed the pretended Letters of Ninon L'enclos to the marquis de Sevigné.

NINTH, in muſic. See INTERVAL.

NINUS, the firſt king of the Aſſyrians, was, it is ſaid, the ſon of Belus. It is added, that he enlarged Nineveh and Babylon; conquered Zoroaſter king of the Bactrians; married Semiramis of Aſcalon; ſubdued almoſt all Aſia; and died after a glorious reign of 52 years, about 1150 B. C.; but all theſe facts are uncertain. See SEMIRAMIS.

NIO, an iſland of the Archipelago, between Naxi to the north, Armago to the eaſt, Santerino to the ſouth, and Sikino to the weſt, and is about 35 miles in circumference. It is remarkable for nothing but Homer's tomb, which they pretend is in this iſland; for they affirm that he died here in his paſſage from Samos to Athens. The iſland is well cultivated, and not ſo ſteep as the other iſlands, and the wheat which it produces is excellent; but oil and wood are ſcarce. It is ſubject to the Turks. E. lon. 25. 53. N. lat. 36. 35.

NIOBE, (fab. hiſt.) according to the fictions of the poets was the daughter of Tantalus, and wife of Amphion king of Thebes; by whom ſhe had ſeven ſons and as many daughters. Having become ſo proud of her fertility and high birth, as to prefer herſelf before Latona, and to ſlight the ſacrifices offered up by the Theban matrons to that goddeſs; Apollo and Diana, the children of Latona, reſented this contempt. The former ſlew the male children and the latter the female; upon which Niobe was ſtruck dumb with grief, and remained without ſenſation. Cicero is of opinion, that on this account the poets feigned her to be turned into ſtone.

The ſtory of Niobe is beautifully related in the ſixth book of the Metamorphoſes of Ovid. That poet thus deſcribes her transformation into ſtone.

Widow'd and childleſs, lamentable ſtate!
A doleful ſight, among the dead ſhe ſat;
Harden'd with woes, a ſtatue of deſpair,
To ev'ry breath of wind unmov'd her hair;
Her cheek ſtill redd'ning, but its colour dead,
Faded her eyes, and ſet with'ring her head.
No more her pliant tongue its motion keeps,
But ſtands congeal'd within her frozen lips.
Stagnate and dull, within her purple veins,
Its current ſtopp'd, the lifeleſs blood remains.
Her feet their uſual offices refuſe,
Her arms and neck their graceful geſtures loſe:
Action and life from every part are gone,
And ev'n her entrails turn to ſolid ſtone.
Yet ſtill ſhe weeps; and whirl'd by ſtormy winds,
Borne thro' the air, her native country finds;
There fix'd, ſhe ſtands upon a bleaky hill;
There yet her marble cheeks eternal tears diſtil.

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Niobe in this ſtatue is repreſented as in an ecſtacy of grief for the loſs of her offſpring, and about to be converted into ſtone herſelf. She appears as if deprived of all ſenſation by the exceſs of her ſorrow, and incapable either of ſhedding tears or of uttering any lamentations, as has been remarked by Cicero in the third book of his Tuſculan Queſtions. With her right hand ſhe claſps one of her little daughters, who throws herſelf into her boſom; which attitude equally ſhows the ardent affection of the mother, and expreſſes that natural confidence which children have in the protection of a parent. The whole is executed in ſuch a wonderful manner, that this, with the other ſtatues of her children, is reckoned by Pliny among the moſt beautiful works of antiquity: but he doubts to whom of the Grecian artiſts he ought to aſcribe the honour of them. "*Par hæſitatio in templo Apollinis Soſiani, Niobem cum liberis morientem, Scopas an Praxiteles fecerit.*" We have no certain information at what period this celebrated work was tranſported from Greece to Rome, nor do we know where it was firſt erected. Flaminius Vacca only ſays, that all theſe ſtatues were found in his time not far from the gate of St. John, and that they were afterwards placed by the Grand Duke Ferdinand in the gardens of the Villa de Medici near Rome. Dr. Moore, ſpeaking of the ſtatue of Niobe, ſays, "The author of Niobe has had the judgment not to exhibit all the diſtreſs which he might have placed in her countenance. This conſummate artiſt was afraid of diſturbing her features too much, knowing full well that the point where he was to expect moſt ſympathy was there, where diſtreſs co-operated with beauty, and where *our pity met our love.* Had he fought it one ſtep farther in *expreſſion*, he had loſt it."

In the following epigram this ſtatue is aſcribed to Praxiteles:

Εκ ζωης με Θεοι θευσαν λιθον. Εκ δε λιθοιο
Ζωην Πραξιτελης εμπαλιν εργασατο.

While for my childrens fate I vainly mourn'd,
The angry gods to maſſy ſtone me turn'd;
Praxiteles a nobler feat has done,
He made me live again from being ſtone.

The author of this epigram, which is to be found in the 4th book of the *Anthologia*, is unknown. Scaliger the father, in his *Farrago Epigrammatum*, p. 172. aſcribes it to Callimachus, but this appears to be only conjecture. Cœlius Calcagninus has made a happy tranſlation of it into Latin.

Vivam olim in lapidem verterunt numina; ſed me
Praxiteles vivam reddidit ex lapide.

And perhaps the following French verſion of it will appear no leſs happy:

De vive que j'étois, les Dieux
M'ont changée en pierre maſſive:
Praxitele a fait beaucoup mieux,
De pierre il m'a ſçû rendre vive.

NIPHON, the largeſt of the Japan iſlands, being 600 miles long, and 100 miles broad. See JAPAN.

NIPPERS, in the manege, are four teeth in the fore-part of a horſe's mouth, two in the upper, and two in the lower jaw. A horſe puts them forth between the ſecond and third year.

NIPPLES, in anatomy. See ANATOMY.

NIPPLE-WORT, in botany. See LAPSANA.

NISAN, a month of the Hebrews, anſwering to our March, and which ſometimes takes from February or April, according to the courſe of the moon. It was the firſt month of the ſacred year, at the coming out of Egypt (Exod. xii. 2.), and it was the ſeventh month of the civil year. By Moſes it is called Abib. The name Niſan is only ſince the time of Ezra, and the return from the captivity of Babylon.

On the firſt day of this month the Jews faſted for the death of the children of Aaron (Lev. x. 1, 2, 3.) On the tenth day was celebrated a faſt for the death of Miriam the ſiſter of Moſes; and every one provided himſelf with a lamb for the paſſover. On this day the Iſraelites paſſed over Jordan under the conduct of Joſhua (iv. 19.) On the fourteenth day in the evening they ſacrificed the paſchal lamb; and the day following, being the fifteenth, was held the ſolemn paſſover. (Exod. xii. 18, &c.) The ſixteenth they offered the ſheaf of the ears of barley as the firſt-fruits of the harveſt of that year. (Levit. xxiii. 9, &c.) The twenty-firſt was the octave of the paſſover, which was ſolemnized with particular ceremonies. The twenty-ſixth the Jews faſted in memory of the death of Joſhua. On this day they began their prayers to obtain the rains of the ſpring. On the twenty-ninth they called to mind the fall of the walls of Jericho.

NISI PRIUS, in law, a judicial writ which lies in caſes where the jury being impannelled and returned before the juſtices of the bank, one of the parties requeſts to have ſuch a writ for the eaſe of the country, in order that the trial may come before the juſtices in the ſame county on their coming thither. The purport of a writ of *niſi prius* is, that the ſheriff is thereby commanded to bring to Weſtminſter the men impannelled, at a certain day, before the juſtices, "*niſi prius juſticiarii domini regis ad aſſiſas capiendas venerint.*"

NISIBIS (anc. geog.), a city both very ancient, very noble, and of very conſiderable ſtrength, ſituated in a diſtrict called *Mygdonia*, in the north of Meſopotamia, towards the Tigris; from which it is diſtant two days journey. Some aſcribe its origin to Nimrod, and ſuppoſe it to be the *Achad of Moſes*. The Macedonians called it *Antiochia of Mygdonia* (Plutarch); ſituated at the foot of mount Maſius (Strabo). It was the Roman bulwark againſt the Parthians and Perſians. It ſuſtained three memorable ſieges againſt the power of Sapor, A. D. 338, 346, and 350; but the emperor Jovianus, by an ignominious peace, delivered it up to the Perſians, A. D. 363.—A colony called *Septimia Neſibitana*.—Another *Niſibis*, of Aria, (Ptolemy), near the lake Arias.

Mr. Ives, who paſſed through this place in 1758, tells us, that "it looked pretty at a diſtance, being ſeated on a conſiderable eminence, at the foot of which runs a river, formerly called the *Mygdonius*, with a ſtone bridge of eleven arches built over it. Juſt by the river, at the foot of the hill or hills (for the town is ſeated on two), begin the ruins of a once more flouriſhing place, which reach quite up to the preſent town. From every part of this place the moſt delightful proſpects would appear, were the ſoil but properly cultivated and planted; but inſtead of thoſe extenſive woods of fruit trees, which Rawolf ſpeaks of as growing near the town, not above thirty or forty ſtraggling trees of any kind can be perceived; and inſtead of that great extent of arable land on which he dwells ſo much, a very inconſiderable number of acres are now remaining. The town itſelf is deſpicable, the ſtreets extremely narrow, and the houſes, even thoſe which are of ſtone, are mean. It ſuffered grievouſly by the famine of 1757, loſing almoſt all its inhabitants either by death or deſertion. The ſtreets preſented many miſerable objects, who greedily devoured rinds of cucumbers, and every other refuſe article of food thrown out into the highway. Here the price of bread had riſen near 4000 per cent. within the laſt 14 years.

NISMES, a flouriſhing city of France, in the department of Gard, and late province of Languedoc, with a biſhop's ſee. Here are ſeveral monuments of antiquity, of which the amphitheatre, built by the Romans, is the principal. The Maiſon Quarrée, or the ſquare houſe, is a piece of architecture of the Corinthian order, and one of the fineſt in the world. The temple of Diana is, in part, gone to ruin. Niſmes was taken by the Engliſh in 1417. The inhabitants were all Calvaniſts; but Louis XIV. demoliſhed their church in 1685, and built a caſtle to keep them in awe. The population of Niſmes is computed at near 50,000. It is ſeated in a plain, abounding in wine and oil, 12 miles north-weſt of Arles, and 75 north-eaſt of Narbonne. E. lon. 4. 26. N. lat. 43. 51.

NISROCH, a god of the Aſſyrians. Sennacherib was killed by two of his ſons while he was paying his adoration to his god Niſroch in his temple. (2 kings, xix. 37.) It is not known who this god Niſrich was. The ſeptuagint calls him Meſrach, Joſephus calls him Araſkes. The Hebrew of Tobit publiſhed by Munſter calls him Dagon. The Jews have a ſtrange notion concerning this deity, and fancy him to have been a plank of Noah's ark. Some think the word ſignifies a dove; and others underſtand by it an eagle, which has given occaſion to an opinion, that Jupiter Belus, from whom the Aſſyrian kings pretended to be derived, was worſhipped by them under the form of an eagle, and called Niſroch. Our poet Milton gives this name to one of the rebel angels:

——In the aſſembly next up ſtood
Niſroch, of Principalities the prince.
Par. Loſt, B. VI. v. 447.

NISSOLIA, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is quinquedentate; the capſule monoſpermous, and terminated by a ligulated wing.

NITHSDALE, NITHISDALE, or *Niddiſdale*, a diviſion of Dumfriesſhire in Scotland, lying to the weſtward of Annandale. It is a large and mountainous tract, deriving its name from the river Nid, which iſſues from a lake called *Loch-cure*, runs by the towns of Sanquhar, Morton, and Drumlanrig, and diſcharges itſelf into the Solway Frith. This country was formerly ſhaded with noble foreſts, which are now almoſt deſtroyed; of that, at preſent, nothing can be more naked, wild, and ſavage. Yet the bowels of the earth yields lead, and, as is ſaid, ſilver and gold: the mountains are covered with ſheep and black cattle; and here are ſtill ſome conſiderable remains of the ancient woods, particularly that of Holywood, three miles from Dumfries, noted for an handſome church, built out of the ruins of an ancient abbey; and alſo for being the birth-place of the famous aſtrologer, hence called *Joannes de Sacro Boſco*. Mr. Pennant calls it a beautiful vale, improved in appearance by the bold curvatures of the meandring ſtream, and for ſome ſpace, he ſays, it is adorned with groves and gentlemens ſeats.

NITOCRIS, the mother of Belſhazzar (whoſe father was Evil Merodach and his grandfather Nebuchadnezzar), was a woman of extraordinary abilities: ſhe took the burden of all public affairs upon herſelf; and, while her ſon followed his pleaſures, did all that could be done by human prudence to ſuſtain the tottering empire. She perfected the works which Nebuchadnezzar had begun for the defence of Babylon; raiſed ſtrong fortifications on the ſide of the river, and cauſed a wonderful vault to be made under it, leading from the old palace to the new, 12 feet high and 15 wide. She likewiſe built a bridge acroſs the Euphrates, and accompliſhed ſeveral other works, which were afterwards aſcribed to Nebuchadnezzar. Philoſtrates, in deſcribing this bridge, tells us, that it was built by a queen who was a native of Media; whence we may conclude this illuſtrious queen to have been by birth a Mede. Nitocris is ſaid to have placed her tomb over one of the moſt remarkable gates of the city, with an inſcription to the following effect: "*If any king of Babylon after me ſhall be in diſtreſs for money, he may open this ſepulchre, and take out as much as may ſerve him; but if he be in no real neceſſity, let him forbear, or he ſhall have cauſe to repent of his preſumption.*"

This monument and inſcription are ſaid to have remained untouched till the reign of Darius, who, conſidering the gate was uſeleſs, no man caring to paſs under a dead body, and being invited by the hopes of an immenſe treaſure, broke it open: but, inſtead of what he ſought, is ſaid to have found nothing but a corpſe; and another inſcription, to the following effect: "*Hadſt thou not been moſt inſatiably avaricious and greedy of th· moſt ſordid gain, thou wouldſt never have violated the abode of the dead.*"

NITRARIA, in botany: A genus of the monogynia order, belonging to the dodecandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The corolla is pentapetalous, with the petals arched at the top; the calyx quinquefid; the ſtamina 15; the fruit a monoſpermous plum.

NITRE, or SALTPETRE. See CHEMISTRY.

NITROUS, any thing impregnated with nitre.

NITROUS *Air*. See AEROLOGY and EUDIOMETER.

NIVELLE, a town of the Auſtrian Netherlands, in the province of Brabant, remarkable for its abbey of Canoneſſes. Here is a manufacture of cambrics, and the town enjoys great privileges. The abbey juſt mentioned is inhabited by young ladies of the firſt quality, who are not confined therein as in nunneries, but may go out and marry whenever they ſee convenient, or a proper match offers. E. lon. 4. 20. N. lat. 50. 46.

NIVELLE *de la Chauſſée* (Peter Claude), a comic poet, born in Paris; acquired great reputation by inventing a new kind of entertainment, which was called *the Weeping Comedy*. Inſtead of imitating Ariſtophanes, Terence, Moliere, and the other celebrated comic poets who had preceded him; and inſtead of exciting laughter by painting the different ridiculous characters, giving ſtrokes of humour and abſurdities in conduct; he applied himſelf to repreſent the weakneſſes of the heart, and to touch and ſoften it. In this manner he wrote five comedies: 1. *La fauſſe Antipathie*. 2. *Le P jug' à la Mode*; this piece met with great ſucceſs. 3. *Mélanide*. 4 *Amour pour Amour*; and, 5. *L'Ecole des Meres*. He was received into the French academy in 1736; and died at Paris in 1754, at 63 years of age. He alſo wrote a tragedy, intitled *Maximianus*; and an Epiſtle to Clio, an ingenious didactic poem.

NIVERNOIS a late province of France, between Burgundy, Bourbonnois, and Berry. It is pretty fertile, contains mines of iron, and is watered by a great number of rivers, of which the Loire, Allier, and Yonne, are the principal. It now forms the department of Nievre.

NIWEGAL, in Pembrokeſhire, South Wales, a ſmall village and beach on the coaſt, remarkable only for the diſcovery of an immenſe quantity of the ſtumps of trees appearing below low water-mark, after and during a ſtorm in the year 1590, notwithſtanding the country all round it is entirely barren of wood.

NIXAPA, a rich and conſiderable town in New Spain, with a rich convent of Dominicans. The country about it abounds in cochineal, indigo, and ſugar. E. lon. 97. 25. N. lat. 15. 20.

NIZAM (ſays Gibbons), one of the moſt illuſtrious miniſters of the Eaſt, was honoured by the caliph as an oracle of religion and ſcience; he was truſted by the ſultan as the faithful vicegerent of his power and juſtice. After an adminiſtration of 30 years, the fame of the vizir, his wealth, and even his ſervices, were transformed into crimes. He was overthrown by the inſidious arts of a woman and a rival; and his fall was haſtened by a raſh declaration, that his cap and ink-horn, the badges of his office, were connected by the divine decree with the throne and diadem of the ſultan. At the age of 93 years, the venerable ſtateſman was diſmiſſed by his maſter, accuſed by his enemies, and murdered by a fanatic: the laſt words of Nizam atteſted his innocence, and the remainder of Malek's life was ſhort and inglorious.

NO, (Jeremiah, Ezekiel), No-AMMON, (Nahum); a conſiderable city of Egypt, thought to be the name of an idol which agrees with Jupiter-Ammon. The Septuagint tranſlate the name in Ezekiel, *Dioſpolis*, "the city of Jupiter." Bochart takes it to be *Thebes* of Egypt; which, according to Strabo and Ptolemy, was called *Dioſpolis*. Jerome, after the Chaldee paraphraſt Jonathan, ſuppoſes it to be Alexandria, named by way of anticipation; or an ancient city of that name is ſuppoſed to have ſtood on the ſpot where Alexandria was built.

No-Man's-Land, a ſpace between the after part of the belfrey and the fore part of a ſhip's boat, when the ſaid boat is ſtowed upon the booms, as in a deep-waiſted veſſel. Theſe booms are laid from the forecaſtle nearly to the quarter-deck, where their after-ends are uſually ſuſtained by a frame called the *gallows*, which conſiſts of two ſtrong poſts, about ſix feet high, with a croſs piece reaching from one to the other, athwart ſhips, and ſerving to ſupport the ends of thoſe booms, maſts, and yards, which lie in reſerve to ſupply the place of others carried away, &c. The ſpace called *No-Man's-Land* is uſed to contain any blocks, ropes, tackles, &c. which may be neceſſary on the forecaſtle. It probably derives this name from its ſituation, as being neither on the ſtarboard nor larboard ſide of the ſhip, nor on the waiſt or forecaſtle; but, being ſituated in the middle, partakes equally of all thoſe places.

NOAH, or NOE, the ſon of Lamech, was born in the year of the world 1056. Amidſt the general corruption into which all mankind were fallen at this time, Noah alone was found to be juſt and perfect in his generation, walking with God. (Gen. vi. 9.) This extraordinary perſon having therefore found favour in the eyes of the Lord, and God ſeeing that all fleſh had corrupted their ways, told Noah, that he was reſolved to deſtroy mankind from the face of the earth, by a flood of waters; and not them alone, but all the beaſts of the earth, and every creeping thing, as well as the fowls of the air. (*Id. ib.* 7.) The Lord therefore directed Noah, as a means of preſerving him and his family (for he had three ſons, Shem, Ham, and Japheth, who were all married before the flood), to build an ark or veſſel, of a certain form and ſize fitted to that end, and which might beſides accommodate ſuch numbers of animals of all ſorts, that were liable to periſh in the flood, as would be ſufficient to preſerve the ſeveral ſpecies, and again repleniſh the earth; together with all neceſſary proviſions for them; all which Noah performed, as may be ſeen more particularly under the article ARK.

In the year of the world 1656, and in the 600th year of his age, Noah, by God's appointment, entered the ark, together with his wife, his three ſons, their wives, and all the animals which God cauſed to come to Noah; and being all entered, and the door of the ark being ſhut upon the outſide, the waters of the deluge began to fall upon the earth, and increaſed in ſuch a manner, that they were fifteen cubits above the tops of the higheſt mountains, and continued thus upon the earth for 150 days; ſo that whatever had life upon the earth, or in the air, was deſtroyed, except ſuch as were with Noah in the ark. But the Lord remembering Noah, ſent a wind upon the earth, which cauſed the waters to ſubſide; ſo that upon the ſeventeenth day of the ſeventh month the ark reſted on the mountains of Ararat: and Noah having uncovered the roof the ark, and obſerving the earth was dry, he received orders from the Lord to come out of it, with all the animals that were therein; and this he did in the ſix hundred and firſt year of his age, on the 27th day of the ſecond month. See the article DELUGE.

Then he offered as a burnt ſacrifice to the Lord one of all the pure animals that were in the ark; and the Lord accepted

his ſacrifice, and ſaid to him, that he would no more pour out his curſe upon the whole earth, nor any more deſtroy all the animals as he had now done. He gave Noah power over all the brute creation, and permitted him to eat of them, as of the herbs and fruits of the earth; except only the blood, the uſe of which God did not allow him. He bid him increaſe and multiply, made a covenant with him, and God engaged himſelf to ſend no more an univerſal deluge upon the earth; and as a memorial of his promiſe, he ſet his bow in the clouds, to be as a pledge of the covenant he made with Noah. (Gen. ix.)

Noah being an huſbandman, began now to cultivate the vine; and having made wine and drank thereof, he unwarily made himſelf drunk, and fell aſleep in his tent, and happened to uncover himſelf in an indecent poſture. Ham, the father of Canaan, having obſerved him in this condition, made himſelf ſport with him, and acquainted his two brothers with it, who were without. But they, inſtead of making it a matter of ſport, turned away from it, and going backwards they covered their father's nakedneſs, by throwing a mantle over him. Noah awaking, and knowing what Ham had done, ſaid, that Canaan the ſon of Ham ſhould be accurſed, that he ſhould be a ſlave of ſlaves in reſpect of his brethren. It is thought he had a mind to ſpare the perſon of his ſon Ham, for fear the curſe might light upon the other children of Ham, who had no part in this action. He curſed Canaan by a ſpirit of prophecy, becauſe the Canaanites his deſcendants were after this to be rooted out by the Iſraelites. Noah added, Let the Lord, the God of Shem, be bleſſed, and let Canaan be the ſervant of Shem. And he was ſo in effect, in the perſon of the Canaanites ſubdued by the Hebrews. Laſtly, Noah ſaid, Let God extend the poſſeſſion of Japheth; let Japheth dwell in the tents of Shem, and let Canaan be his ſervant. This prophecy had its accompliſhment, when the Grecians, and afterwards the Romans, being deſcended from Japheth, made a conqueſt of Aſia, which was the portion of Shem.

But Noah lived yet after the deluge three hundred and fifty years; and the whole time of his life having been nine hundred and fifty years, he died in the year of the world 2006. He left three ſons, Shem, Ham, and Japheth, of which mention is made under their ſeveral names; and according to the common opinion, he divided the whole world amongſt them, in order to re-people it. To Shem he gave Aſia, to Ham Africa, and Europe to Japheth. Some will have it, that beſides theſe three ſons, he had ſeveral others. The ſpurious Beroſus gives him thirty, called Titans, from the name of their mother Titæa. They pretend that the Teutons or Germans are derived from a ſon of Noah called Thuiſcon. The falſe Methodius alſo makes mention of Jonithus or Jonicus, a pretended ſon of Noah.

St. Peter calls Noah a preacher of righteouſneſs (2 Peter ii. 5.), becauſe before the deluge he was inceſſantly preaching and declaring to men, not only by his diſcourſes, but by his unblameable life, and by the building of the ark, in which he was employed ſix ſcore years, that the wrath of God was ready to pour upon them. But his preaching had no effect, ſince, when the deluge came, it found mankind plunged in their former enormities. (Mat. xxiv. 37.)

Several learned men have obſerved, that the Heathen confounded Saturn, Deucalion, Ogyges, the god Cœlus or Ouranus, Janus, Protheus, Prometheus, &c. with Noah. The wife of Noah is called Noriah by the Gnoſtics; and the fable of Deucalion and his wife Pyrrha is manifeſtly invented from the hiſtory of Noah.

The Rabbins pretend, that God gave Noah and his ſons (all who are not of the choſen race of Abraham they call Noachidæ) certain general precepts, which contain, according to them, the natural right which is common to all men indifferently, and the obſervation of which alone will be ſufficient to ſave them. After the law of Moſes, the Hebrews would not ſuffer any ſtranger to dwell in their country, unleſs he would conform to the precepts of the Noachidæ. In war they put to death, without quarter, all that were ignorant of them. Theſe precepts are ſeven in number. The *firſt* directs, that obedience be paid to judges, magiſtrates, and princes. By the *ſecond*, the worſhip of falſe gods, ſuperſtition, and ſacrilege, are abſolutely forbidden. The *third* forbids curſing the name of God, blaſphemies, and falſe oaths. The *fourth* forbids all inceſtuous and unlawful conjunctions, as ſodomy, beaſtiality, and crimes againſt nature. The *fifth* forbids the effuſion of blood of all ſorts of animals, murder, wounds, and mutilations. The *ſixth* forbids thefts, cheats, lying, &c. The *ſeventh* forbids to eat the parts of an animal ſtill alive, as was practiſed by ſome pagans.

To theſe the Rabbins have added ſome others: but what inclines us to doubt the antiquity of theſe precepts is, that no mention is made of them in ſcripture, or in the writings of Joſephus or Philo; and that none of the ancient fathers knew any thing of them.

NOB, a ſacerdotal city of the tribe of Benjamin or Ephraim. St. Jerom ſays, that in his time it was entirely deſtroyed, and that the ruins of it might be ſeen not far from Dioſpolis. When David was drove away by Saul, he went to Nob, and aſking the high-prieſt Abimelech for ſome proviſions and arms, the prieſt gave him the ſhew-bread which had been lately taken off the holy table, and the ſword of Goliah. Saul being informed of this by Doeg, cauſed all the prieſts of Nob to be ſlain, and the city to be deſtroyed. 1 Sam. xxi. xxii.

NOBAH, a city beyond Jordan. It took the name of Nobah from an Iſraelite of this name who had made a conqueſt of it, (Numb. xxxii. 42.) Gideon purſued the Midianites as far as this city, (Judg. viii. 2.) Euſebius ſays, that there is a deſolate place of this name about eight miles from Heſhbon towards the ſouth. But this could not be the Nobah now mentioned, becauſe it was much farther to the north.

NOBILIARY, in literary hiſtory, a book containing the hiſtory of the noble families of a nation or province: ſuch are Choriere's Nobiliary of Dauphiné, and Caumartin's Nobiliary of Provence. The Germans are ſaid to be particularly careful of their Nobiliaries, in order to keep up the dignity of their families.

NOBILITY in general ſignifies dignity, grandeur, or greatneſs; more particularly, it ſignifies antiquity of family, joined with riches: in the common acceptation of the word, it means that quality or dignity which raiſes a man above the rank of a peaſant or a commoner.

Whether that equality of rank and condition which has of late been ſo loudly contended for would be more agreeable to the order of nature, or more conducive to the happineſs and proſperity of mankind, may indeed be made a queſtion; but it is a queſtion, we apprehend, which cannot receive different anſwers from men capable of reflecting without prejudice and partiality. A ſtate of perfect equality can ſubſiſt only among beings poſſeſſing equal talents and equal virtues; but ſuch beings are not men. Were all mankind under the conſtant influence of the laws of virtue, a diſtinction of ranks would be unneceſſary; but in that caſe civil government itſelf would likewiſe be unneceſſary, becauſe men would have attained all that perfection to which it is the object of civil government as well as of religion to guide them: every man then would be a law unto himſelf. But whilſt, in ſo many breaſts, the ſelfiſh paſſions predominate over thoſe which are ſocial, violence muſt be reſtrained by authority; and there can be no authority without a diſtinction of ranks, ſuch as may influence the public opinion.

It is well obſerved by Hume, that government is founded only on opinion; and that this opinion is of two kinds, opinion of intereſt, and opinion of right. When a people are perſuaded

that it is their intereſt to ſupport the government under which they live, that government muſt be very ſtable. But among the worthleſs and unthinking part of the community, this perſuaſion has ſeldom place. All men, however, have a notion of rights—of a right to property and a right to power; and when the majority of a nation conſiders a certain order of men as having a right to that eminence in which they are placed, this opinion, call it prejudice or what we will, contributes much to the peace and happineſs of civil ſociety. There are many, however, who think otherwiſe, and imagine that "the ſociety in which the greateſt equality prevails muſt always be the moſt ſecure. Theſe men conceive it to be the buſineſs of a good government to diſtribute as equally as poſſible thoſe bleſſings which bounteous nature offers to all." It may readily be allowed that this reaſoning is concluſive; but the great queſtion returns, "How *far* can equality prevail in a ſociety which is ſecure? and what is *poſſible* to be done in the equal diſtribution of the bleſſings of Nature?" Till theſe queſtions be anſwered, we gain nothing by declaiming on the rights and equality of men; and the anſwers which have ſometimes been given to them ſuppoſe a degree of perfection in human nature, which, if it were real, would make all civil inſtitutions uſeleſs, as well as the reveries of thoſe reformers. The conduct of the democratic ſtates of Pagan antiquity, together with the oppreſſive anarchy and ſhameful violences which we have ſeen and ſtill ſee in a neighbouring kingdom, will be conſidered by many as a full and ſatisfactory anſwer, deduced from experience, to all the ſchemes of the viſionary theoriſt: ſuch facts at leaſt render the abolition of the order of nobility a matter of more importance, and of infinitely greater difficulty, than thoſe who plead for it are diſpoſed to allow.

It is an opinion not uncommon, and at leaſt plauſible, that the nobility of a well regulated ſtate is the beſt ſecurity againſt monarchial deſpotiſm or lawleſs uſurpation on the one hand, and the confuſion of democratic inſolence on the other. Self-intereſt is the moſt powerful principle in the human breaſt; and it is obviouſly the intereſt of ſuch men to preſerve that balance of power in ſociety upon which the very exiſtence of their order depends. Corrupted as the preſent age confeſſedly is, a very recent inſtance could be given, in which the Britiſh Houſe of Peers reſcued at once the ſovereign and the people from the threatened tyranny of a factious junto.

A perfect equality, however, in rank and fortune has ſeldom been contended for, except by the moſt ignorant enthuſiaſts. It is indeed doubtful whether it could poſſibly exiſt. The more moderate and rational reformers have acknowledged, that as theſe differences have always exiſted in ſome way or other, ſo, from the infinite variety of talents and attainments in the world, we have reaſon to expect they will exiſt in every form of government and among every people. The queſtion, therefore, is reduced to this: Whether the preſent mode of diſtinction, or any other which could be inſtituted in its ſtead, be upon the whole the beſt?" That the preſent is not perfect, or wholly without faults, few will be ſanguine enough to contradict: and a wiſe man in the ſober hour of philoſophical reflection will ſcarce preſume to aſſert, that any other ſcheme which human ingenuity can plan would be wholly without imperfection, or altogether free from error. The caſe is, the errors of our own ſyſtem are preſent, and on this account we ſee and feel them with peculiar force: the other plan we look forward to, perhaps in too ſanguine a manner, and we probably forget, in the deluſive heat of imagination, that if diſtinction depended entirely on merit, we ſhould ſcarce find a ſociety of men ſo honeſt, or ſo able, as always to reward it according to its deſerts; or if this were poſſible, as perhaps in the nature of things it is not, ſuch is the ſelf-partiality of the generality of men, that few would think he were dealt juſtly by if he were not promoted as well as his neighbour; and it is clearly impoſſible to promote every one. For ſuch reaſons then, and many more which our limits oblige us to omit, many think (and we are inclined to think with them), that it is ſafer to remain as we are, as we know the evils that attend our ſituation, and are ſtill able to bear them, rather than to hazard a change, which, with ſome benefits, might alſo perhaps increaſe the troubles, and deſtroy many of the pleaſures, of ſocial life.

Perhaps it may not be amiſs to lay before our readers the following obſervations from that moſt judicious commentator on the laws of England, Mr. Juſtice Blackſtone, on this important ſubject.

"The diſtinction of rank and honours (ſays he) is neceſſary in every well-governed ſtate, in order to reward ſuch as are eminent for their ſervices to the public, in a manner the moſt deſirable to individuals, and yet without burden to the community; exciting thereby an ambitious, yet laudable ardour, and generous emulation, in others. And emulation, or virtuous ambition, is a ſpring of action which, however dangerous or invidious in a mere republic or under a deſpotic ſway, will certainly be attended with good effects under a free monarchy; where, without deſtroying its exiſtence, its exceſſes may be continually reſtrained by that ſuperior power from which all honour is derived. Such a ſpirit, when nationally diffuſed, gives life and vigour to the community; it ſets all the wheels of government in motion, which, under a wiſe regulator, may be directed to any beneficial purpoſe; and thereby every individual may be made ſubſervient to the public good, while he principally means to promote his own particular views. A body of nobility is alſo more peculiarly neceſſary in our mixed and compounded conſtitution, in order to ſupport the rights of both the crown and the people, by forming a barrier to withſtand the encroachments of both. It creates and preſerves that gradual ſcale of dignity, which proceeds from the peaſant to the prince; riſing like a pyramid from a broad foundation, and diminiſhing to a point as it riſes. It is this aſcending and contracting proportion that adds ſtability to any government; for when the departure is ſudden from one extreme to another, we may pronounce that ſtate to be precarious. The nobility, therefore, are the pillars, which are reared from among the people, more immediately to ſupport the throne; and, if that falls, they muſt alſo be buried under its ruins. Accordingly, when in the laſt century the commons had determined to extirpate monarchy, they alſo voted the houſe of lords to be uſeleſs and dangerous. And ſince titles of nobility are thus expedient in the ſtate, it is alſo expedient that their owners ſhould form an independent and ſeparate branch of the legiſlature. If they were confounded with the maſs of the people, and like them had only a vote in electing repreſentatives, their privileges would ſoon be borne down and overwhelmed by the popular torrent, which would effectually level all diſtinctions. It is therefore highly neceſſary that the body of nobles ſhould have a diſtinct aſſembly, diſtinct deliberations, and diſtinct powers from the commons."

The origin of nobility in Europe is by ſome referred to the Goths; who, after they had ſeized a part of Europe, rewarded their captains with titles of honour, to diſtinguiſh them from the common people. We ſhall only in this place further conſider the manner in which in our own country they may be created, and the incidents attending them; referring for a fuller account of their origin in Europe to the articles REVOLUTION, and *Civil* SOCIETY.

1. The right of peerage ſeems to have been originally territorial; that is, annexed to lands, honours, caſtles, manors, and the like; the proprietors and poſſeſſors of which were (in right of thoſe eſtates) allowed to be peers of the realm, and were ſummoned to parliament to do ſuit and ſervice to their ſovereign: and, when the land was alienated, the dignity paſſed with it as appendant. Thus in England the biſhops ſtill ſit in the houſe of lords in right of ſucceſſion to certain ancient baronies annexed, or ſuppoſed to be annexed, to their

epiſcopal lands; and thus in 11 Henry VI. the poſſeſſion of the caſtle of Arundel was adjudged to confer an earldom on its poſſeſſor. But afterwards, when ALIENATIONS grew to be frequent, the dignity of peerage was confined to the lineage of the party ennobled, and inſtead of territorial became perſonal. Actual proof of a tenure by barony became no longer neceſſary to conſtitute a lord of parliament; but the record of the writ of ſummons to him or his anceſtors was admitted as a ſufficient evidence of the tenure.

Peers of Great Britain (judge Blackſtone obſerves) are now created either by writ or by patent: for thoſe who claim by preſcription muſt ſuppoſe either a writ or patent made to their anceſtors; though by length of time it is loſt. The creation by writ, or the king's letter, is a ſummons to attend the houſe of peers, by the ſtyle and title of that barony which the king is pleaſed to confer: that by patent is a royal grant to a ſubject of any dignity and degree of peerage. The creation by writ is the more ancient way; but a man is not ennobled thereby, unleſs he actually take his ſeat in the houſe of lords; and ſome are of opinion that there muſt be at leaſt two writs of ſummons, and a ſitting in two diſtinct parliaments, to evidence an hereditary barony: and therefore the moſt uſual, becauſe the ſureſt, way is to grant the dignity by patent, which endures a man and his heirs according to the limitation thereof, though he never himſelf makes uſe of it. Yet it is frequent to call up the eldeſt ſon of a peer to the houſe of lords by writ of ſummons, in the name of his father's barony: becauſe in that caſe there is no danger of his childrens loſing the nobility in caſe he never takes his ſeat; for they will ſucceed to their grandfather. Creation by writ has alſo one advantage over that by patent; for a perſon created by writ holds the dignity to him and his heirs, without any words to that purport in the writ; but in letters patent there muſt be words to direct the inheritance, elſe the dignity endures only to the grantee for life. For a man or woman may be created noble for their own lives, and the dignity not deſcend to their heirs at all, or deſcend only to ſome particular heirs: as where a peerage is limited to a man, and the heirs male of his body by Elizabeth his preſent lady, and not to ſuch heirs by any former or future wife.

2. Let us next take a view of a few of the principal incidents attending the nobility,—excluſive of their capacity as members of parliament, and as hereditary counſellors of the crown, for both which we refer to the articles LORDS and PARLIAMENT. And firſt we muſt obſerve, that in criminal caſes a nobleman ſhall be tried by his peers. The great are always obnoxious to popular envy: were they to be judged by the people, they might be in danger from the prejudice of their judges; and would moreover be deprived of the privilege of the meaneſt ſubjects, that of being tried by their equals, which is ſecured to all the realm by magna charta, c. 29. It is ſaid, that this does not extend to biſhops; who, though they are lords of parliament, and ſit there by virtue of their baronies which they hold *jure eccleſiæ*, yet are not ennobled in blood, and conſequently not peers with the nobility. As to peereſſes, no proviſion was made for their trial when accuſed of treaſon or felony, till after Eleanor ducheſs of Glouceſter, wife to the lord protector, had been accuſed of treaſon, and found guilty of witchcraft, in an eccleſiaſtical ſynod, through the intrigues of Cardinal Beaufort. This very extraordinary trial gave occaſion to a ſpecial ſtatute, 20 Hen. VI. c. 9. which enacts, that peereſſes, either in their own right or by marriage, ſhall be tried before the ſame judicature as peers of the realm. If a woman, noble in her own right, marries a commoner, ſhe ſtill remains noble, and ſhall be tried by her peers: but if ſhe be only noble by marriage, then by a ſecond marriage with a commoner ſhe loſes her dignity; for as by marriage it is gained, by marriage it is alſo loſt. Yet if a ducheſs-dowager marries a baron, ſhe continues a ducheſs ſtill; for all the nobility are *pares*, and therefore it is no degradation. A peer or peereſs (either in her own right or by marriage) cannot be arreſted in civil caſes: and they have alſo many peculiar privileges annexed to their peerage in the courſe of judicial proceedings. A peer ſitting in judgment, gives not his verdict upon oath, like an ordinary juryman, but upon his honour; he anſwers alſo to bills in chancery upon his honour, and not upon his oath; but, when he is examined as a witneſs either in civil or criminal caſes, he muſt be ſworn; for the reſpect which the law ſhows to the honour of a peer does not extend ſo far as to overturn a ſettled maxim, that *in judicio non creditur niſi juratus*. The honour of peers is however ſo highly tendered by the law, that it is much more penal to ſpread falſe reports of them, and certain other great officers of the realm, than of other men: ſcandal againſt them being called by the peculiar name of *ſcandalum magnatum*, and ſubjected to peculiar puniſhment by divers ancient ſtatutes.

A peer cannot loſe his nobility but by death or attainder; though there was an inſtance, in the reign of Edward IV. of the degradation of George Nevile duke of Bedford by act of parliament, on account of his poverty, which rendered him unable to ſupport his dignity. But this is a ſingular inſtance: which ſerves at the ſame time, by having happened, to ſhow the power of parliament; and, by having happened but once, to ſhew how tender the parliament hath been in exerting ſo high a power. It hath been ſaid indeed, that if a baron waſtes his eſtate, ſo that he is not able to ſupport the degree, the king might degrade him: but it is expreſsly held by later authorities, that a peer cannot be degraded but by act of parliament.

Anton. Matthæus obſerves, that nobility, among the Romans, was a quite different thing from what it is among us. The nobles, among the Romans, were either thoſe raiſed to the magiſtrature, or deſcended from magiſtrates: there was no ſuch thing as nobility by patent. Bartoly ſays, that doctors, after they have held a profeſſor's chair in a univerſity for 20 years, become noble; and are intitled to all the rights of counts. But this claim is not admitted at court, &c. though Bartoli's ſentiments be backed with thoſe of ſeveral other authors, particularly Chaſſanæus in his *Conſuetudin. Burgundiæ*; *Boyer ſur la Coutume de Berry*; *Faber C. de Dig. Def.* 9. &c. which laſt, however, reſtrains Bartoli's rule to doctors in law, and princes phyſicians.

By an edict of the French king, in 1669, it was declared, that trade ſhould not derogate from nobility, provided the perſon did not ſell by retail. And in Bretagne, by ancient cuſtom, a nobleman loſt nothing by trading even in retail: but here aſſumed all his rights as ſoon as he ceaſed traffic, his nobility having ſlept all the time.

In Germany, a woman, not noble by birth, doth not become *v. gr.* a counteſs or baroneſs by marrying a count or baron: a lady of the higher degree indeed becomes a princeſs by marrying a prince; but this doth not hold of a lady of the lower nobility.

On the coaſt of Malabar, children are only capable of being noble by the mother's ſide; it being allowed them to take as many huſbands as they pleaſe, and to quit them whenever they think good.

NOBLE, *Nobilis*, a perſon who has a privilege which raiſes him above a commoner or peaſant, either by birth, by office, or by patent from his prince. The word comes from the Latin *nobilis*; formed from the ancient *noſcibilis*, "diſtinguiſhable, remarkable."

In England, the word *noble* is of a narrower import than in other countries; being confined to perſons above the degree of knights; whereas, abroad, it comprehends not only knights,

but what we ſimply call *gentlemen*. The nobles of England are alſo called *pares regni*, as being *nobilitatis pares*, though *gradu impares*.

The Venetian *nobleſſe* is famous: it is in this that the ſovereignty of the ſtate reſides. It is divided into three claſſes. The firſt only comprehends 24 families. The ſecond includes the deſcendants of all thoſe who were entered in the golden book, in 1289, and deſtined to govern the ſtate, which then began to be ariſtocratic. The third conſiſts of ſuch as have bought the dignity of noble Venetians. This laſt claſs is only admitted to the inferior employs; the two former to all indifferently. The title of *noble Venetians* is ſometimes alſo given to foreign kings, princes, &c.

Nobles, among the Romans, were ſuch as had the *jus imaginum*, or the right of uſing the pictures or ſtatues of their anceſtors; a right which was allowed only to thoſe whoſe anceſtors had borne ſome *curule* office, that is, had been *curule ædile*, *cenſor*, *prætor*, or *conſul*. For a long time, none but the *Patricii* were the *nobiles*, becauſe no perſon but of that ſuperior rank could bear any *curule* office; hence in Livy, Salluſt, &c. *nobilitas* is uſed to ſignify the Patrician order, and ſo oppoſed to *plebs*. To make the true meaning of *nobiles* ſtill more clear, let it be obſerved, that the Roman people were divided into *nobiles*, *novi*, and *ignobiles*. *Nobiles* were they who had the pictures, &c. of their anceſtors; *novi* were ſuch as had only their own; *ignobiles* were ſuch as had neither. See Jus *Imaginis*. The Roman nobility, by way of diſtinction, wore an half moon upon their ſhoes, eſpecially thoſe of Patrician rank. The Grecian nobility were called Ευπατριδαι, as being deſcended from thoſe old heroic anceſtors ſo famous in hiſtory. Such were the *Praxiergidæ*, *Etrobutidæ*, *Alcmæonidæ*, &c. all which had many privileges annexed to their quality; amongſt which was this, that they wore graſhoppers in their hair as a badge of nobility.

Noble, a money of account containing ſix ſhillings and eight pence. The noble was anciently a real coin ſtruck in the reign of Edward III. and then called the *penny of gold*; but it was afterwards called a *roſe-noble*, from its being ſtamped with a roſe: it was current at 6s. 8d.

NOCERA, a town in Italy, in the dominions of the king of Naples and Sicily, or, as he is more commonly called, the king of the Two Sicilies. It is an epiſcopal city, but might with greater propriety be ſtyled a cluſter of villages: its ſeveral parts being extended along the foot of the mountains, form the Città Sotana, or low town; and the biſhop's palace, together with ſome convents embowered in cypreſs groves, cover the peak of a ſingle hill in a very picturesque manner, and compoſe the Città Soprana.

Nocera (anciently, *Nuceria Alphaterna*, a Roman colony), it is reported, contains near 30,000 inhabitants; they are diſperſed in forty patches of habitation. Their houſes are conſtructed of two kinds of ſtone: the common walls are built with yellow tufa dug out of the hills that lie about a mile to the eaſt of the town; which ſtone ſeems unqueſtionably to have been formed by a conſolidation of ſubſtances thrown out of Veſuvius; becauſe on opening theſe quarries, the workmen have frequently diſcovered tombs, vaſes, and coins locked up in the body of the ſtoney ſtratum. The caſes of their doors and windows are made of a black ſtone drawn from the hill of Fiano, two miles to the north; it lies eight feet below the ſurface, in a bed or vein 140 feet thick, reſting upon a baſe of ſand. This ſeems evidently to be a ſtream of lava congealed.

Nocera is a place of very conſiderable antiquity: in the 13th century it was called de Pagani, to diſtinguiſh it from a city in Umbria of a ſimilar name; this addition was in alluſion to a colony of Saracens which Frederick of Suabia brought from Sicily, and ſettled here, that they might be out of the way of their dangerous connections with Africa: hence Nocera has often been confounded with Lucera by the negligent or ignorant chroniclers of the ſucceeding ages. The moſt remarkable event that occurs in its hiſtory is the ſiege of its caſtle, A. D. 1384. E. lon. 12. 55. N. lat. 43. 2.

Terra Nocerana, *Earth of Nocera*, in the materia medica, a ſpecies of bole remarkably heavy, of a greyiſh-white colour, of an inſipid taſte, and generally with ſome particles in it which grit between the teeth. It is much eſteemed by the Italians as a remedy for venomous bites, and in fevers; but, excepting as an abſorbent and aſtringent, no dependence is to be had on it.

NOCTAMBULI, Noctambulones, or *Night-walkers*; a term of equal import with *ſomnambuli*; applied to perſons who have a habit of riſing and walking about in their ſleep. The word is a compound of the Latin *nox*, "night," and *ambulo*, "I walk." Schenkius, Horſtius, Clauderus, and Hildanus, who have wrote of ſleep, give us divers unhappy hiſtories of ſuch noctambuli. When the diſeaſe is moderate, the perſons affected with it only repeat the actions of the day on getting out of bed, and go quietly to the places they frequented at other times; but thoſe who have it in the moſt violent degree, go up to dangerous places, and do things which would terrify them to think of when they are awake. Theſe are by ſome called *lunatic* night-walkers, becauſe fits are obſerved to return with the moſt frequency and violence at the changes of the moon.—For the cure ſome recommend purging and a cooling regimen: others are of opinion that the beſt method is to place a veſſel of water at the patient's bed-ſide in ſuch a manner that he will naturally ſtep into it when he gets out of bed; or if that ſhould fail, a perſon ſhould ſit up to watch and beat him every time it happens. See Sleep-walkers, or Somnambuli.

NOCTILUCA, a ſpecies of phoſphorus, ſo called becauſe it ſhines in the dark without any light being thrown upon it: ſuch is the phoſphorus made of urine.

NOCTURNAL, ſomething relating to the night, in contradiſtinction to diurnal.

Nocturnal, *Noctturlabium*, an inſtrument chiefly uſed at ſea, to take the altitude or depreſſion of ſome ſtars about the pole, in order to find the latitude and hour of the night. Some nocturnals are hemiſpheres, or planiſpheres, on the plane of the equinoctial. Thoſe commonly in uſe among ſeamen are two; the one adapted to the polar ſtar, and the firſt of the guards of the Little Bear; the other to the pole ſtar, and the pointers of the Great Bear.

This inſtrument conſiſts of two circular plates, applied to each other. The greater, which has a handle to hold the inſtrument, is about $2\frac{1}{2}$ inches diameter, and is divided into twelve parts, agreeing to the twelve months; and each month ſubdivided into every fifth day; and ſo as that the middle of the handle correſponds to that day of the year wherein the ſtar here regarded has the ſame right aſcenſion with the ſun. If the inſtrument be fitted for two ſtars, the handle is made moveable. The upper left circle is divided into twenty-four equal parts for the twenty-four hours of the day, and each hour ſubdivided into quarters. Theſe twenty-four hours are noted by twenty-four teeth to be told in the night. Thoſe at the hour 12 are diſtinguiſhed by their length. In the centre of the two circular plates is adjuſted a long index, moveable upon the upper plate; and the three pieces, viz. the two circles and index, are joined by a rivet which is pierced through the centre with a hole, through which the ſtar is to be obſerved. See Pl. 1.

To uſe the nocturnal, turn the upper plate till the long tooth, marked 12, be againſt the day of the month on the under plate; then, bringing the inſtrument near the eye, ſuſpend it by the handle with the plane nearly parallel to the equinoctial; and viewing the pole ſtar through the hole of the centre, turn the index about, till, by the edge coming from the centre, you ſee

the bright ſtar or guard of the Little Bear, (if the inſtrument be fitted to that ſtar): then that tooth of the upper circle, under the edge of the index, is at the hour of the night on the edge of the hour-circle: which may be known without a light, by counting the teeth from the longeſt, which is for the hour 12.

NOD, or *the land of* Nod. It was to this country that Cain withdrew after his fratricide, (Gen. iv. 16). The ſeptuagint, as well as Joſephus, read *Naid* inſtead of *Nod*, and have taken it for the name of a place. It is not eaſily known what country this was, unleſs perhaps it was the country of Nyſe or Nyſea, towards Hyrcania. St. Jerome and the Chaldee interpreters have taken the word Nod in the ſenſe of an appellative, for *vagabond* or *fugitive*; "He dwelt a fugitive in the land." But the Hebrew reads, "He dwelt in the land of Nod." (Gen. iv. 16.)

NODAB, a country bordering upon Iturea and Idumæa, but now unknown. We read in the Chronicles, that the tribe of Reuben, aſſiſted by thoſe of Gad and Manaſſeh, had a war againſt the Hagarites, the Jeturites, and the people of Nephiſh, and of Nodab, in which the Iſraelites had the advantage. 1 Chr. v. 19. But the time and the other particulars of this war are unknown.

NODATED HYPERBOLA, a name given by Sir Iſaac Newton to a kind of hyperbola, which, by turning round, deculſates or croſſes itſelf.

NODDY. See Sterna.

NODE, a tumour ariſing on the bones, and uſually proceeding from ſome venereal cauſe; being much the ſame with what is otherwiſe called *exoſtoſis*.

NODES, in aſtronomy, the two points where the orbit of a planet interſects the ecliptic. Such are the two points C and D, pl. 1. fig. 1. of which the node C, where the planet aſcends northward above the plane of the ecliptic, is called the *aſcending node*, or the *dragon's head*, and is marked thus ☊. The other node D, where the planet deſcends to the ſouth, is called the *deſcending node*, or the *dragon's tail*, marked thus ☋. The line CD, wherein the two circles CEDF and CGDH interſect, is called the *line of nodes*. It appears from obſervation, that the line of the nodes of all the planets conſtantly changes its place, and ſhifts its ſituation from eaſt to weſt, contrary to the order of the ſigns; and that the line of the moon's nodes, by a retrogade motion, finiſhes its circulation in the compaſs of 19 years; after which time, either of the nodes having receded from any point of the ecliptic, returns to the ſame again; and when the moon is in the node, ſhe is alſo ſeen in the ecliptic. If the line of nodes were immoveable, that is, if it had no other motion than that whereby it is carried round the ſun, it would always look to the ſame point of the ecliptic, or would keep parallel to itſelf, as the axis of the earth does. From what hath been ſaid, it is evident, that the moon can never be obſerved preciſely in the ecliptic, but twice in every period; that is, when ſhe enters the nodes. When ſhe is at her greateſt diſtance from the nodes, viz. in the points E, F, ſhe is ſaid to be in her limits.

The moon muſt be in or near one of the nodes, when there is an eclipſe of the ſun or moon.

To make the foregoing account of the motion of the moon's nodes ſtill clearer, let the plane of fig. 2. *ibid.* repreſent that of the ecliptic, S the ſun, T the centre of the earth, L the moon in her orbit D N *d n*. N *n* is the line of the nodes paſſing between the quadrature Q and the moon's place L, in her laſt quarter. Let now LP, or any part LS, repreſent the exceſs of the ſun's action at T; and this being reſolved into the force LR, perpendicular to the plane of the moon's orbit, and PR parallel to it, it is the former only that has any effect to alter the poſition of the orbit, and in this it is wholly exerted. Its effect is twofold: 1. It diminiſhes its inclination by a motion which we may conceive as performed round the diameter D *d*, to which LT is perpendicular. 2. Being compounded with the moon's tangential motion at L, it gives it an intermediate direction L *t*, through which and the centre a plane being drawn, muſt meet the ecliptic nearer the conjunction C than before.

NODUS, or node, in dialing, a certain point or pole in the gnomon of a dial, by the ſhadow or light whereof either the hour of the day in dials without furniture, or the parallels of the ſun's declination, and his place in the ecliptic, &c. in dials with furniture, are ſhown. See Dialling.

NOEOMAGUS LEXUVIORUM, (Ptol.); thought to be the *Civitas Lexoviorum* of the lower age. Now *Liſieux*, a city in Normandy.—Another of the *Tricaſtini*; a town of Gallia Narbonenſis; thought to be *S. Pol de Trois Chateaux*, ſix miles to the weſt of Nyons in Dauphiné.

NOETIANS, in church-hiſtory, Chriſtian heretics in the third century, followers of Noetius, a philoſopher of Epheſus, who pretended that he was another Moſes ſent by God, and that his brother was a new Aaron. His hereſy conſiſted in affirming that there was but one perſon in the Godhead; and that the Word and the Holy Spirit were but external denominations given to God in conſequence of different operations: that, as Creator, he is called *Father*; as incarnate, *Son*; and as deſcending on the apoſtles, *Holy Ghoſt*.

NOLA, a very ancient city, formerly populous and ſtrong, ſituated in a plain to the north eaſt of Veſuvius in Campania, ſaid to be built by the Chalcidians, (Juſtin, Silius Italicus); according to others, by the Tuſcans. At this place Hannibal met with the firſt check by Marcellus. Veſpaſian added the appellation *Auguſta Colonia*, (Frontinus). At this place, or in its neighbourhood, Auguſtus is ſaid to have expired. It is alſo ſaid that bells were firſt invented there in the beginning of the 5th century; hence their Latin names *Nolæ* or *Campanæ*. It retains its old name to this day, but it hath vaſtly fallen ſhort of its ancient ſplendour. A town of the kingdom of Naples. E. lon. 15. N. lat. 41. 5.

NOLANA, in botany: A genus of the monogynia order, belonging to the pentendria claſs of plants; and in the natural method ranking under the 41ſt order *Aſperifoliæ*. The corolla is campanulated; the ſtyle ſituated betwixt the germens; the ſeeds are bilocular, and reſemble berries.

NOLLE PROSEQUI, is where a plaintiff in an action does not declare in a reaſonable time; in which caſe it is uſual for the defendant's attorney to enter a rule for the plaintiff to declare, after which a *non prof.* may be entered. A *nolle proſequi* is eſteemed a voluntary confeſſion, that the plaintiff has no cauſe of action; and therefore if a plaintiff enters his *nolle proſequi*, he ſhall be amerced: and if an informer cauſe the ſame to be entered, the defendant ſhall have coſts.

NOLLET (Jean Antoine), a deacon, licentiate in theology, preceptor to the *Enfans de France* for phyſics and natural hiſtory, regius profeſſor of phyſics in the college of Navarre, member of the academy of ſciences at Paris, of the royal ſociety of London, of the inſtitution of Bologna, and of the academy of ſciences of Erfort; was born at Pimbré, in the dioceſe of Noyon, on the 17th of November, 1700, of reſpectable but not wealthy parents. To make up the want of riches, they determined to give their ſon a good education. They ſent him to the college of Clermont in Beauvoiſis, and afterwards to Beauvais, there to finiſh his introductory ſtudies. The progreſs which he made in the different claſſes, determined them to ſend him to ſtudy philoſophy at Paris. Thenceforward they intended him for the clerical order; and they conſidered the ſtrictneſs and purity of his morals, together with his unwearied application to ſtudy, as ſufficient proofs of his vocation. The young Nollet yielded without reluctance to the wiſhes of his parents. As ſoon as he was capable of ſhowing an inclination for any

thing, he had diſcovered a taſte for phyſics; but this was not become his ruling paſſion; he therefore ſacrificed it to the ſtudy of ſcholaſtic divinity, to which he wholly dedicated himſelf during his time of probation in 17.8. No ſooner had he been inveſted with the deaconſhip, than he ſolicited and obtained a licence to preach. This new occupation, however, did not make him entirely loſe ſight of thoſe ſtudies which had firſt engaged his attention. They inſenſibly began to occupy a greater portion of his time, which was now more equally divided between theology and the ſciences. The latter, however, prevailed; and thenceforth he entered into the ſtudy of phyſics with an ardour which was only increaſed by that kind of privation to which he had been long ſubject. He was received into the ſociety of arts, eſtabliſhed at Paris under the patronage of the late count de Clermont. In 1730, the Abbé Nollet was engaged in a work conjunctly with Reamur and Du Fay of the academy of ſciences. In 1734, he went to London in company with M M. du Fay, du Hamel, and de Juſſieu. His merit procured him a place in the royal ſociety without any ſolicitation. Two years after, he went to Holland, where he formed an intimate connection with Deſaguliers, Graveſande, and Muſchenbroek. On his return to Paris, he reſumed the courſe of experimental phyſics which he had begun in 1725, and which he continued till 1760. Theſe courſes of phyſics firſt ſuggeſted the idea of particular courſes in other branches of ſcience, ſuch as in chemiſtry, anatomy, natural hiſtory, &c. In 1738, the count de Maurepas prevailed on the cardinal Fleury to eſtabliſh a public claſs for experimental phyſics; and the Abbé Nollet was appointed the firſt profeſſor. In the beginning of the year 1739, he was admitted a member of the royal academy of ſciences; and in the month of April following, the king of Sardinia, intending to eſtabliſh a profeſſorſhip of phyſics at Turin, invited the Abbé Nollet into his dominions. From thence he travelled into Italy. In 1744, he was honoured with an invitation to Verſailles, to inſtruct the dauphin in experimental philoſophy; the king and royal family were often preſent at his lectures. The qualities as well of his underſtanding as of his heart gained him the eſteem and confidence of his pupil. Going one day in ſtate to Paris, he cauſed intimation to be made that he was to dine at the Thuilleries. M. Nollet having gone thither to pay his court, the dauphin no ſooner perceived him, than he had the goodneſs to ſay, "Binet has the advantage of me, he has been at your houſe." Till the period of his death, this prince ſhowed marks of the ſtrongeſt attachment and favour for this ingenious philoſopher. He would have wiſhed that he had been a little more attentive to the improvement of his fortune. He prevailed upon him to go and pay court to a man in power, whoſe patronage might have been of ſervice to him. The Abbé Nollet accordingly waited upon the placeman, and made him a preſent of his works. "I never read any works of that kind," ſaid the patron coldly, and caſting a look at the volumes before him. "Sir (replied the Abbé), will you allow them to remain in your anti chamber? There perhaps there may be found men of genius who will read them with pleaſure." In the month of April 1749, he made a grand tour into Italy, being ſent thither for the purpoſe of making obſervations. At Turin, Venice, and Bologna, the Abbé Nollet appeared as a deputy from the philoſophers of the reſt of Europe. During his ſhort ſtay in Italy, the wonders of electricity were not the only object of his reſearches; every part of phyſics the arts, agriculture, &c. came equally under his notice. Upon his return through Turin, the king of Sardinia, always truly ſenſible of his merit, offered him the order of Saint Maurice, which he did not think proper to accept without his ſovereign's permiſſion. In 1753 the king inſtituted a claſs of experimental philoſophy in the royal college of Navarre, and appointed the Abbé Nollet profeſſor. In 1757, he received from the king a brevet appointing him preceptor in phyſics and natural hiſtory to the *Enfans de France*. In the month of Auguſt, the ſame year, he was appointed profeſſor of experimental philoſophy in the ſchool of Artillery, at that time eſtabliſhed at La Fere. In the month of November following, he was admitted as a penſionary of the royal academy of ſciences. M. de Cremillo, director-general of artillery and fortification, having founded a claſs of experimental philoſophy at Mezieres in 1761, the Abbé Nollet was appointed profeſſor. This celebrated and laborious philoſopher, who has rendered the moſt important ſervices to phyſics by the diſcoveries with which he has enriched every branch of this ſcience, but particularly electricity, died at Paris on the 25th of April 1770, aged 70; much regretted by the literary world, and by his friends, of whom his gentle character and beneficent heart had procured him a great number. He often retired from the gay and ſplendid ſocieties of Paris, to give aſſiſtance to his relations, who were by no means in affluent circumſtances. His works are, 1. Several papers inſerted in the memoirs of the academy of ſciences; among which one on the Hearing of Fiſhes is particularly valuable. 2. *Leçons de Phyſique Experimentale*, 6 vols. 12mo; a book well compoſed, and uniting pleaſure with inſtruction. 3. *Recueil de Lettres ſur l'Electricité*, 3 vols. 12mo. 1753. 4. *Eſſai ſur l'Electricité des Corps*, 1 vol. 12mo. 5. *Recherches ſur les cauſes particulieres des Phenomènes Electriques*, 1 vol. 12mo. 6. *L'Andes Experiences*, 3 vols. 2mo with figures, 1770.

NOMADES, a name given, in antiquity, to ſeveral nations whoſe whole occupation was to feed and tend their flocks; and who had no fixed place of abode, but were conſtantly ſhifting, according to the conveniences of paſturage. The word comes from the Greek νεμω, *paſco*, "I feed." The moſt celebrated among the Nomades were thoſe of Africa, who inhabited between Africa, properly ſo called, to the eaſt, and Mauritania to the weſt. They are alſo called *Numidæ*, or *Numidians*.—Salluſt ſays, they were a colony of Perſians brought into Africa with Hercules. The Nomades of Aſia inhabited the coaſts of the Caſpian Sea.—The Nomades of Scythia were the inhabitants of Little Tartary; who ſtill retain the ancient manner of living.

NOMARCHA, in antiquity, the governor or commander of a nome, or nomos.—Egypt was anciently divided into ſeveral regions or quarters, called *nomes*, from the Greek νομος, taken in the ſenſe of a diviſion; and the officer who had the adminiſtration of each *nome* or *nomos*, from the king, was called *monarcha*, from νομος and αρχη "command."

NOMBRE-DE DIOS, a town of Mexico, in the province of Darien, a little to the eaſtward of Porto Bello. It was formerly a famous place; but it is now abandoned, on account of its unhealthy ſituation. W lon. 78. 35. N. lat. 9. 43.

NOMBRIL POINT, in heraldry, is the next below the feſs-point, or the very centre of the eſcutcheon. Suppoſing the eſcutcheon divided into two equal parts below the feſs, the firſt of theſe diviſions is the nombril, and the lower the baſe.

NOME, or NAME, in algebra, denotes any quantity with a ſign prefixed or added to it, whereby it is connected with ſome other quantity, upon which the whole becomes a binomial, trinomial, or the like. See ALGEBRA.

NOMENCLATOR, in Roman antiquity, was uſually a ſlave who attended upon perſons that ſtood candidates for offices, and prompted or ſuggeſted to them the names of all the citizens they met, that they might court them and call them by their names, which among that people was the higheſt piece of civility.

NOMENCLATORS, among the botanical authors, are thoſe who have employed their labours about ſettling and adjuſting the right names, ſynonyms, and etymologies of names, in regard to the whole vegetable world.

NOMENCLATURE, NOMENCLATURA, a catalogue of ſeveral of the more uſual words in any language, with their ſignifications, compiled in order to facilitate the uſe of ſuch words.

to thoſe who are to learn the tongue: ſuch are our Latin, Greek, French, &c. Nomenclatures. The chemical nomenclature has within theſe few years undergone a total change. In our Treatiſe on that ſcience, we have given a table exhibiting theſe new names. Which have been very generally adopted.

NOMENEY, a town in Germany, in the duchy of Lorrain, ſituated on the river Seille, 15 miles north of Nancy.

NOMINALS, or NOMINALISTS, a ſect of ſchool-philoſophers, the diſciples and followers of Occam, or Ocham, an Engliſh cordelier, in the 14th century. They were great dealers in words, whence they were vulgarly denominated *Word-ſellers*; but had the denomination of *Nominaliſts*, becauſe, in oppoſition to the *Realiſts*, they maintained, that words, and not things, were the object of dialectics.

This ſect had its firſt riſe towards the end of the 11th century, and pretended to follow Porphyry and Ariſtotle; but it was not till Ocham's time that they bore the name. The chief of this ſect, in the 11th century, was a perſon called *John*, who, on account of his logical ſubtilty, was called the *ſophiſt*; and his principal diſciples were Robert of Paris, Roſcelin of Compiegne, and Arnoul of Laon. At the beginning, the nominals had the upper hand: but the realiſts, though greatly divided among themſelves, were ſupported by men of great abilities; ſuch as Albertus Magnus, T. Aquinas, and Duns Scotus. The nominal ſect became hereby into diſrepute; till William Occam, in the 14th century, again revived it, and filled France and Germany with the flame of diſputation. Having joined the party of the Franciſcan monks, who ſtrenuouſly oppoſed John XXII. that pope himſelf, and his ſucceſſors after him, left no means untried to extirpate the philoſophy of the nominaliſts, which was deemed highly prejudicial to the intereſts of the church: and hence it was, that in the year 1339, the univerſity of Paris, by a public edict, ſolemnly condemned and prohibited the philoſophy of Occam, which was that of the nominaliſts. The conſequence was, that the nominaliſts flouriſhed more than ever. In the 15th century, the controverſy was continued with more vigour and animoſity than before; and the diſputants were not content with uſing merely the force of eloquence, but had frequently recourſe to more hoſtile and dangerous weapons: and battles were the conſequence of a philoſophical queſtion, which neither ſide underſtood. In moſt places, however, the realiſts maintained a manifeſt ſuperiority over the nominaliſts While the famous Gerſon, and the moſt eminent of his diſciples were living, the nominaliſts were in high eſteem and credit in the univerſity of Paris. But upon the death of theſe patrons, the face of things was much changed to their diſadvantage. In the year 1473, Louis XI. by the inſtigation of his confeſſor, the biſhop of Avranches, iſſued out a ſevere edict againſt the doctrines of the nominaliſts, and ordered all their writings to be ſeized and ſecured, that they might not be read by the people: but the ſame monarch mitigated this edict the year following, and permitted ſome of the books of that ſect to be delivered from their confinement. In the year 1481, he not only granted a full liberty to the nominaliſts and their writings, but alſo reſtored that philoſophical ſect to its former authority and luſtre in the univerſity. The nominaliſts were the founders of the univerſity of Leipſic: and there are many yet abroad who pique themſelves on being nominals.

The nominals, with the Stoics, admit the formal conceptions or ideas of things, as the ſubject and foundation of univerſality: but to this they add names, which repreſent and ſignify, after the ſame univocal manner, and without any diſtinction, a great variety of ſingle things alike in genus and ſpecies. Whence it is that they are called *nominals*; as pretending, that to become learned, it is not enough to have juſt ideas of things, but it is likewiſe required to know the proper names of the genera and ſpecies of things, and to be able to expreſs them clearly and preciſely, without confuſion or ambiguity.

NOMINATIVE, in grammer, the firſt CASE of NOUNS which are declineable. The ſimple poſition, or laying down of a noun, or name, is called the *nominative caſe*; yet it is not ſo properly a caſe, as the matter or ground whence the other caſes are to be formed, by the ſeveral changes and inflections given to this firſt termination. Its chief uſe is to be placed in diſcourſe before all verbs, as the ſubject of the propoſition or affirmation.

NONA, a city of Dalmatia, remarkable at preſent only for its ruins, which might furniſh abundant materials to gratify the curioſity of antiquaries; but indeed they are ſo buried by repeated devaſtations, to which that unhappy city has been expoſed, that rarely any veſtige of them appears above ground. "I went thither (ſays Fortis in his Travels), in hopes of finding ſomething worthy of notice, but was diſappointed. Nothing is to be ſeen that indicates the grandeur of the Roman times; neither are there any remains of barbarous magnificence, to put one in mind of the ages in which the kings of the Croat Slavi had their reſidence there. It lies on a ſmall iſland, ſurrounded by a harbour, which in former times was capable of receiving large ſhips; but is now become a fetid pool by means of a little muddy river that falls into it, after a courſe of about ſix miles through the rich abandoned fields of that diſtrict. The ancient inhabitants turned this water into another channel, and made it run through the valley of Draſnich, into the ſea; and the remains of the bank raiſed by them for that purpoſe are ſtill to be ſeen. Notwithſtanding, however, the depopulation of this diſtrict, and the dreary ſituation of Nona in particular, the new inhabitants have not loſt courage; and animated by the privileges granted to them by this moſt ſerene republic, are endeavouring to bring the population and agriculture once more into a flouriſhing ſtate. Proper drains for the water would not only render that rich territory habitable, but moreover very fertile; and the brackiſh marſh that ſurrounds the walls of Nona is well calculated to ſupply a conſiderable quantity of fiſh, eſpecially eels. The government generouſly granted the inveſtiture to private perſons, who already draw no inconſiderable advantage from the fiſhing; and did they but adopt better methods, they might every year ſalt many thouſands of eels, which would greatly anſwer our internal commerce, and ſave at leaſt a part of the money that goes out of the country for foreign ſalt fiſh. To the left of the city of Nona, the walls of ſome ancient ruinous buildings appear; which probably in ancient times were ſituated on the main land, though now ſurrounded by water. The ſea forms a narrow channel in this place, which is eaſily fordable, and, at low water, the ſmalleſt boat can ſcarcely paſs."

NONAGE, in law, generally ſignifies all the time a perſon continues under the age of 21; but, in a ſpecial ſenſe, it is all the time that a perſon is under the age of 14.

NON-CAPE, a promontory on the weſt coaſt of Africa, oppoſite to the Canary iſlands. W. lon. 12. 0. N. lat. 44. 28.

NONCONFORMISTS, thoſe who refuſe to join the eſtabliſhed worſhip. According to Blackſtone, Nonconformiſts, in England, are of two ſorts. Firſt, ſuch as abſent themſelves from divine worſhip in the eſtabliſhed church through total irreligion, and attend the ſervice of no other perſuaſion. Theſe, by the ſtat. 1. Eliz. c. 2. 23 Eliz. c. 1. and 3 Jac. I. c. 4. forfeit one ſhilling to the poor every Lord's-day they ſo abſent themſelves, and 20l. to the king if they continue ſuch default for a month together. And if they keep any inmate thus irreligiouſly diſpoſed in their houſes, they forfeit 10l. *per* month.

The ſecond ſpecies of nonconformiſts are thoſe who offend through a miſtaken or perverſe zeal. Such were eſteemed, by the Engliſh laws enacted ſince the times of the Reformation,

to be Papiſts and Proteſtant diſſenters: both of which were ſuppoſed to be equally ſchiſmatics, in not communicating with the national church; with this difference, that the Papiſts divided from it upon material, though erroneous, reaſons; but many of the diſſenters upon matters of indifference, or, in other words, for no reaſon at all. "Yet certainly (ſays Sir William Blackſtone) our anceſtors were miſtaken in their plans of compulſion and intolerance. The ſin of ſchiſm, as ſuch, is by no means the object of temporal coercion and puniſhment. If, through weakneſs of intellect, through miſdirected piety, through perverſeneſs and acerbity of temper, or (which is often the caſe) through a proſpect of ſecular advantage in herding with a party, men quarrel with the eccleſiaſtical eſtabliſhment, the civil magiſtrate has nothing to do with it; unleſs their tenets and practice are ſuch as threaten ruin or diſturbance to the ſtate. He is bound indeed to protect the eſtabliſhed church: and if this can be better effected by admitting none but its genuine members to offices of truſt and emolument, he is certainly at liberty ſo to do; the diſpoſal of offices being matter of favour and diſcretion. But this point being once ſecured, all perſecution for diverſity of opinions, however ridiculous or abſurd they may be, is contrary to every principle of ſound policy and civil freedom. The names and ſubordination of the clergy, the poſture of devotion, the materials and colour of the miniſter's garment, the joining in a known or unknown form of prayer, and other matters of the ſame kind, muſt be left to the option of every man's private judgment.

"With regard therefore to *Proteſtant diſſenters*, although the experience of their turbulent diſpoſition in former times occaſioned ſeveral diſabilities and reſtrictions (which I ſhall not undertake to juſtify) to be laid upon them by abundance of ſtatutes; yet at length the legiſlature, with a true ſpirit of magnanimity, extended that indulgence to theſe ſectaries, which they themſelves, when in power, had held to be countenancing ſchiſm, and denied to the church of England. The penalties are conditionally ſuſpended by the ſtatute of 1 W. & M. ſt. 1. c. 18. "for exempting their Majeſties Proteſtant ſubjects, diſſenting from the church of England, from the penalties of certain laws," commonly called the *Toleration act*; which declares, that neither the laws above-mentioned, nor the ſtatutes 1 Eliz. c. 2. § 14. 3 Jac. I. c. 4. & 5. nor any other penal laws made againſt Popiſh recuſants (except the teſt-acts) ſhall extend to any diſſenters, other than Papiſts and ſuch as deny the Trinity: provided, 1. That they take the oaths of allegiance and ſupremacy (or make a ſimilar affirmation, being Quakers), and ſubſcribe the declaration againſt Popery. 2. That they repair to ſome congregation certified to and regiſtered in the court of the biſhop or archdeacon, or at the county-ſeſſions. 3. That the doors of ſuch meeting-houſe ſhall be unlocked, unbarred, and unbolted; in default of which, the perſons meeting there are ſtill liable to all the penalties of the former acts. Diſſenting teachers, in order to be exempted from the penalties of the ſtatutes 13 & 14 Car. II. c. 4. 17 Car. II. c. 2. and 22 Car. II. c. 1. are alſo to ſubſcribe the articles of religion mentioned in the ſtatute 13 Eliz. c. 12. (viz. thoſe which only concern the confeſſion of the true Chriſtian faith, and the doctrine of the ſacraments), with an expreſs exception of thoſe relating to the government and powers of the church, and to infant-baptiſm. And by ſtatute 10 Ann. c. 2. this toleration is ratified and confirmed; and it is declared, that the ſaid act ſhall at all times be inviolably obſerved for the exempting ſuch Proteſtant diſſenters as are thereby intended from the pains and penalties therein mentioned. Thus, though the offence of non-conformity is by no means univerſally abrogated, it is ſuſpended, and ceaſes to exiſt with regard to theſe Proteſtant diſſenters, during their compliance with the conditions impoſed by the act of toleration: and, under theſe conditions, all perſons, who will approve themſelves no Papiſts or oppugners of the Trinity, are left at full liberty to act as their conſciences ſhall direct them in the matter of religious worſhip. And if any perſon ſhall wilfully, maliciouſly, or contemptuouſly diſturb any congregation, aſſembled in any church or permitted meeting-houſe, or ſhall miſuſe any preacher or teacher there, he ſhall (by virtue of the ſame ſtatute) be bound over to the ſeſſions of the peace, and forfeit 20l. But by ſtatute 5 Geo. I. c. 4. no mayor or principal magiſtrate muſt appear at any diſſenting meeting with the enſigns of his office, on pain of diſability to hold that or any other office: the legiſlature judging it a matter of propriety, that a mode of worſhip, ſet up in oppoſition to the national, when allowed to be exerciſed in peace, ſhould be exerciſed alſo with decency, gratitude, and humility. Neither doth the act of toleration extend to enervate thoſe clauſes of the ſtatutes 13 & 14 Car. II. c. 4. and 17 Car. II. c. 2. which prohibit (upon pain of fine and impriſonment) all perſons from teaching ſchool, unleſs they be licenſed by the ordinary, and ſubſcribe a declaration of conformity to the liturgy of the church, and reverently frequent divine ſervice *eſtabliſhed* by the laws of this kingdom.

"As to *Papiſts*, what has been ſaid of the Proteſtant diſſenters would hold equally ſtrong for a general toleration of them; provided their ſeparation was founded only upon difference of opinion in religion, and their principles did not alſo extend to a ſubverſion of the civil government. If once they could be brought to renounce the ſupremacy of the Pope, they might quietly enjoy their ſeven ſacraments; their purgatory, and auricular confeſſion; their worſhip of relics and images; nay, even their tranſubſtantiation. But while they acknowledge a foreign power, ſuperior to the ſovereignty of the kingdom, they cannot complain if the laws of that kingdom will not treat them upon the footing of good ſubjects.

"The following are the laws that have been enacted againſt the Papiſts; who may be divided into three claſſes, perſons profeſſing Popery, Popiſh recuſants convict, and Popiſh prieſts. 1. Perſons profeſſing the Popiſh religion, beſides the former penalties for not frequenting their pariſh-church, are diſabled from taking any lands either by deſcent or purchaſe, after 18 years of age, until they renounce their errors; they muſt at the age of 21 regiſter their eſtates before acquired, and all future conveyances and wills relating to them; they are incapable of preſenting to any advowſon, or granting to any other perſon any avoidance of the ſame; they may not keep or teach any ſchool, under pain of perpetual impriſonment; and, if they willingly ſay or hear maſs, they forfeit the one 200, the other 100 merks, and each ſhall ſuffer a year's impriſonment. Thus much for perſons who, from the misfortune of family-prejudices, or otherwiſe, have conceived an unhappy attachment to the Romiſh church from their infancy, and publicly profeſs its errors. But if any evil induſtry is uſed to rivet theſe errors upon them; if any perſon ſends another abroad to be educated in the Popiſh religion, or to reſide in any religious houſe abroad for that purpoſe, or contributes to their maintenance when there; both the ſender, the ſent, and the contributor, are diſabled to ſue in law or equity, to be executor or adminiſtrator to any perſon, to take any legacy or deed of gift, and to bear any office in the realm; and ſhall forfeit all their goods and chattels, and likewiſe all their real eſtate for life. And where theſe errors are alſo aggravated by apoſtacy or perverſion; where a perſon is reconciled to the ſee of Rome, or procures others to be reconciled, the offence amounts to high-treaſon. 2. Popiſh recuſants, convicted in a court of law of not attending the ſervice of the church of England, are ſubject to the following diſabilities, penalties, and forfeitures, over and above thoſe before-mentioned. They are conſidered as perſons excommunicated; they can hold no office or employment; they muſt not keep arms

in their houſes, but the ſame may be ſeized by the juſtices of the peace; they may not come within 10 miles of London, on pain of 100l.; they can bring no action at law or ſuit in equity; they are not permitted to travel above five miles from home, unleſs by licence, upon pain of forfeiting all their goods; and they may not come to court, under pain of 100l. No marriage or burial of ſuch recuſant, or baptiſm of his child, ſhall be had otherwiſe than by the miniſters of the church of England, under other ſevere penalties. A married woman, when recuſant, ſhall forfeit two thirds of her dower or jointure, may not be executrix or adminiſtratrix to her huſband, nor have any part of his goods; and during the coverture may be kept in priſon, unleſs her huſband redeems her, at the rate of 10l. a-month, or the third part of all his lands. And laſtly, as a feme-couvert recuſant may be impriſoned, ſo all others muſt, within three months after conviction, either ſubmit and renounce their errors, or, if required ſo to do by four juſtices, muſt abjure and renounce the realm: and if they do not depart, or if they return without the king's licence, they ſhall be guilty of felony, and ſuffer death as felons without benefit of clergy. There is alſo an inferior ſpecies of recuſancy, (refuſing to make the declaration againſt Popery enjoined by ſtatute 30 Car. II. ſt. 2. when tendered by the proper magiſtrate); which, if the party reſides within ten miles of London, makes him an abſolute recuſant convict; or, if at a greater diſtance, ſuſpends him from having any ſeat in parliament, keeping arms in his houſe, or any horſe above the value of 5l. 3. Popiſh prieſts are in a ſtill more dangerous condition. By ſtatute 11 & 12 W. III. c. 4. Popiſh prieſts, or biſhops, celebrating maſs or exerciſing any part of their functions in England, except in the houſes of ambaſſadors, are liable to perpetual impriſonment. And by the ſtatute 27 Eliz. c. 2. any Popiſh prieſt, born in the dominions of the crown of England, who ſhall come over hither from beyond ſea (unleſs driven by ſtreſs of weather and tarrying only a reaſonable time), or ſhall be in England three days without conforming and taking the oaths, is guilty of high treaſon: and all perſons harbouring him are guilty of felony without the benefit of clergy.

This is a ſhort ſummary of the laws againſt the Papiſts; of which the preſident Monteſquieu obſerves, that they are ſo rigorous, though not profeſſedly of the ſanguinary kind, that they do all the hurt that can poſſibly be done in cold blood. But in anſwer to this, it may be obſerved (what foreigners who only judge from our ſtatute-book are not fully apprized of), that theſe laws are ſeldom exerted to their utmoſt rigour: and indeed, if they were, it would be very difficult to excuſe them. For they are rather to be accounted for from their hiſtory, and the urgency of the times which produced them, than to be approved (upon a cool review) as a ſtanding ſyſtem of law. The reſtleſs machinations of the Jeſuits during the reign of Elizabeth, the turbulence and uneaſineſs of the Papiſts under the new religious eſtabliſhment, and the boldneſs of their hopes and wiſhes for the ſucceſſion of the queen of Scots, obliged the parliament to counteract ſo dangerous a ſpirit by laws of a great, and then perhaps neceſſary, ſeverity. The powder-treaſon, in the ſucceeding reign, ſtruck a panic into James I. which operated in different ways: it occaſioned the enacting of new laws againſt the Papiſts; but deterred him from putting them in execution. The intrigues of queen Henrietta in the reign of Charles I. the proſpect of a Popiſh ſucceſſor in that of Charles II. the aſſaſſination-plot in the reign of king William, and the avowed claim of a Popiſh pretender to the crown in ſubſequent reigns, will account for the extenſion of theſe penalties at thoſe ſeveral periods of our hiſtory." But now that all juſt fears of a pretender may be ſaid to have vaniſhed, and the power and influence of the pope has become feeble, ridiculous, and deſpicable, not only in Britain, but in almoſt every kingdom of Europe; and as in fact the Britiſh Catholics ſolemnly diſclaim the dangerous principles aſcribed to them; the Britiſh legiſlature, giving way to that liberality of ſentiment becoming Proteſtants, have lately repealed the moſt rigorous of the above edicts, *viz.* The puniſhment of Popiſh prieſts or Jeſuits who ſhould be found to teach or officiate in the ſervices of that church; which acts were felony in foreigners, and high treaſon in the natives of this kingdom:—The forfeitures of Popiſh heirs, who had received their education abroad; and whoſe eſtates went to the next Proteſtant heir.—The power given to the ſon, or other relation, being a Proteſtant, to take poſſeſſion of the father's or other relation's eſtate, during the life of the real proprietor:—And the debarring Papiſts from the power of acquiring any legal property by purchaſe.—In propoſing the repeal of theſe penalties, it was obſerved, That, beſides that ſome of them had now ceaſed to be neceſſary, others were at all times a diſgrace to humanity. The impriſonment of a Popiſh prieſt for life, only for officiating in the ſervices of his religion, was horrible in its nature: and although the mildneſs of government had hitherto ſoftened the rigour of the law in the practice, it was to be remembered that the Roman Catholic prieſts conſtantly lay at the mercy of the baſeſt and moſt abandoned of mankind—of common informers; for on the evidence of any of theſe wretches, the magiſterial and judicial powers were of neceſſity bound to enforce all the ſhameful penalties of the act. Others of theſe penalties held out the moſt powerful temptations for the commiſſion of acts of depravity, at the very thought of which our nature recoils with horror: they ſeemed calculated to looſen all the bands of ſociety; to diſſolve all civil, moral, and religious obligations and duties, to poiſon the ſources of domeſtic felicity, and to annihilate every principle of honour. The encouragement given to children to lay their hands upon the eſtates of their parents, and the reſtriction which debars any man from the honeſt acquiſition of property, need only to be mentioned to excite indignation in an enlightened age.

In order the better to ſecure the Engliſh eſtabliſhed church againſt perils from non-conformiſts of all denominations, infidels, Turks, Jews, heretics, Papiſts, and ſectaries, there are, however, two bulwarks erected; called the *corporation* and *teſt acts*: by the former of which, no perſon can be legally elected to any office relating to the goverment of any city or corporation, unleſs, within a twelvemonth before, he has received the ſacrament of the Lord's ſupper according to the rites of the church of England; and he is alſo enjoined to take the oaths of allegiance and ſupremacy at the ſame time that he takes the oath of office: or, in default of either of theſe requiſites, ſuch election ſhall be void. The other, called the *teſt act*, directs all officers civil and military to take the oaths and make the declaration againſt tranſubſtantiation, in any of the king's courts at Weſtminſter, or at the quarter-ſeſſions, within ſix kalendar months after their admiſſion; and alſo within the ſame time to receive the ſacrament of the Lord's Supper, according to the uſage of the church of England, in ſome public church immediately after divine ſervice and ſermon, and to deliver into court a certificate thereof ſigned by the miniſter and church-warden, and alſo to prove the ſame by two credible witneſſes; upon forfeiture of 500l. and diſability to hold the ſaid office. And of much the ſame nature with theſe is the ſtatute 7 Jac. I. c. 2. which permits no perſons to be naturaliſed or reſtored in blood, but ſuch as undergo a like teſt: which teſt having been removed in 1753, in favour of the Jews, was the next ſeſſion of parliament reſtored again with ſome precipitation.

Non *Naturals*, in medicine, ſo called, becauſe by their abuſe they become the cauſes of diſeaſes. Phyſicians have divided the non-naturals into ſix claſſes, viz. the air, meats and drinks, ſleep and watching, motion and reſt, the paſſions of the mind, the retentions and excretions. See Medicine.

Non-*Obſtante*, *(notwithſtanding,)* a clauſe frequent in ſtatutes

and letters-patent, importing a licence from the king to do a thing, which at common law might be lawfully done, but being reſtrained by act of parliament cannot be done without ſuch licence.

NON-*Prſ.* See NOLLE *Proſequi.*

NON-*Suit*, ſignifies the dropping of a ſuit or action, or a renouncing thereof by the plaintiff or defendant; which happens moſt commonly upon the diſcovery of ſome error in the plaintiff's proceedings when the cauſe is ſo far proceeded in, that the jury is ready at the bar to deliver in their verdict.

NONES, (NONÆ,) in the Roman kalendar, the fifth day of the months January, February, April, June, Auguſt, September, November, and December; and the ſeventh of March, May, July, and October. March, May, July, and October, had ſix days in their nones; becauſe theſe alone, in the ancient conſtitution of the year by Numa, had 31 days a piece, the reſt having only 29, and February 30: but when Cæſar reformed the year, and made other months contain 31 days, he did not allot them ſix days of nones.

NONJURORS, thoſe who refuſed to take the oaths to government, and who were in conſequence under certain incapacities, and liable to certain ſevere penalties. It can ſcarcely be ſaid that there are any nonjurors now in the kingdom; and it is well known that all penalties have been removed both from Papiſts and Proteſtants, formerly of that denomination, as well in Scotland as in England. The members of the Epiſcopal church of Scotland have long been denominated Nonjurors; but perhaps they are now called ſo improperly, as the ground of their difference from the eſtabliſhment is more on account of eccleſiaſtical than political principles.

NONIUS (PETER), in Spaniſh *Nunez*, a learned Portugueſe, and one of the ableſt mathematicians of the 16th century, was born at Alcacer. He was preceptor to Don Henry, king Emmanuel's ſon, and taught the mathematics in the univerſity of Coimbra. He publiſhed the following works, by which he gained great reputation: 1. *De arte navigandi.* 2. *Animotationes in theorias planetarum Purbachii*; which are greatly eſteemed. 3. A treatiſe *De Crepuſculis.* 4. A treatiſe on algebra. It is obſerved in Furetier's dictionary, that Peter Nonius, in 1530, firſt invented the angles of 45 degrees made in every meridian, and that he called them *rhumbs* in his language, and calculated them by ſpherical triangles. Nonius died in 1577, aged 80.

NONIUS, the name which was not many years ago given to the common device for ſubdividing the arcs of quadrants and other aſtronomical inſtruments, from the perſuaſion that it was invented by *Nonius* or *Nunez*, of whom ſome account has been given in the preceding article. The generality of aſtronomers of the preſent age, transferring the honour of the invention from *Nunez* to *Peter Vernier*, a native of Franche Comté, have called this method of diviſion by his name. (See VERNIER). Mr. Adams, however, in his *Geometrical and Geographical Eſſays*, has lately ſhown that Clevius the Jeſuit may diſpute the invention with them both. The truth ſeems to be, that Nunez ſtarted the idea, Clevius improved it, and Vernier carried it to its preſent ſtate of perfection. The method of Nunez, deſcribed in his treatiſe *De Crepuſculis*, printed at Liſbon in 1542, conſiſts in deſcribing within the ſame quadrant 45 concentric circles, dividing the outermoſt into 90 equal parts, the next within into 89, the next into 88, &c. till the innermoſt was divided into 46 only. On a quadrant thus divided the plumb line or index muſt croſs one or other of the circles very near a point of diviſion; whence, by computation, the degrees and minutes of the arch might be eaſily aſcertained. This method is alſo deſcribed by Nunez in his treatiſe *De arte atque ratione navigandi*, where he would fain perſuade himſelf, that it was not unknown to Ptolemy. But as the degrees are thus divided very unequally, and as it is very difficult to attain exactneſs in the diviſion, eſpecially when the numbers into which the arches are to be divided are incommenſurable (of which there are no leſs than nine), the method of diagonals, firſt publiſhed by Thomas Digges, Eſq in a treatiſe intitled *Alae ſeu ſcalae mathematicae*, printed at London in 157 , and ſaid to be invented by one Richard Chenſeler, was ſubſtituted in its room. Nonius's method was, however, improved at different times and by different perſons; and it muſt be acknowledged, that if Vernier ſaw either the original or any of the improvements (and there can be little doubt of his having ſeen them all), his merit is only that of having applied to an uſeful practical purpoſe the ſpeculative invention of another perſon.

NONIUS (Marcellus), a grammarian and peripatetic philoſopher, born at Tivoli, wrote a treatiſe, intitled *De proprietate ſermonum.* This author is only valuable for his giving fragments of ancient authors, that are nowhere elſe to be found. The above treatiſe was printed at Paris in 1614, with notes.

NONNIUS, or NONIUS (Lewis), a learned phyſician of Antwerp in the 17th century, wrote ſeveral works which are eſteemed; the principal of which are, 1. An excellent treatiſe intitled *Ichthyophagia ſive de Piſcium eſu.* 2. *Hiſpania*; which is of great uſe in underſtanding the ancient geography of Spain. 3. A commentary on the medals of Greece, and thoſe of Julius Cæſar, Auguſtus, and Tiberius, in folio; it contains Goltzius's two works on the ſame ſubject. 4. A commentary on Goltzius's account of Greece, the iſlands, &c. 5. Poems, &c.

NONNUS, a Greek poet of the 5th century, and native of Panopolis in Egypt, was the author of an heroic poem in 48 books, intitled *Dionyſiacorum*, and a paraphraſe in verſe of St. John's Goſpel, which may ſerve as a commentary upon it.

NONUPLA, in the Italian muſic, denotes a quick time, peculiar to jigs. This ſpecies of time is otherwiſe called *the meaſure of nine times*, which requires two falls of the hand, and one riſe. There are three ſorts of nonupla 1. *Nonupla di ſemiminime*, or *dupla ſeſquiquarta*, thus marked $\frac{9}{4}$, where nine crotchets are to be in the bar, of which four make a ſemi-breve in common time, *i. e.* in the down ſtroke ſix, and but three up: it is uſually beat *adagio.* 2. *Nonupla di crome*, or *ſeſqui ottava*, marked thus $\frac{9}{8}$, wherein nine quavers make a bar inſtead of eight in common time, *i. e.* ſix down and three up: it is beat *preſto.* 3. *Nonupla di ſemi-crome* or *ſuper ſetti partiente nona*, thus diſtinguiſhed $\frac{9}{16}$, in which nine ſemi-quavers are contained in a bar, whereof ſixteen are required in common time, ſix down and three up: it is ordinarily beat *preſtiſſimo.* Beſide theſe, there are two other ſpecies of nonupla, for which ſee TRIPLE.

NOOTKA-SOUND, or, as it was called by Captain Cook, *King George's Sound*, lies in N. lat. 49. 34. W. lon. 153. 12. It is an entrance or ſtrait to a vaſt inland ſea on the weſt coaſt of North America, and is ſaid to reſemble the Baltic or Mediterranean in Europe. Upon the ſea-coaſt the land is tolerably high and level; but within the ſound it riſes into ſteep hills, which have an uniform appearance. The trees of which the woods are compoſed, are the Canadian pine, white cypreſs, and two or three other ſorts of pine. In general, the trees grow here with great vigour, and are of a large ſize. About the rocks and borders of the woods were ſeen ſome ſtrawberry plants and raſpberry, currant, and gooſeberry buſhes, all in a flouriſhing ſtate. The principal animals ſeen here were racoons, martens, and ſquirrels. Birds are far from being numerous, and thoſe that are to be ſeen are remarkably ſhy, owing perhaps to their being continually haraſſed by the natives, either to eat them, or to become poſſeſſed of their feathers to be worn as ornaments. The quebrantahueſſos, ſhags, and gulls, were ſeen off the coaſt; and the two laſt were alſo frequent in the ſound. Though the variety of fiſh is not very great, yet they are in greater quanti-

ties than birds. The principal ſorts are the common herring, a ſilver-coloured bream, and another of a brown colour. Captain Cook and Doctor King, who viſited this place, conſider it as an excellent ſhelter for ſhips: and in the account of *A Voyage to the Pacific Ocean*, they give ſome directions for ſailing into it. Theſe and other matters of that kind we ſhall not trouble our readers with; and perhaps the generality of them will be better pleaſed with the following extract from Meare's Voyages to the North-weſt coaſt of America.

"The people of the Nootka nation are, in general, robuſt and well-proportioned: their faces are large and full, their cheeks high and prominent, with ſmall black eyes; their noſes are broad and flat, their lips thick, and they have generally very fine teeth, and of the moſt brilliant whiteneſs.

"The manner in which the children of Nootka are treated, when young, is not more extraordinary from its ſtrange, and, as it ſhould appear, total inutility, as from its agreement with the cuſtoms of the Chineſe and Tartars, to whom this practice gives theſe people a conſiderable reſemblance. The head of the infant is bound by the mother with a kind of fillet of ſeveral folds, as low down as the eyes, in order to give it a certain form, which, at this tender age, it is capable of receiving. It might be ſuppoſed, that ſuch a tight-drawn ligature muſt cauſe conſiderable pain to the child; but we never obſerved that any of the infants, in ſuch a ſtate of preparation for ſugar-loaf heads, ſuffered any viſible pain or inconvenience.

"Though the cuſtom of compreſſing the head in this manner gives them an unpleaſant appearance, by drawing up the eyebrows, and ſometimes producing the diſagreeable effect of ſquinting, as well as of flattening the noſe and diſtending the noſtrils, they are by no means an ill-looking race of people. They have alſo the cuſtom, which is known to prevail in ſo many Indian nations, of plucking out the beard by the roots, on its firſt appearance; and, as it continues to ſprout, to keep it down by the ſame practice. It is one of the domeſtic employments aſſigned to their wives, to watch this appearance of manhood, and to eradicate the hairs as they come forth; which they do in a very dexterous manner with their fingers, and without giving the leaſt pain in the operation. Some of them, however, though we ſaw but very few of this diſpoſition, when they advance in years and become infirm, ſuffer their beards to grow without interruption. But, notwithſtanding they have ſo great an averſion to the hair of their chin, that of the head is an object of their attentive vanity; it is ſtrong, black, and glotſy, grows to a conſiderable length, and is either tied in a kind of knot on the top of their heads, or ſuffered to hang down their backs in flowing negligence.

"In their exterior form they have not the ſymmetry or elegance which is found in many other Indian nations.—Their limbs, though ſtout and athletic, are crooked and ill-ſhaped; their ſkin, when cleanſed of filth and ochre, is white; and we have ſeen ſome of the women, when in a ſtate of cleanlineſs (which, however, was by no means a common ſight, and obtained with difficulty), who not only poſſeſſed the fair complexion of Europe, but features that would have attracted notice, for their delicacy and beauty, in thoſe parts of the world where the qualities of the human form are beſt underſtood. But theſe examples of beauty are by no means numerous among the women of Nootka, who are calculated rather to diſguſt than to charm an European beholder. Their hair, like that of the men, is black; their eyes are of the ſame colour; and, in exterior appearance, they are not to be immediately diſtinguiſhed from the men. In their characters they are reſerved and chaſte; and examples of looſe and immodeſt conduct were very rare among them. There were women at St George's Sound, whom no offers could tempt to meretricious ſubmiſſions."

All reports concerning Nootka Sound agree in characterizing the inhabitants as "a very inoffenſive race of people." Inoffenſive, however, as they are, a cuſtom of a very unnatural, and we ſhould imagine cruel, kind prevails among them: for, together with many other articles which they expoſed to ſale to Captain Cook's ſhips, they brought human ſkulls and hands (part of the fleſh ſtill remaining on them), which they acknowledged they had been feeding on; and ſome of them, we are told, had evident marks of the fire.

From hence it is too apparent, that the horrid practice of devouring their enemies exiſts here as well as at New Zealand and other South Sea iſlands: and hence, too, appears what men of even the beſt natural diſpoſitions will be, if left entirely to the freedom of their own will, without law to controul or religion to inſtruct them. As there are but two villages of the Sound inhabited, the number of people cannot be many; perhaps they are about 2000 in all. Our limits prevent us from being ſo minute as we could wiſh to be, reſpecting the form of their houſes and their manner of building them; of their furniture, decorations, and other things of that kind: we can therefore only refer thoſe who wiſh for further information on this ſubject to Cook and other voyagers and travellers, &c.

The employment of the men is chiefly fiſhing, &c whilſt the women manufacture their garments. Their ingenuity in this and in the mechanic arts is far from being inconſiderable; and in the imitative arts their ſkill is very great. On theſe ſubjects, however, we cannot enlarge: we have in general made it our buſineſs, and it certainly is our duty, to dwell, where it can be done, on the manners or religion of the inhabitants of the ſeveral places which come under our notice; and they who know the utility of this in developing the philoſophy of the human mind, the moſt important of all ſciences, will not blame our intentions, even if they ſhould not approve of the execution. In Cook's Voyages before referred to, we find the following obſervations on the religion and language of the inhabitants of Nootka Sound.

"Little knowledge we can be ſuppoſed to have acquired of the political and religious inſtitutions eſtabliſhed among theſe people. We diſcovered, however, that there were ſuch men as chiefs, diſtinguiſhed by the title of *Acweek*, to whom the others are, in ſome degree, ſubordinate. But the authority of each of theſe great men ſeems to extend no farther than to his own family, who acknowledge him as their head. As they were not all elderly men, it is poſſible this title may be hereditary.

"Nothing that we ſaw could give us any inſight into their notions of religion, except the figures already mentioned, called *Kumma*. Theſe, perhaps, were idols; but as the word *acweek* was frequently mentioned when they ſpoke of them, we may ſuppoſe them to be the images of ſome of their anceſtors, whoſe memories they venerate. This, however, is all conjecture; for we could receive no information concerning them; knowing little more of their language than to enable us to aſk the names of things, and being incapable of holding any converſation with the natives relative to their traditions or their inſtitutions.

"Their language is neither harſh nor diſagreeable, farther than proceeds from their pronouncing the *k* and *h* with leſs ſoftneſs than we do. As to the compoſition of their language, we are enabled to ſay but little. It may, however, be inferred from their flow and diſtinct method of ſpeaking, that it has few prepoſitions or conjunctions, and is deſtitute of even a ſingle interjection to expreſs ſurpriſe or admiration. The affinity it may bear to other languages, we have not been able ſufficiently to trace, not having proper ſpecimens to compare it with; but from the few Mexican words we have procured, there is an obvious agreement throughout the language, in the frequent terminations of the words in *l*, *tl*, or *z*.

"The word *wakaſh* was frequently in the mouths of the people of Nootka. It ſeemed to expreſs approbation, applauſe,

and friendſhip. Whenever they appeared to be pleaſed or ſatisfied at any ſight or occurrence, they would call out *wakaſh! wakaſh!*—It is worthy of remark, that as theſe people do eſſentially differ from the natives of the iſlands in the Pacific Ocean, in their perſons, cuſtoms, and language, we cannot ſuppoſe their reſpective progenitors to have belonged to the ſame tribe, when they emigrated into thoſe places where we now find their deſcendants."

We cannot finiſh this article without taking notice of a circumſtance, which at the time made a great noiſe in Europe, and which it is probable will find a place in the future hiſtories of the contending countries.

A ſmall aſſociation of Britiſh merchants reſident in the Eaſt Indies had, early in the year 1786, formed the project of opening a trade to this part of the world, for the purpoſe of ſupplying the Chineſe market with furs. The principal point towards which theſe expeditions were directed, was Port Nóotka, or King George's Sound; and the adventurers, being in ſome degree ſatisfied with their traffic, took meaſures, in the year 1788, to ſecure to themſelves a permanent ſettlement; at the ſame time that the ſhipping employed in this expedition was generally two, and never exceeded the amount of four, ſmall veſſels. The Spaniards conceived ſome jealouſy of the intruſion of the Engliſh into a part of the world which they had long been deſirous to regard as their excluſive property; and accordingly a Spaniſh frigate of 26 guns was diſpatched from the province of Mexico, for the purpoſe of putting an end to this commerce. The Spaniſh frigate arrived in May 1789, and captured two Engliſh veſſels in the following July, at the ſame time taking poſſeſſion of the little ſettlement which had been formed upon the coaſt. Such, in ſhort, is the circumſtance which was likely to involve us in an expenſive war. Happily, however, for both countries, and perhaps for Europe, the matter was at length, after great altercation, amicably ſettled; and it muſt ſtill be ſo freſh in the memories of our readers, that we truſt they will excuſe us from enlarging further upon it—the whole article having extended perhaps to more than a ſufficient length.

NOPAL, Raquette, or *Indian fig*; plants ſo named by the Indians, from which the cochineal is collected in Mexico. Theſe plants bear fruits which reſemble our figs; tinge the urine of thoſe who eat them; and probably communicate to the cochineal the property which makes it uſeful to the dyer. The Indians of Mexico cultivate the nopal near their habitations, and ſow, as it were, the inſect which affords the cochineal. They make ſmall neſts of moſs or fine herbs; put twelve or fourteen cochineals into each neſt; place three or four of theſe neſts on each leaf of the nopal; and faſten them there by the prickles of the plant. In the courſe of a few days, thouſands of ſmall inſects iſſue out, and fix themſelves upon the parts of the leaf which are beſt ſheltered and afford the moſt nouriſhment. The cochineals are collected ſeveral times in the courſe of the year; and are deprived of life by ſcalding them, or by putting them into an oven. See Cochineal.

NOPALXOCHQUETZALLI, or Nopalcochquetzalli, the prickly pear of Mexico, and common over all the Weſt Indies. See Cactus and Pl. I.

NORBURY, a town in England, in Staffordſhire, on the ſouth-weſt ſide of Eccleſhall. Here is a ſurpriſing echo, which, taken 440 yards north-eaſt from the manor-houſe, near a little bank under a wood ſide, repeats in a ſtill day 10 or 11 ſyllables very diſtinctly, or 12 or 13, if ſpoken very quick. It is remarked that the banks of the Black Meer, in this pariſh, grow forward every year over the ſurface of the water, at the rate of three or four yards every ſeven years.

NORDEN (Frederic Lewis), an ingenious traveller and naval officer in the Daniſh ſervice, was born at Gluckſtadt in Holſtein in the year 1708. He was well ſkilled in mathematics, ſhip-building, and eſpecially in architecture; and in 1732 obtained a penſion to enable him to travel for the purpoſe of ſtudying the conſtruction of ſhips, particularly the galleys and other rowing veſſels uſed in the Mediterranean. He ſpent near three years in Italy; and Chriſtian VI. being deſirous of obtaining a circumſtantial account of Egypt, Mr. Norden at Florence received an order to extend his travels to that country. How he acquitted himſelf in this commiſſion, appears from his Travels into Egypt and Nubia, printed at Copenhagen in folio, 1756; and which were ſoon after tranſlated into Engliſh by Dr. Peter Templeman. In the war between England and Spain, Mr. Norden, then a captain in the Daniſh navy, attended Count Ulric Adolphus, a ſea captain, to England; and they went out volunteers under Sir John Norris, and afterwards under Sir Chaloner Ogle. During his ſtay in London, Mr. Norden was made a fellow of the royal ſociety, and gave the public drawings of ſome ruins and coloſſal ſtatues at Thebes in Egypt, with an account of the ſame in a letter to the Royal Society, 1741. His health at this time was declining; and taking a tour to France, he died at Paris in 1742.

NORDHEIM, a town in Germany, in the Hanover quarter. Of the four larger towns of this principality, it is the third in order. It is ſituated on the Ruhme, which runs into the Leine. It contains 500 houſes, and, beſide a ſeculariſed Lutheran abbey, has one pariſh-church, and ſome charitable foundations, and alſo enjoys ſome manufactures.

NORES (Jason de), a ſcholar, a poet, and philoſopher, was born at Nicoſia in Cyprus. He loſt his fortune when the Turks made themſelves maſters of that iſland in 1570. He retired to Padua; where he acquired great reputation by teaching moral philoſophy. His character had that caſt of ſeverity which is often the conſequence of ſcholaſtic habits. He was one of thoſe men who diſcuſs every thing without being capable of feeling any thing. The *Paſtor Fido* of Guarini made its appearance; and paſtorals became a faſhionable ſpecies of reading throughout all Italy. Nores, who did not reliſh works of this kind, attacked the production of Guarini; who entirely confuted him in a little piece printed at Ferrara in 1588. Nores made a reply two years after; and the poet was preparing an anſwer ſtill more ſevere than the former, when his antagoniſt died of grief occaſioned by the baniſhment of his only ſon for having killed a Venetian in a duel. He left behind him a great many works, ſome in Italian, and others in Latin. The chief of his Italian works, are, 1. The Poeticks, Padua, 1588, 4to; this edition is rare. 2. A Treatiſe on Republics, 1578, 4to; which he forms on the model of that of the Venetians, his maſters. 3. A Treatiſe on the World and its Parts, Venice, 1571, 8vo. 4. Introduction to three books of Ariſtotle's Rhetoric, Venice, 1584, 4to, valuable. 5. A Treatiſe on what Comedy, Tragedy, and Epic Poetry, may receive from Moral Philoſophy. His Latin works are, 1. *Inſtitutio in Philoſophiam Ciceronis*, Padua, 1576, 8vo. 2. *Brevis et diſtincta ſumma præceptorum de arte dicendi, ex libris Ciceronis collecta*, Venice, 1553, 8vo; a good work. 3. *De Conſtitutione partium humanæ et civilis philoſophiæ*, 4to. 4. *Interpretatio in Artem poeticam Horatii*, &c. In all his works we remark great perſpicuity and accuracy, profound erudition, happy expreſſions, an elevated and ſometimes forcible ſtyle.—His ſon Peter Nores, ſucceſſively ſecretary to ſeveral cardinals, at once a man of letters and a man of buſineſs, left behind him different manuſcripts; among others, the life of Paul IV. in Italian.

NORFOLK, a county of England, ſo called from its northern ſituation in reſpect of Suffolk, is bounded on the eaſt and north by the German ocean; on the ſouth by Suffolk, from which it is parted by the rivers Waveney and the Leſſer Ouſe; and on

the weſt it is ſeparated from Cambridgeſhire by the Greater Ouſe, and from a ſmall part of Lincolnſhire by the Waſhes. According to Templeman, it extends in length 57 miles, in breadth 35, and 140 in circumference. It contains an area of 1426 ſquare miles, one city, 32 market-towns, 711 villages, according to the book of rates, though ſome make them 1500; and 236,000 inhabitants, as ſome have it, and 283,000, according to others. It is divided into 31 hundreds, 164 vicarages, and 660 pariſhes.

The air differs in different parts of the county according to the ſoil, which in ſome places is marſhy, eſpecially on the ſea-coaſt, and there the air is foggy and unwholeſome; in others it is clayey and chalky, poor, lean, and ſandy, and there the air is good. The county is almoſt all champaign, except in ſome places, where riſe gentle hills. The marſh-lands yield rich paſture for cattle; the clay-grounds peaſe, rye, and barley; and the ſandy-heaths feed vaſt flocks of large ſheep, of which ſome villages are ſaid to keep 4000 or 5000. Theſe heaths abound alſo in rabbits of a ſilver-grey colour. Walſingham is noted for producing the beſt ſaffron. Great quantities of mackarel and herring are caught upon the coaſts of this county, the former in the ſpring, and the latter in September; eſpecially at Yarmouth, where they are cured in a particular manner; and to great perfection. Wood and honey are alſo very plentiful in this county; and on the coaſts jet and ambergriſe are ſometimes found. The inhabitants are generally ſtrong and active, ſagacious and acute. That they are ſo robuſt, is the more to be wondered at, becauſe the common people live much on puddings, *Norfolk dumplings*. They are for the moſt part in eaſy circumſtances, and were formerly very quarrelſome and litigious. In conſequence of this diſpoſition, lawyers ſwarmed among them to ſuch a degree, that a ſtatute was made ſo early as the reign of Henry VI. to reſtrain their number. The manufactures of the county, which is exceedingly populous, are chiefly woollen and worſted ſtuffs and ſtockings, for which they are well ſupplied with wool from the vaſt flocks of ſheep bred in it. It gives title of duke to the elder branch of the family of Howard, lies in the dioceſe of Norwich, and ſends twelve members to parliament, viz. two knights for the ſhire, two citizens for Norwich, and two burgeſſes for each of the boroughs of Lynn Regis, Great Yarmouth, Thetford, and Caſtle-Riſing.

The county is well watered, and ſupplied with fiſh by the rivers Yare, Thyrn, Waveney, the Greater and Leſſer Ouſe, and the Bure, beſides rivulets. The Bure abounds in excellent perch, and the Yare has a fiſh peculiar to it called the *ruffe*. The latter riſes about the middle of the county; and after being joined by the Waveney and Bure, falls into the ſea at Yarmouth. At the equinoxes, eſpecially the autumnal, the Ouſe is ſubject to great inundations, being forced back by the ſea, that enters it with great fury. This county was famous at a very early period for its fiſheries, which where extenſive and valuable, and ſeem to have been carried on with ſpirit. It has alſo been remarkable, for at leaſt 400 years paſt, for the manufacture of fine worſted ſtuffs.

Norfolk, a county of Virginia contiguous to North-Carolina.

Norfolk-*Iſland*, a pretty little iſland of the South Sea, lying in 29° 12′ 30″ ſouth latitude, and 168° 16′ eaſt longitude. A colony was lately ſettled on it; and the following account of it is given in *Governor Phillip's Voyage to Botany Bay*, &c.

"Norfolk-Iſland is about ſeven leagues in circumference; and if not originally formed, like many other ſmall iſlands, by the eruption of volcanic matter from the bed of the ſea, muſt doubtleſs have contained a volcano. This concluſion is formed from the vaſt quantity of pumice-ſtone which is ſcattered in all parts of it, and mixed with the ſoil. The crater, or at leaſt ſome traces of its former exiſtence, will probably be found at the ſummit of a ſmall mountain, which riſes near the middle of the iſland. To this mountain the commandant has given the name of *Mount Pitt*. The iſland is exceedingly well watered. At or near Mount Pitt riſes a ſtrong and copious ſtream, which flowing through a very fine valley, divides itſelf into ſeveral branches, each of which retains ſufficient force to be uſed in turning mills; and in various parts of the iſland ſprings have been diſcovered.

"The climate is pure, ſalubrious, and delightful, preſerved from oppreſſive heats by conſtant breezes from the ſea, and of ſo mild a temperature throughout the winter, that vegetation continues there without interruption, one crop ſucceeding another. Refreſhing ſhowers from time to time maintain perpetual verdure: not indeed of graſs, for none has yet been ſeen upon the iſland; but of the trees, ſhrubs, and other vegetables, which in all parts grow abundantly. On the leaves of theſe, and of ſome kinds in particular, the ſheep, hogs, and goats, not only live, but thrive and fatten very much. To the ſalubrity of the air every individual in this little colony can bear ample teſtimony, from the uninterrupted ſtate of good health which has been in general enjoyed.

"When our ſettlers landed, there was not a ſingle acre clear of wood in the iſland, and the trees were ſo bound together by that kind of creeping ſhrub called *ſupple-jack*, interwoven in all directions, as to render it very difficult to penetrate far among them. The commandant, ſmall as his numbers were at firſt, by indefatigable activity ſoon cauſed a ſpace to be cleared ſufficient for the requiſite accommodations, and for the production of eſculent vegetables of all kinds in the greateſt abundance. When the laſt accounts arrived, three acres of barley were in a very thriving ſtate, and ground was prepared to receive rice and Indian corn. In the wheat there had been a diſappointment, the grain that was ſown having been ſo much injured by the weevil as to be unfit for vegetation. But the people were all at that time in commodious houſes; and, according to the declarations of Mr. King himſelf, in his letters to Governor Phillip, there was not a doubt that this colony would be in a ſituation to ſupport itſelf entirely without aſſiſtance in leſs than four years; and with very little in the intermediate time. Even two years would be more than ſufficient for this purpoſe, could a proper ſupply of black cattle be ſent.

"Fiſh are caught in great plenty, and in the proper ſeaſon very fine turtle. The woods are inhabited by innumerable tribes of birds, many of them very gay in plumage. The moſt uſeful are pigeons, which are very numerous; and a bird not unlike the Guinea-fowl, except in colour (being chiefly white), both of which were at firſt ſo tame as to ſuffer themſelves to be taken by hand. Of plants that afford vegetables for the table, the chief are cabbage palm, the wild plantain, the fern tree, a kind of wild ſpinage, and a tree which produces a diminutive fruit, bearing ſome reſemblance to a currant. This, it is hoped, by tranſplanting and care, will be much improved in ſize and flavour.

"But the productions which give the greateſt importance to Norfolk-Iſland are the pines and the flax plant; the former riſing to a ſize and perfection unknown in other places, and promiſing the moſt valuable ſupply of maſts and ſpars for our navy in the Eaſt Indies; the latter not leſs eſtimable for the purpoſes of making ſail-cloth, cordage, and even the fineſt manufactures, growing in great plenty, and with ſuch luxuriance as to attain the height of eight feet. The pines meaſure frequently 160, or even 180 feet in height, and are ſometimes 9 or 10 feet in diameter at the bottom of the trunk. They riſe to about 80 feet without a branch: the wood is ſaid to be of the beſt quality, almoſt as light as that of the beſt Norway maſts; and the turpentine obtained from it is remarkable for purity and whiteneſs. The fern tree is found alſo of a great height

for its ſpecies, meaſuring from 70 to 80 feet, and affords excellent food for the ſheep and other ſmall cattle. A plant producing pepper, and ſuppoſed to be the true oriental pepper, has been diſcovered lately in the iſland, growing in great plenty; and ſpecimens have been ſent to England in order to aſcertain this important point."

Norvolk-*Sound*, according to the account of Captain George Dixon, is ſituated in 57° 3′ north latitude, and 135° 36′ weſt longitude. It is a very extenſive place, but how far it ſtretches to the northward is not known. There may poſſibly be a paſſage through to the Bay of Iſlands, but neither is this certain. The ſhore, in common with the reſt of the coaſt, abounds with pines; there is alſo great quantities of the witch-hazel. There are various kinds of flowering trees and ſhrubs, wild gooſeberries, currants, and raſpberries; wild parſley is found here in great plenty, and it eats excellently either as a ſalad or boiled amongſt ſoup. The ſaranne, or wild lily-root, grows alſo in great plenty and perfection. There are a very few wild geeſe or ducks ſeen here, but they are ſhy and difficult to approach.

NORHAM, a town in England, in the county of Northumberland, on the river Tweed, near the mouth of the Till, under the caſtle, which was anciently erected on a ſteep rock moated round, for the better ſecurity againſt the incurſions of the Scotch moſs-troopers. It is of great antiquity; and its old church has lately received repairs, and been made a decent place of worſhip. Antiquities have been diſcovered here. The church had the privilege of a ſanctuary. The caſtle has been frequently honoured with the preſence of ſovereigns; particularly Edward I. here received the oath of treaty from John Baliol of Scotland. It has been a formidable ſtructure, a great part of which is in ruins; the ſite of which, with its demeſnes, conſiſted of 1030 acres.

NORIA, an hydraulic machine much uſed in Spain. It conſiſts of a vertical wheel of 20 feet diameter, on the circumference of which are fixed a number of little boxes or ſquare buckets, for the purpoſe of raiſing the water out of the well, communicating with the canal below, and to empty it in a reſervoir above, placed by the ſide of the wheel. The buckets have a lateral orifice to receive and to diſcharge the water. The axis of this wheel is embraced by four ſmall beams, croſſing each other at right angles, tapering at the extremities, and forming eight little arms. This wheel is near the centre of the horſe-walk, contiguous to the vertical axis, into the top of which the horſe-beam is fixed; but near the bottom it is embraced by four little beams, forming eight arms ſimilar to thoſe above deſcribed, on the axis of the water-wheel. As the mule which they uſe goes round, theſe horizontal arms, ſupplying the place of cogs, take hold, each in ſucceſſion, of thoſe arms which are fixed on the axis of the water-wheel, and keep it in rotation.

This machine, than which nothing can be cheaper, throws up a great quantity of water; yet undoubtedly it has two defects: the firſt is, that part of the water runs out of the buckets and falls back into the well after it has been raiſed nearly to the level of the reſervoir: the ſecond is, that a conſiderable proportion of the water to be diſcharged is raiſed higher than the reſervoir, and falls into it only at the moment when the bucket is at the higheſt point of the circle, and ready to deſcend.

Both theſe defects might be remedied with eaſe, by leaving theſe ſquare buckets open at one end, making them ſwing on a pivot fixed a little above their centre of gravity, and placing the trough of the reſervoir in ſuch a poſition as to ſtop their progreſs whilſt perpendicular; make them turn upon their pivot, and ſo diſcharge their contents.

From the reſervoir the water is conveyed by channels to every part of the garden; theſe have diviſions and ſubdiviſions or beds, ſome large, others very ſmall, ſeparated from each other by little channels, into which a boy with his ſhovel or his hoe directs the water, firſt into the moſt diſtant trenches, and ſucceſſively to all the reſt, till all the beds and trenches have been either covered or filled with water.

Mr. Townſend, from whom we have taken the above account, thinks, that on account of the extreme ſimplicity of this machine, it is an invention of the moſt remote antiquity. By means of it the inhabitants every morning draw as much water from the well as will ſerve through the day, and in the evening diſtribute it to every quarter according to the nature of their crops. The reſervoirs into which they raiſe the water are about 20, 30, or even 40 feet ſquare, and three feet high above the ſurface of the ground, with a ſtone cope on the wall, declining to the water for the women to waſh and beat their cloths upon.

Our limits preclude us from following Mr. Townſend farther in the deſcription of a particular noria uſed at Barcelona; which he conceives to be the original chain-pump, or at leaſt its parent. He compares it with ſimilar inſtruments, and ſhows its advantages and diſadvantages.

NORICUM (Ptolemy, Tacitus); a Roman province, ſituated between the Danube on the north, and thus ſeparated from ancient Germany; the Alpes Noricæ on the ſouth; the river Ænus on the weſt, which ſeparates it from Vindelicia; and Mons Cetius on the eaſt, which divides it from Pannonia. Now containing a great part of Auſtria, all Saltzburg, Stiria, and Carinthia. It was anciently a kingdom under its own kings (Cæſar, Velleius, Suetonius). *Norici* the people, ſubdued by Tiberius under Auguſtus, as allies of the Pannonii (Dio, Velleius). Tacitus reckons Noricum among thoſe provinces which were governed by procurators, officers ſent by the emperors to receive and diſpoſe of the public revenue according to order. It was divided into two provinces, but at what time uncertain; ſuppoſed as low down as Dioclefian and Conſtantine, *viz.* the *Noricum Ripenſe*, running along the ſouth ſide of the Danube; and the *Noricum Mediterraneum*, extending towards the Alps. How far each of theſe extended in breadth does not appear: all the account we have of the matter being from Sextus Rufus, and the *Notitia Imperii Occidentalis*. Anciently a country famous for its iron and ſteel (Horace); as is Stiria at this day, a part of Noricum. A climate cold and more ſparingly fruitful (Solinus).

NORIN, a river which riſes in a corner of the Venetian confines, that runs between the rugged marble hills, and is left entirely to itſelf from its very ſource; hence a vaſt tract of land is overflowed by it, and encumbered with reeds, willows, and wild elders. A ſmall ſpace of ground only remains dry between the roots of the hills and the marſh at a place called *Prud*, and that is all covered with pieces of ancient hewn ſtones, fragments of inſcriptions, columns, and capitals, and baſs-reliefs of the beſt age, worn and deformed by time, and the barbariſm of the northern people, who began on that ſide to deſtroy Narona. The inhabitants, who go often to cut reeds in the marſh, aſſert, that the veſtiges of that large city, may ſtill be ſeen under water. It appears to have been extended over the plain a great way, and undoubtedly it was three miles in length at the foot of the hills. The ancient road is now under water; and it is neceſſary to aſcend a very ſteep road, in order to paſs the point of a craggy hill, on which probably before the Roman times thoſe fortifications were erected that coſt Vetinius ſo much labour.

NORIS (Henry), cardinal, who was a great ornament of the order of the monks of St. Auguſtine, was deſcended from the preſident Jaſon or James de Noris, and born at Verona 1631. He was carefully educated by his father Alexander Noris, originally of Ireland, and well known by his Hiſtory of

Germany. He discovered from his infancy an excellent understanding, great vivacity, and a quick apprehension. His father instructed him in the rudiments of grammar, and procured an able professor of Verona, called *Massolcim*, to be his preceptor. At 15 he was admitted a pensioner in the Jesuits' college at Rimini, where he studied philosophy; after which he applied himself to the writings of the fathers of the church, particularly those of St. Augustine: and taking the habit in the convent of the Augustine monks of Rimini, he distinguished himself among that fraternity in a short time by his erudition; insomuch, that as soon as he was out of his noviciate or time of probation, the general of the order sent for him to Rome, in order to give him an opportunity of improving himself in the more solid branches of learning. He did not disappoint his superior's expectations. He gave himself up entirely to his study, and spent whole days, and even nights, in the library of the Angeliques of St. Augustine. His constant course was to stick to his books 14 hours a day; and this course he continued till he became a cardinal. By this means he became qualified to instruct others; and on this errand he was sent first to Pezaro, and thence to Perousa, where he took his degree of doctor of divinity; after which proceeding to Padua, he applied himself to finish his History of Pelagianism. He had begun it at Rome at the age of 26; and having completed his design, the book was printed at Florence and published in 1673. The grand duke of Tuscany invited him the following year to that city, made him his chaplain, and professor of ecclesiastical history in the university of Pisa, which his highness had founded with that view.

In his history he set forth and defended the condemnation pronounced, in the eighth general council, against Origen and Mopsuesta, the first authors of the Pelagian errors: he also added An Account of the Schism of Aquileia, and a Vindication of the Books written by St. Augustine against the Pelagians and Semi-Pelagians. The work had procured him a great reputation, but met with several antagonists, to whom he published proper answers: the dispute grew warm, and was carried before the sovereign tribunal of the inquisition. There the history was examined with the utmost rigour, and the author dismissed without the least censure. It was reprinted twice afterwards, and Mr. Noris honoured by Pope Clement X. with the title of Qualificator of the Holy Office. Notwithstanding this, the charge was renewed against the Pelagian History, and it was dilated afresh before the inquisition in 1676; but it came out again with the same success as at first. Mr. Noris was now suffered to remain in peace for sixteen years, and taught ecclesiastical history at Pisa, without any molestation, till he was called to Rome by Innocent XII. who made him under-librarian of the Vatican in 1692. This post was the way to a cardinal's hat; his accusers therefore took fresh fire, and published several new pieces against him. Hence the pope appointed some learned divines, who had the character of having taken neither side, to re-examine Father Noris's books, and make their report of them. Their testimony was so advantageous to the author, that his holiness made him counsellor of the inquisition. Yet neither did this hinder one of his adversaries, the most formidable on account of his erudition, to rise up against him, and attack him warmly, under the assumed title of a *Scrupulous Doctor of the Sorbonne*. Noris tried to remove these scruples in a work which appeared in 1695, under the title of An Historical Dissertation concerning one of the Trinity that suffered in the flesh; wherein, having justified the monks of Scythia, who made use of that expression, he vindicated himself also from the imputation of having attainted the Pope's infallibility, of having abused Vincentius Lirinensis, and other bishops of Gaul, as favourers of Semi-pelagianism, and of having himself gone into the errors of the bishop of Ypres.

His answers to all these accusations were so much to the satisfaction of the Pope, that at length his holiness honoured him with the purple in 1695. After this, he was in all the congregations, and employed in the most important affairs; so that he had little time to spend in his study, a thing of which he frequently complained to his friends. Upon the death of cardinal Casanati, he was made chief library keeper of the Vatican in 1700; and two years afterwards nominated, among others, to reform the calendar: but he died at Rome in 1704 of a dropsy. He was one of the most learned men in the last century: his writings abound with erudition, and are very elegantly finished. He was a member of the academy; whence he assumed the name of Eucrates Agoretico. His works are numerous, and were published at Verona, in 1729 and 1730, in five volumes folio.

NORKOPING, a town of Sweden, in the province of East Gothland, in east longitude 15° 30′, latitude 58° 20′. Its name signifies "the northern market" in the Swedish language. It stands on the banks of a large river called *Motala*, which coming from the lake *Vetter*, falls a little lower into a gulf called *Braviken*. It is the largest and most populous town in Sweden next to Stockholm, conveniently situated near the sea on a navigable river, which brings large vessels up to the middle of the town. There are some handsome streets, and the houses in general are neatly built. Some of the churches are worth seeing; but the greatest curiosity are the famous copper mines, where there is a vast number of people constantly at work. In this article the town carries on a very good trade; as also in several other manufactures, as leather, steel, and guns, which they make the best in Sweden. It covers a large space of ground, being ten miles in circumference; but the houses are small and scattered, and the inhabitants do not exceed 10,000. The river Motala flows through the town, forms a series of cataracts, and is divided into four principal streams, which encircle several rocky islands, covered with houses and manufactories. At the extremity of the town it is navigable for small vessels. Several manufactories are established in the town; 55 fabrics of cloth, which employ 1500 men; 3 sugar-houses; 1 of snuff; 50 mills for grinding corn, which is exported in large quantities: and a brass-foundery. A salmon-fishery gives employment and riches to many of the inhabitants.

NORMANDY, a late province of France, bounded on the west by the Atlantic, on the north by the English Channel, on the east by Picardy and the Isle of France, and on the south by Perche, Maine, and Bretagne. It is one of the most fertile in France, and abounds in all things except wine, but that defect is supplied by cyder and perry. It contains iron, copper, and a great number of rivers and harbours. This province now forms the departments of Calvados, Eure, the Channel, Orne, and Lower Seine.

NORMANS, a fierce warlike people of Norway, Denmark, and other parts of Scandinavia. They at different times overran, and ravaged most countries in Europe: to the respective histories of those countries we therefore refer for a fuller account of them, as it is impossible to enlarge upon particulars in this place without repeating what has been already said, or may be said, in different parts of the work.

NORMAN *Characters*, a species of writing introduced into England by William I. From some old manuscripts the Norman writing appears to have been composed of letters nearly Lombardic. In regal grants, charters, public instruments, and law proceedings, this character was used with very little variation from the reign of the Conqueror to that of Edward III. See WRITING.

NORRIS, or NORIS. See NORIS.

NORRIS (JOHN), a learned English divine and Platonic philosopher, was born in 1657 at Collingborne-Kingston, in Wiltshire, of which place his father Mr. John Norris was then

miniſter. He bred his ſon firſt at Wincheſter ſchool, and afterwards ſent him to Exeter college in Oxford, where he was admitted in 1676; but was elected fellow of All Souls in 1680, ſoon after he had taken his degree of bachelor of arts. From his firſt application to philoſophy, Plato became his favourite author; by degrees he grew deeply enamoured with the beauties of that divine writer, as he thought him; and took an early occaſion to communicate his ideal happineſs to the public, by printing an Engliſh tranſlation of a rhapſody, under the title of The Picture of Love unveiled, in 1682. He commenced maſter of arts in 1684, and the ſame year opened a correſpondence with that learned myſtic divine Dr. Henry More of Chriſt's college in Cambridge. He had alſo a correſpondence with the learned lady Maſham, Dr. Cudworth's daughter, and the ingenious Mrs. Aſtell. He reſided at his college, and had been in holy orders five years, when he was preſented to the rectory of Newton St. Loe, in Somerſetſhire, 1680; upon which occaſion he married and reſigned his fellowſhip. In 1691, his diſtinguiſhed merit procured him the rectory of Bemerton, near Sarum. This living, upwards of 200l. a-year, came very ſeaſonably to his growing family; and was the more acceptable, for the eaſineſs of the parochial duty, which gave him leiſure to make an addition to his revenues by the fruits of his genius; the activity of which produced a large harveſt, that continued increaſing till 1710. But this activity ſeems to have become fatal to him; for towards the latter end of his life, he grew very infirm, and died in 1711, in his 55th year, at Bemerton. He was interred in the chancel of that church, where there is a handſome marble monument erected to his memory, with this inſcription: "H. S. E. Johannes Norris, parochiæ hujus rector, ubi annos viginti bene latuit curæ paſtoralis et litiris vacans, quo in receſſu ſibi poſuit late per orbem ſparſa ingenii paris ac pietatis monumenta. Obiit an. Dom. 1711, ætatis 54." As to his character, he had a tincture of enthuſiaſm in his compoſition, which led him to imbibe the principles of the idealiſts in philoſophy, and the myſtics in theology; and the whole turn of his poetry ſhows, that this enthuſiaſm alone made him a poet. As an idealiſt, he oppoſed Locke, and adorned Malebranche's opinion, of ſeeing all things in God, with all the advantages of ſtyle and perſpicuity of expreſſion. In ſhort, his errors, which are harmleſs enough of themſelves, ought to be eaſily pardoned, on account of the general excellence of his writings, eſpecially upon ſubjects of practical divinity, which are univerſally eſteemed.

NORTH, one of the four cardinal points of the world; being that point of the horizon which is directly oppoſite to the ſun in meridian. The north wind is generally accompanied with a conſiderable degree of cold. It ſometimes blows with almoſt irreſiſtible fury. It is often mentioned by the claſſic authors under the name of *Boreas*, which is of Greek original. See BOREAS.

NORTH-*Pole*. See POLE.

NORTH (Dudley, lord), the third baron of that accompliſhed family, was one of the fineſt gentlemen in the court of king James; but in ſupporting that character, diſſipated and gamed away the greateſt part of his fortune. In 1645, he appears to have acted with the parliament; and was nominated by them to be adminiſtrator of the admiralty, in conjunction with the great earls of Northumberland, Eſſex, Warwick, and others. He lived to the age of 85, the latter part of which he paſſed in retirement; and wrote a ſmall folio of miſcellanies, in proſe and verſe, under this title, A Foreſt promiſcuous of ſeveral Seaſons Productions, in four parts, 1659.

NORTH (Dudley, lord), ſon of the former, was make knight of the bath in 1616, at the creation of Charles prince of Wales; and ſat in many parliaments, till excluded by the prevailing party in that which condemned the king. From that period lord North lived privately in the country, and towards the end of his life entertained himſelf with books, and, as his numerous iſſue required, with economy; on which he wrote a little tract, called *Obſervations and advices economical*, 12mo. His other works are, Paſſages relating to the long parliament; The hiſtory of the life of Lord Edward North, the firſt Baron of the family, addreſſed to his eldeſt ſon; and a volume of Eſſays.

NORTH (Francis lord Guildford, lord-keeper of the great ſeal in the reigns of Charles II. and James II.) was a third ſon of the ſecond Dudley lord North, baron of Kertling; and ſtudied at St. John's college in Cambridge, from whence he removed to the Middle Temple. He acquired French, Italian, Spaniſh, and Dutch; and became not only a good lawyer, but was well verſed in hiſtory, mathematics, philoſophy, and muſic. He was afterwards made the king's ſolicitor-general, and was choſen to repreſent the borough of Lynn in parliament. He ſucceeded Sir Heneage Finch in the poſt of attorney-general; and lord chief juſtice Vaughan, in the place of lord chief-juſtice of the common pleas. He was afterwards made keeper of the great ſeal; and in 1683 was created a baron, by the title of *Lord Guildford*. He died at his houſe at Wroxton in 1685. He wrote a philoſophical eſſay on muſic; a paper on the gravitation of fluids, conſidered in the bladders of fiſhes, printed in Lowthorp's abridgement of the Philoſophical Tranſactions; and ſome other pieces.

NORTH (Right Hon. Frederick), earl of Guildford, lord North, lord warden and admiral of the Cinque Ports, governor of Dover caſtle, lord lieutenant and cuſtos rotulorum of Somerſetſhire, chancellor of the univerſity of Oxford, recorder of Glouceſter and Taunton, an elder brother of the Trinity houſe, preſident of the Foundling hoſpital and of the Aſylum, a governor of the Turkey Company and of the Charter houſe, K. G. and LL. D. was born April 13, 1732; and married, May 20, 1756, Miſs Ann Speke, an heireſs of the ancient family of Dillington in Somerſetſhire, by whom he has left two ſons and three daughters; the eldeſt ſon George-Auguſtus, born Sept. 11, 1757, and married, Sept. 30, 1785, to Miſs Hobart, ſucceeds to the earldom and eſtates. The late earl ſucceeded his father Auguſt 4, 1790. His lordſhip ſucceeded the celebrated Mr. Charles Townſend as manager of the houſe of commons and chancellor of the exchequer; and in 1770, on the reſignation of the duke of Grafton, was made firſt lord of the treaſury; in which office he continued until the cloſe of the American war, or rather until the formation of the Rockingham miniſtry, which began the buſineſs of peace with the colonies. He was a man of ſtrong mental faculties; and as an orator, at once commanded attention and enforced conviction: but taking the helm at a time when the king's party were unpopular, and when it was ſuppoſed that the late earl of Bute was the great machine by which the cabinet was moved, ſo he continued in that ſtate of unpopularity until he reſigned the ſeals. During the whole of his premierſhip (and to conduct the helm at that time required uncommonly great abilities) he ſtudiouſly avoided impoſing any taxes that ſhould materially affect the lower claſs of people. The luxuries, and not the neceſſaries, of life were repeated objects of his budget. As a financier, he ſtood high, even in the opinion of oppoſition; and they were a combination of all the great talents in the kingdom: but, fatally wedded to the deſtructive plan of ſubduing the republican ſpirit of the Americans, his adminiſtration will not only ſtand marked in the page of hiſtory with an immenſe waſte of public treaſure, but it will appear beſprinkled with the kindred blood of thouſands of Britiſh ſubjects. To the very laſt moment he ſpoke in the ſenate, however, he defended that war; and ſaid, he was then, as he was formerly, prepared to meet the minuteſt inveſtigation as to his conduct in that buſineſs; which nothing but the unforeſeen intervention of France could have prevented from being crown-

ed with ſucceſs. His lordſhip was one of the firmeſt and moſt ſtrenuous ſupporters of the conſtitution in church and ſtate. He died on the 5th of Auguſt 1792. His recollection he retained to his laſt moments: his family, except lord North, who came within a few minutes afterwards, were aſſembled round his bed, and he took leave of them individually. Their grief did not ſuffer them to leave the room for ſome time after the event; and Lady Caroline Douglas was at laſt forced from it. Even Dr. Warren, who muſt be ſtrengthened as far as habit can operate againſt nature to endure ſuch ſcenes, ran from this, convulſed with ſorrow. If any extent of ſympathy can leſſen affliction, this family may find ſuch relief; for perhaps no man was ever more generally beloved by all who had acceſs to him than the earl of Guildford.

We may form an opinion of the eſtimation the celebrated univerſity of Oxford entertained of their chancellor while living, by the very great honour they paid to his remains. About five o'clock in the afternoon of the 15th, the great bell at St. Mary's church at Oxford rang out, which was a ſignal that the funeral proceſſion had arrived in the environs of that city. The officers of the univerſity, and the whole body of reſident ſtudents, were previouſly aſſembled in Magdalen College, in order to pay ſome tribute to the memory of their deceaſed chancellor. They joined the proceſſion at Magdalen Bridge, and paraded on foot before the hearſe up the high-ſtreet to Carfax; from thence down the corn market to St. Giles's church at the town's end, in a moſt ſolemn manner. Here they halted, and opening to the right and left, the hearſe and other carriages paſſed through, the whole univerſity being uncovered. The hearſe and attendants then proceeded to Banbury, where his Lordſhip's remains were depoſited in the family vault.

NORTH-*Cape*, the moſt northerly promontory in Europe, on the coaſt of Norway. E. lon. 21. 0. N. lat. 78. 0.

NORTH-*Ferry*, a ſmall village on the north ſide of the Frith of Forth, at the Queen's-Ferry paſſage. There was here formerly a chapel, ſerved by the monks of Dunfermline, and endowed by Robert I. Near it are large granite quarries, which partly ſupply London with paving ſtones, and employ many veſſels for the conveyance. "The granite (Mr. Pennant ſays) lies in perpendicular ſtrata, and above is a reddiſh earth, filled with micaceous friable nodules."

NORTH-*Foreland*, a cape or promontory of Kent, in the iſle of Thanet, four miles eaſt of Margate. Between this and the South-Foreland are the Downs, through which all ſhips paſs that are bound to or from the weſt. E. lon. 1. 25. N. lat. 51. 25.

NORTH *Weſt Paſſage*, a paſſage to the Pacific Ocean through Hudſon's Bay or Davis's Straits, and which hath been frequently attempted without ſucceſs; notwithſtanding which, many people are ſtill of opinion that it is practicable.

The idea of a paſſage to the Eaſt Indies by the north pole, or through ſome opening near to it, was ſuggeſted as early as the year 1527. The perſon who had the honour to conceive this idea was Robert Thorne, a merchant of Briſtol, who addreſſed two papers on the ſubject, the one to king Henry VIII. the other to Dr. Ley, ambaſſador from that monarch to the emperor Charles V. To remove any objection to the undertaking, which might be drawn from the ſuppoſed danger, he inſiſts, in his addreſs to the king, upon the great advantages of conſtant day-light in the polar ſeas, and the probability of the climate being in thoſe regions temperate during the ſummer months. In the paper addreſſed to Dr. Ley, he obſerves that coſmographers may as probably be miſtaken in the opinion which they entertain of the polar regions being impaſſable from extreme cold, as it has been found they were in ſuppoſing the countries under the line to be uninhabitable from exceſſive heat.

The poſſibility of the paſſage was, in conſequence of theſe addreſſes, very generally ſuppoſed; and in 1557, Sir Martin Forbiſher ſailed to 62° north latitude, where he diſcovered the ſtraits which have ſince bore his name. In 1577, Barne, in a book entitled the *Regiment of the Sea*, mentions a north-weſt paſſage as one of the five ways to Cathay; and dwells on the mildneſs of the climate, which, from the conſtant preſence of the ſun during ſummer, he imagines muſt be found near the pole. In 1578, George Beſt, a gentleman who had been with Sir Martin Forbiſher in his voyages of diſcovery, wrote a very ingenious diſcourſe to prove all parts of the world habitable. It does not, however, appear that any voyage was undertaken, for the expreſs purpoſe of attempting to ſail to India in a north-weſt direction, till the year 1607, when Henry Hudſon was ſent, at the expence of ſome merchants in London, to diſcover a paſſage by the north pole to Japan and China. He ſailed from Graveſend on the 1ſt of May, and on the 21ſt of June fell in with the land to the weſtward, in latitude 73°, which he named *Hold-with-hope*. On the 27th he diſcovered Spitſbergen, and met with much ice. The higheſt latitude in which he made an obſervation was 80° 27′. See HUDSON.

In March 1609, Jones Poole was ſent by Sir Thomas Smith, and the reſt of the Muſcovy Company, to make further diſcoveries towards the north pole. After great ſeverity of weather, and much difficulty from ice, he made the ſouth part of Spitſbergen on the 16th of May; and ſailing along and ſounding the coaſt, he made many accurate diſcoveries; but was not in that voyage able to proceed beyond 79° 50′. He was again employed (1611), in a ſmall veſſel called the *Elizabeth*, to attempt the north-weſt paſſage; but after ſurmounting numberleſs difficulties, and penetrating to 80° of latitude, he loſt his ſhip at Spitſbergen. Two voyages, equally unſucceſsful, were made in 1614 and 1615, by Baffin and Fotherby; the latter of whom concludes the account of his diſcoveries and dangers, with exhorting the company which employed him not to adventure more than 150 or 200 pounds at moſt on yearly voyages to theſe ſeas.

Hitherto nothing had been done in this great undertaking but by private adventurers, fitted out for the double purpoſe of diſcovery and preſent advantage; and the polar regions were ſuffered to remain unexplored in that direction, from the year 1615 till 1773, when the earl of Sandwich, in conſequence of an application which had been made to him by the Royal Society, laid before his majeſty a propoſal for an expedition to try how far navigation is practicable towards the north pole. Upon receiving this propoſal, his majeſty was pleaſed to direct that the voyage ſhould be immediately undertaken, with every aſſiſtance that could contribute to its ſucceſs. Accordingly, the Race-horſe and Carcaſs bombs were fitted out for the purpoſe, and the command of the expedition given to Captain Phipps, now Lord Mulgrave. His Lordſhip's inſtructions were to proceed up to the pole, or as far towards it as poſſible, and as nearly upon a meridian as the ice or other obſtructions ſhould admit; and during the courſe of the voyage, to make ſuch obſervations of every kind as might be uſeful to navigation, or tend to the promotion of natural knowledge. A very accurate account of this voyage was publiſhed by his Lordſhip in 1774. He had, by exerting all the powers of a ſkilful and intrepid ſeamen, forced his way, on the 1ſt of Auguſt, to 80° 37′, but could proceed no farther, as he was there oppoſed by one continued plain of ſmooth unbroken ice, bounded only by the horizon.

Many other attempts have been made to diſcover this paſſage, by ſailing along the weſtern coaſt of America; but hitherto none of them has been crowned with ſucceſs. So early as 1579, Sir Francis Drake aſſured queen Elizabeth that he had ſailed ſome leagues up the ſtraits of Anian, and diſcovered New Albion, to the north of Calefornia; but the ſtrait is now known to have no exiſtence; and Drake's real diſcoveries were

not improved. In 1630, king Charles I. ſent captain Luke Fox in one of his pinnaces to attempt the paſſage; but of his proceedings we know nothing, but that he reached port Nelſon in Hudſon's bay, where he found ſome remains of former navigators. Next year captain James was fitted out by the merchants of Briſtol for the ſame purpoſe. James was one of the ableſt navigators that ever ſailed from England or any other country; and his voyages to the north were printed in 1633. After all the experiments he had made, he concluded that there was no ſuch paſſage; or if there be, he affirmed that the diſcovery of it would not be attended with thoſe advantages which are commonly expected. His reaſons, however, for theſe opinions have been anſwered, and many ſubſequent attempts have been made to perform what he thought impoſſible. The arguments for a north-weſt paſſage were ſo plauſible, that, in 1744, an act of parliament was paſſed to encourage the diſcovery of it. Among many others, captain Cook attempted the diſcovery in vain, and thence adopted James's opinion. (See Cook's *Diſcoveries*, No. 103.) This celebrated navigator, after having proceeded northwards to the weſtern extremity of America, and aſcertained the proximity of the two great continents of Aſia and America, returned to the Sandwich iſlands, firmly perſuaded of the impracticability of a paſſage in that hemiſphere from the Atlantic into the Pacific Ocean, either by an eaſtern or a weſtern courſe.

Later voyagers, however, have pretended to detect ſome errors in Cook's diſcoveries; and the author of a ſmall tract, intitled *An authentic Statement of all the Facts relative to Nootka-Sound*, goes a great way to make the diſcovery not yet hopeleſs. In his account of the expedition under the direction of Meſſrs. Etches, he ſays, that "one of the firſt diſcoveries made by theſe ſhips was, that what was by the immortal Cook laid down as a continuation of the north-weſt continent of America, and lying between the northern latitudes of 48 and 57, is on the contrary an extenſive cluſter of unexplored iſlands inhabited by numerous tribes of friendly Indians, with whom a regular connection was formed."

Theſe iſlands they diſcovered, contrary to the aſſertion of captain Cook, to conceal the opening of a vaſt inland ſea, or archipelago, in all probability equal to the Mediterranean or Baltic ſeas, and dividing the great northern continent of America. The Princeſs Royal penetrated ſome hundred leagues among them, in a north-eaſt courſe, to within 200 leagues of Hudſon's houſe, but had not then an opportunity to explore the extreme termination of that archipelago, their commercial concerns obliging them to return to the China market; but the commanders had the ſtrongeſt reaſons to believe, had time favoured their ſurvey, that they ſhould have been able to diſcover the long-wiſhed for paſſage between the Atlantic and South Sea. They conceived, that ſhould neither the inland arm of the ſea through which the Princeſs Royal penetrated, nor a large ſtrait named Sir Charles Middleton's, about three degrees to the ſouthward, be found to reach acroſs the continent, yet that the land barrier muſt be very inconſiderable; and that at the extremity of this bay a practicable paſſage, either by rivers or lakes, will, by perſeverance, be found terminating towards Hudſon's bay.

Upon the whole, however, it appears to us extremely doubtful whether there be ſuch a paſſage; but it is much more likely to be diſcovered, if diſcovered at all, by the progreſſive advances of mercantile enterpriſe than by any immediate expedition undertaken for that purpoſe.

North-*Eaſt Paſſage*, a paſſage to the Eaſt Indies along the northern coaſts of Aſia, which, like the former, hath frequently been attempted, but hitherto without ſucceſs. The firſt attempt was made in 1553 by Sir Hugh Willoughby, who commanded three ſhips. He departed from the Thames and ſailed to the North Cape, where one of his ſhips left him, and returned home. The other two ſhips being ſeparated, Sir Hugh proceeded farther northward, and diſcovered that part of Greenland which the Dutch have ſince called *Spitzberg*; but the ſeverity of the cold obliging him to return to the ſouthward, he was forced, by bad weather, into the river Arzina, in Muſcovite Lapland, where, not being able to come out, he was found the next ſpring frozen to death, with all his ſhip's company; having the notes of his voyage and his laſt will lying before him, whereby it appeared that he lived till January. But Richard Chancellor, in the third ſhip, with better ſucceſs, in the meanwhile entered Wardhuys, where he waited ſome time for his companions to no purpoſe; uncertain whether they were loſt, or driven farther by ſtreſs of weather. He held a council on what he ſhould do; whether to return, or purſue his voyage. Whatever danger might be in the laſt, every one agreed to it, that they might not ſeem to have leſs courage than their captain. They therefore ſet ſail, and in a few days found themſelves in a ſea where they could no longer perceive any night. This ſhip, wandering about, entered ſoon after into a large bay or gulf. Here they caſt anchor, in ſight of land; and while they were examining the coaſt, they diſcovered a fiſhing boat. Chancellor getting into his ſloop, went towards it; but the fiſhermen took to flight. He followed, and, overtaking them, ſhowed them ſuch civilities as conciliated their affections to him; and they carried him to the place where now is the famous port of St. Machael the Archangel. Theſe people immediately ſpread through all the coaſts an account of the arrival of thoſe ſtrangers; and people came from ſeveral parts to ſee them, and aſk them queſtions. They, in their turn, examined the others, and found that the country they were in was Ruſſia, governed by the mighty emperor John Baſilowitz. Chancellor from Archangel travelled on ſledges to the czar at Moſcow; from whom, overjoyed at the proſpect of opening a maritime commerce with Europe, he obtained privileges for the Engliſh merchants, and letters to king Edward VI. who was not, however, alive to receive them.

In 1585, Mr. John Davis in two barks diſcovered Cape Deſolation, which is ſuppoſed to be part of Greenland; and two years after advanced as far as lat. 72°, where he diſcovered the ſtrait which ſtill bears his name. To enumerate all the attempts which have been made to diſcover a north-eaſt paſſage, would ſwell the article to very little purpoſe. The Engliſh, Dutch, and Danes, have all attempted it without ſucceſs. The laſt voyage from England for this purpoſe was made in 1676, under the patronage of the duke of York. That unfortunate prince, who was on all occaſions earneſt for the promotion of commerce, and the lord Berkeley, &c. fitted out a ſhip, commanded by captain Wood, for an attempt once more to find a north-eaſt paſſage to India, accompanied with a ſhip of the king's. They were encouraged to this attempt, after it had been ſo long deſpaired of, by ſeveral new reports and reaſonings: ſome of which ſeem not to have been very well grounded—As,

"1. On the coaſt of Corea, near Japan, whales had been found with Engliſh and Dutch harpoons ſticking in them. This is no infallible proof that ſhips could get thither by a north-eaſt paſſage, although whales might.

"2. That, 20 years before, ſome Dutchmen had ſailed within one degree of the north pole, and found it temperate weather there: and that therefore William Barents, the Dutch navigator who wintered at Nova Zembla in the year 1596, ſhould have ſailed further to the north before turning eaſtward; in which caſe, ſaid they, he would not have found ſo much obſtruction from the ice.

"3. That two Dutch ſhips had lately ſailed 300 leagues to the eaſtward of Nova Zembla; but their Eaſt India company had ſtifled that deſign, as againſt their intereſt:—and ſuch like other airy reports. But this attempt proved very unfortunate. They doubled the North Cape, and came among much ice and

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drift wood, in 76° of north latitude, ſteering to the coaſt of Nova Zembla, where the king's ſhip ſtruck upon the rocks, and was ſoon beat to pieces; and captain Wood returned home with an opinion, "that ſuch a paſſage was utterly impracticable, and that Nova Zembla is a part of the continent of Greenland."

Theſe paſſages, however, are not yet deemed impracticable by all. The count de Buffon holds it for certain, that there is a paſſage from Europe to China by the north ſea. The reaſon why it has been ſo often attempted in vain, he thinks, is, that fear prevented the undertakers from keeping at a ſufficient diſtance from land, and from approaching the pole, which they probably imagined to be an immenſe rock. Hence he affirms, that if any farther attempts be made to find a paſſage to China and Japan by the north ſeas, it will be neceſſary to keep at a diſtance from the land and the ice; to ſteer directly towards the pole; and to explore the moſt open ſeas, where unqueſtionably, ſays he, there is little or no ice. This opinion has been lately revived by the Hon. Daines Barrington, who ſays, that if the paſſage be attempted by the pole itſelf, he has very little doubt of its being accompliſhed. See *North*-Pole.

NORTHAMPTON, a town in England, capital of a county of the ſame name, ſituated in W. lon. 0. 55. N. lat. 52. 15. According to Camden, it was formerly called *North-afandon*, from its ſituation to the north of the river Nen, called anciently *Anfona*, by which and another leſſer river it is almoſt incloſed. Dr. Gibſon ſays, that the ancient Saxon annals called both it and Southampton ſimply *Hamton*; and afterwards, to diſtinguiſh them, called the one, from its ſituation, *Southamton*, and the other *Northamton*; but never *North-afandon*. Though it does not appear to be a place of very great antiquity, nor to have emerged from obſcurity till after the conqueſt it has ſent members to parliament ſince the reign of Edward I. and being in the heart of the kingdom, ſeveral parliaments have been held at it. There was alſo a caſtle, and a church dedicated to St. Andrew, built by Simon de Sancto Licio, commonly called *Senlez*, the firſt earl of Northampton of that name. It is ſaid to have been burnt down during the Daniſh depredations; but in the reign of St. Edward it appears to have been a conſiderable place. It was beſieged by the barons in their war with king John; at which time that military work called *Hunſhill*, is ſuppoſed to have been raiſed. In the time of Henry III. it ſided with the barons, when it was beſieged and taken by the king. Here the bloody battle was fought in which Henry VI. was taken priſoner. It was entirely conſumed by a moſt dreadful fire in 1675; yet, by the help of liberal contributions from all parts of the country, it hath ſo recovered itſelf, that it is now one of the neateſt and beſt-built towns of the kingdom. Among the public buildings, which are all lofty, the moſt remarkable are the church called *All-hallows* (which ſtands at the meeting of four ſpacious ſtreets), the ſeſſions and aſſize houſe, and the George-Inn, which belongs to the poor of the town. A county-hoſpital or infirmary has been lately built here, after the manner of thoſe of Bath, London, Briſtol, &c. It has a conſiderable manufacture of ſhoes and ſtockings; and its fairs are noted for horſes both for draught and ſaddle; beſides, it is a great thoroughfare for the north and weſt roads. It was formerly walled, and had ſeven churches within and two without. The horſe-market is reckoned to exceed all others in the kingdom, it being deemed the centre of all its horſe-markets and horſe-fairs, both for ſaddle and harneſs, and the chief rendezvous of the jockies both from York and London. Its principal manufacture is ſhoes, of which great numbers are ſent beyond ſea; and the next to that, ſtockings and lace, as we have hinted at above. It is the richer and more populous, by being a thoroughfare both in the north and weſt roads; but, being 80 miles from the ſea, it can have no commerce by navigation. The walls of this town were above two miles in compaſs. It is ſuppoſed to contain about 1083 houſes, and 5200 inhabitants. It had formerly a nunnery in the neighbouring meadows, with ſeveral other monaſteries; and of its very old caſtle on the weſt ſide of the town, a ſmall part of the ruins are ſtill to be ſeen. Some diſcontented ſcholars came hither from Oxford and Cambridge, about the end of the reign of Henry III: and, with the king's leave, proſecuted their ſtudies here academically for three years; during which there was the face of an univerſity, till it was put a ſtop to by expreſs prohibition, becauſe it was a damage to both univerſities. The public horſe-races are on a neighbouring down, called *Pye-Leys*. In and about the town are abundance of cherry-gardens. Within half a mile of the town is one of the croſſes erected by king Edward I. in memory of his queen Eleanor, whoſe corpſe was reſted there in its way to Weſtminſter. On the north ſide of the river, near that croſs, many Roman coins have been ploughed up. At Guileſborough, north-weſt of Northampton, are to be ſeen the veſtiges of a Roman camp, the ſituation of which is the more remarkable, as lying between the Nen and the Avon, the only paſs from the north to the ſouth parts of England not intercepted by any river. This camp was ſecured only by a ſingle intrenchment, which was, however, very broad and deep.

Northamptonshire, a county of England, is ſituated in the very heart of the kingdom: bounded on the eaſt by the counties of Bedford and Huntingdon; on the ſouth by thoſe of Buckingham and Oxford; on the weſt by Warwickſhire; and on the north by the counties of Leiceſter, Rutland, and Lincoln, which are ſeparated from it by the Leſſer Avon, and the Welland. Its greateſt length is about 50 miles, its greateſt breadth about 20, and its circumference about 130. It contains 330 pariſhes. There are in it one city, 11 market-towns, 25,000 houſes, and 150,000 inhabitants. Nine members are returned to parliament for this county, viz. two knights for the ſhire, two for the city of Peterborough, two for each of the towns of Northampton and Brockly, and one for Higham Ferrers. It lies in the Mid-land circuit, and in the dioceſe of Peterborough. As this county is dry, well cultivated, free from marſhes, except the fens about Peterborough, in the centre of the kingdom, and of courſe at a diſtance from the ſea, it enjoys a very pure and wholeſome air. In conſequence of this it is very populous, and ſo full of towns and churches, that 30 ſpires or ſteeples may be ſeen in many places at one view; and even in the fens, the inhabitants ſeem to enjoy a good ſtate of health, and to be little affected by the water which frequently overflows their grounds, eſpecially in winter, but is never ſuffered to remain long upon it. Its ſoil is exceeding fertile both in corn and paſturage; but it labours under a ſcarcity of fuel, as it doth not produce much wood, and, by lying at a diſtance from the ſea, cannot be eaſily ſupplied with coal. Its commodities, beſides corn, are ſheep, wool, black cattle, and ſalt-petre; and its manufactures are ſerges, tammies, ſhalloons, boots, and ſhoes. Beſides many leſſer brooks and ſtreams, it is well watered by the rivers Nen, Welland, Ouſe, and Leam; the three firſt of which are large, and for the moſt part navigable.

Northampton, a county of North America, in Virginia, forming the ſouth part of the peninſula on the eaſtern coaſt of Virginia.

NORTH rocks, (otherwiſe called *St. Patrick's rocks*, form a ſeat of ſtone amongſt them called *St. Patrick's chair*, whence the rocks have taken this ſecond name); ſituated in the harbour of Donaghadee, in the county of Down, and province of Ulſter, in Ireland. From north to ſouth they are about two thirds of a league, between which is clean good ground. But care muſt be taken of the ſouth rock, on which many ſhips have periſhed: for it is overflowed by every tide, and no crew

can ſave their lives if the wind blows high. This rock ſtands a full mile from the ſhore.

NORTH SEA. See *North* Sea.

NORTHERN LIGHTS, the ſame with AURORA BOREALIS, under which article we have given an account of this phenomenon, and of the ſuppoſed cauſes of it. Natural ſcience, however, does not arrive at perfection at once, and it is well if it does ſo after trials repeated for years with care and accuracy. How far the cauſes that have been aſſigned for this appearance will account for it, or whether they will be able to remove all difficulties, it is not for us to determine; but it is the part of philoſophers to hear all ſides, and to attend with patient aſſiduity to every hypotheſis, rejecting or receiving as reaſon, after the ſtricteſt inveſtigation, ſhall ſeem to favour the one ſide or the other. Wiſhing to lay before our readers every thing important either in ſcience or in literature, we cannot let paſs the opportunity which the preſent article affords us, of mentioning an hypotheſis which doctor Stearns, an American, formed, about the year 1788, to account for the appearances called *aurora borealis*, and *aurora auſtralis*. For this laſt, ſee AURORA BOREALIS.

Doctor Stearns ſuppoſes that theſe phenomena originate from aqueous, nitrous, ſulphureous, bituminous, and other exhalations, from the fumes of various kinds of earths or other minerals, vegetables, animals, fires, volcanoes, &c. Theſe, he thinks, become rarefied, and being charged with electrical fluid, become ſpecifically lighter than the circumambient air: hence, of courſe, they aſcend; and being elevated to the upper regions of the air and driven by the winds from warmer to colder climates, the cold makes them combine and ſtiffen. When they are afterwards agitated by different currents of air, they ſparkle and crackle like the hairs of cats and other animals when ſtiffened with cold. This coruſcation in quite cold atmoſpheres, and in thoſe which are more temperate, appears in different poſitions in the horizon, zenith, or otherwiſe, according to the ſituation of the ſpectator, and the poſition of the elevated exhalations. The difference of colours the doctor ſuppoſes to ariſe from the different qualities of the articles combined, thoſe of the moſt inflammable nature ſhining with the greateſt luſtre.

The doctor likewiſe tries to account for theſe lights not appearing, or but ſeldom appearing, in ancient times. The atmoſphere, he thinks, was not impregnated with materials proper to produce them. He imagines that the increaſed conſumption of fuel, in America in particular, the burning of volcanoes, and the approach of blazing ſtars, whoſe atmoſpheres have been ſo expanded by the ſun's heat that part of them have fallen into the earth's atmoſphere, and communicated to it new matter, have ſo changed and prepared our air, that whenever its conſiſtence is proper, then, if the light of the ſun and moon is not too powerful, the aurora borealis will appear.

NORTHUMBERLAND, the moſt northerly county of England, and formerly a diſtinct kingdom, is bounded on the north and weſt by the river Tweed, which divides it from Scotland, the Cheviot-hills, and part of Cumberland; waſhed on the eaſt by the German Ocean; and ſeparated from Durham on the ſouth by the rivers Tyne and Derwent. This county, which gives the title of *duke* to a nobleman who married the daughter of Algernon duke of Somerſet, whoſe mother was heireſs of the Piercy family, extends about 66 miles in length from north to ſouth, and about 47 in breadth from eaſt to weſt. It is remarkably populous, containing 12 market-towns, 280 villages, and 460 pariſhes. The face of the country, eſpecially towards the weſt, is roughened with huge mountains, the moſt remarkable of which are the Cheviot-hills, and the high ridge called *Rideſdale*; but the lands are level towards the ſea-ſide and the borders of Durham. The climate, like that of every other mountainous country in the neighbourhood of the ſea, is moiſt and diſagreeable: the air, however, is pure and healthy, as being well ventilated by breezes and ſtrong gales of wind; and in winter mitigated by the warm vapours from the two ſeas, the Iriſh and the German Ocean, between which it is ſituated. The ſoil varies in different parts of the county. Among the hills it is barren; though it affords good paſture for ſheep, which cover thoſe mountains. The low country, when properly cultivated, produces plenty of wheat, and all ſorts of grain; and great part of it is laid out in meadow-lands and rich enclоſures. Northumberland is well watered with many rivers, rivulets, and fountains: its greateſt rivers are the Tweed and the Tyne. The Tyne is compoſed of two ſtreams called *South* and *North Tyne*: the firſt riſes on the verge of Cumberland, near Alſton-Moor; enters Northumberland, running north to Haltweſel; then bends eaſterly, and receiving the two ſmall rivers Eaſt and Weſt Alon, unites above Hexham with the other branch, taking its riſe at a mountain called *Fane-head* in the weſtern part of the county, thence called *Tine-dale*; is ſwelled in its courſe by the little river Shele; joins the Read near Billingham; and running in a direct line to the ſouth-eaſt, is united with the ſouthern Tyne, forming a large river that waſhes Newcaſtle, and falls into the German Ocean near Tinmouth.

In all probability the mountains of Northumberland contain lead-ore and other mineralized metals in their bowels, as they in all reſpects reſemble thoſe parts of Wales and Scotland where lead mines have been found and proſecuted. Perhaps the inhabitants are diverted from inquiries of this nature, by the certain profits and conſtant employment they enjoy in working the coal pits, with which this country abounds. The city of London, and the greateſt part of England, are ſupplied with fuel from theſe ſtores of Northumberland, which are inexhauſtible, enrich the proprietors, and employ an incredible number of hands and ſhipping. About 658,858 chaldrons are annually ſhipped for London.

There are no natural woods of any conſequence in this county; but many plantations belonging to the ſeats of noblemen and gentlemen, of which here is a great number. As for pot-herbs, roots, ſalading, and every article of the kitchen-garden and orchard, they are here raiſed in great plenty by the uſual means of cultivation; as are alſo the fruits of more delicate flavour, ſuch as the apricot, peach, and nectarine. The ſpontaneous fruits it produces in common with other parts of Great Britain, are the crab-apple, the ſloe or bullace, the hazel-nut, the acorn, hips, and haws, with the berries of the bramble, the juniper, wood-ſtrawberries, cranberries, and bilberries.

Northumberland raiſes a good number of excellent horſes and black cattle, and affords paſture for numerous flocks of ſheep; both the cattle and ſheep are of a large breed, but the wool is coarſer than that which the more ſouthern counties produce. The hills and mountains abound with a variety of game, ſuch as red deer, foxes, hares, rabbits, heathcock, grouſe, partridge, quail, plover, teal, and woodcock: indeed, this is counted one of the beſt ſporting counties in Great Britain. The ſea and rivers are well ſtocked with fiſh; eſpecially the Tweed, in which a vaſt number of ſalmon is caught and carried to Tinmouth, where being pickled, they are conveyed by ſea to London, and ſold under the name of *Newcaſtle Salmon*.

The Northumbrians were anciently ſtigmatized as a ſavage, barbarous people, addicted to cruelty, and inured to rapine. The truth is, before the union of the two crowns of England and Scotland, the borderers on each ſide were extremely licentious and ungovernable, trained up to war from their infancy, and habituated to plunder by the mutual incurſions made into each kingdom; incurſions which neither truce nor treaty could totally prevent. People of a pacific diſpoſition, who propoſed to earn their livelihood by agriculture, would not on any terms remain

in a country expoſed to the firſt violence of a bold and deſperate enemy; therefore the lands lay uncultivated, and in a great meaſure deſerted by every body but lawleſs adventurers, who ſubſiſted by theft and rapine. There was a tract 50 miles in length and 6 in breadth, between Berwick and Carliſle, known by the name of the *Debateable Land*, to which both nations laid claim, though it belonged to neither; and this was occupied by a ſet of banditti who plundered on each ſide, and what they ſtole in one kingdom, they ſold openly in the other: nay, they were ſo dexterous in their occupation, that by means of hot bread applied to the horns of the cattle which they ſtole, they twiſted them in ſuch a manner, that, when the right owner ſaw them in the market, they did not know their own property. Wardens were appointed to guard the marches or borders in each kingdom; and theſe offices were always conferred on noblemen of the firſt character for influence, valour, and integrity. The Engliſh border was divided into three marches, called the *caſt*, *weſt*, and *middle marches*; the gentlemen of the country were conſtituted deputy-wardens, who held march-courts, regulated the watches, diſciplined the militia, and took meaſures for aſſembling them in arms at the firſt alarm: but in the time of peace between the two nations, they were chiefly employed in ſuppreſſing the inſolence and rapine of the borderers. Since the union of the crowns, however, Northumberland is totally changed, both with reſpect to the improvement of the lands, and the reformation of the inhabitants. The grounds, being now ſecure from incurſion and inſult, are ſettled by creditable farmers, and cultivated like other parts of the kingdom. As hoſtilities have long ceaſed, the people have forgot the uſe of arms, and exerciſed themſelves in the more eligible avocations of peace; in breeding ſheep and cattle, manuring the grounds, working at the coal-pits, and in different branches of commerce and manufacture. In their perſons they are generally tall, ſtrong, bold, hardy, and freſh-coloured; and though leſs unpoliſhed than their anceſtors, not quite ſo civiliſed as their ſouthern neighbours. The commonalty are well fed, lodged, and cloathed; and all of them remarkably diſtinguiſhed by a kind of *ſhibboleth* or *whurle*, being a particular way of pronouncing the letter *R*, as if they hawked it up from the wind-pipe, like the cawing of rooks. In other reſpects, the language they ſpeak is an uncouth mixture of the Engliſh and Scottiſh dialects. There is no material diſtinction between the faſhionable people of Northumberland and thoſe of the ſame rank in other parts of the kingdom: the ſame form of education will produce the ſame effects in all countries. The gentlemen of Northumberland, however, are remarkable for their courage, hoſpitality, and hard drinking. The number of inhabitants are reckoned 126,400, of houſes 22,740.

A great number of Roman monuments have been found in this county; but the moſt remarkable curioſity of that kind conſiſts in the remains of Hadrian's vallum and the wall of Severus. See ADRIAN note (A), and SEVERUS's *Wall*.

The moſt noted towns in Northumberland, are Newcaſtle, Morpeth, Alnwick, Berwick, Hexham, and North Shields. It ſends two members to parliament.

NORTHWICK, a ſmall town of Cheſhire, long celebrated for its rock-ſalt and brine pits. The ſtratum of ſalt lies about 40 yards deep; and ſome of them are hollowed into the form of a temple. The deſcent is through a dome, the roof ſupported by rows of pillars about two yards thick, and ſeveral in height; and when illuminated with a ſufficient number of candles, they make a moſt magnificent appearance. Above the ſalt is a bed of whitiſh clay *(Argilla cærula-cinerea)*, uſed in making the Liverpool earthen ware; and in the ſame place is alſo dug a good deal of the gypſum, or plaſter-ſtone. The foſſil ſalt is generally yellow, and ſemipellucid, ſometimes debaſed with a dull greeniſh earth, and is often found, but in ſmall quantities, quite clear, and colourleſs. The town is ſituated near the river Dane, and is tolerably handſome: it has a market on Fridays. It is 20 miles north-eaſt of Cheſter, and 173 north-weſt of London. W. lon. 2. 36. N. lat. 53. 16.

NORTON, in Cheſhire, a good modern alms-houſe, founded by P—y Brook, Eſq. on the ſite of a priory of canons regular of St. Auguſtine, founded by William, ſon of Nigellus, A. D. 1135, who did not live to complete his deſign; for Euſtace de Burgaville granted to Hugh De Catherine paſtures for 100 ſheep, in caſe he finiſhed the church in all reſpects conformable to the intent of the founders. It was granted afterwards to R. Brooke, Eſq.

NORTON'S SOUND, was diſcovered in captain Cook's laſt voyage, and was ſo named in honour of Sir Fletcher Norton (Lord Grantley), a near relation of Mr. afterwards Dr. King. It extends as far as N. lat. 64° 55′. There is no good ſtation for ſhips, nor even a tolerable harbour in all the ſound. Mr. King, on his landing here, diſcerned many ſpacious valleys, with rivers flowing through them, well wooded, and bounded with hills of a moderate height. One of the rivers towards the north-weſt ſeemed to be conſiderable; and he was inclined to ſuppoſe, from its direction, that it diſcharged itſelf into the ſea from the head of the bay. Some of his people penetrating beyond this into the country, found the trees to be of a larger ſize the further they proceeded. E. lon. 197. 13. N. lat. 64. 31.

NORWAY, a kingdom of Europe, the moſt weſterly part of the ancient Scandinavia. It is bounded on the N. and W. by the Northern Ocean, on the E. by Swediſh Lapland and Sweden, and on the S. by the Categate; extending from the Naze in lat. 57. 30. to the North Cape in lat. 71. 20. Its breadth, which is very unequal, is from 30 to 280 miles. It is divided into the four governments of Aggerhuys or Chriſtiania, Chriſtianſand, Bergen, and Drontheim. From its rocky ſoil and northern poſition, Norway is not populous in proportion to its extent. Mr. Coxe has calculated the number of inhabitants to be 750,000. They maintain their own army, which conſiſts of 24,000 foot and 6000 cavalry. Their troops are much eſteemed for their bravery, and like the Swiſs mountaineers, are exceedingly attached to their country. Norway is bleſſed with a particular code, called the Norway Law, compiled by Grieffelfeld, at the command of Chriſtian V. the great legiſlator of his country. By this law, peaſants are free, a few only excepted on ſome noble eſtates near Frederickſtadt; and the benefits of this code are viſible in the great difference, in their appearance, between the free peaſants in Norway and the enſlaved vaſſals of Denmark, though both living under the ſame government. The Norwegian peaſants poſſeſs much ſpirit and fire in their manner; are frank, open, and undaunted, yet not inſolent; never fawning to their ſuperiors, yet paying a proper reſpect to thoſe above them. The ſame cauſes which affect the population of Norway, operate likewiſe on the ſtate of tillage, for the country does not produce ſufficient corn for its own conſumption; but it is rich in paſture, and produces much cattle. The fiſheries, particularly on the W. coaſt, find employment and wealth for the natives, and ſupply the fineſt ſailors for the Dutch fleet. The principal fiſh, which, dried and ſalted, furniſh a conſiderable article of exportation, are cod, ling, and whiting: their livers alſo yield train-oil; and the ſmalleſt are given as winter fodder to the cattle. The extenſive foreſts of oak and pine produce timber, ſpars, beams, and planks, beſide charcoal, turpentine, bark, fuel, and even manure; and the birch (the bark of which is uſed as a covering for the roofs of houſes) not only ſupplies fuel, but alſo a kind of wine. The general exports are tallow, butter, ſalt, dried fiſh, timber, planks, horſes, horned cattle, ſilver, alum, Pruſſian blue, copper, and iron. It abounds in lakes and rivers: the former ſo

large, that they appear like inlets of the ſea. Norway was formerly governed by its own hereditary ſovereigns. On the demiſe of Hagen V. in 1319, without male iſſue, his grandſon in the female line, Magnus Smek, united in his perſon the kingdoms of Sweden and Norway. Magnus was ſucceeded in the kingdom of Norway by his ſon Hagen VI. huſband of the celebrated Margaret; and, at his deceaſe, in 1380, Norway was united to Denmark by their ſon Olof V. who dying without iſſue, Margaret herſelf was raiſed to the throne by the unanimous voice of the nation. On her death, it deſcended, with Denmark and Sweden, to her nephew Eric. Sweden was afterward ſeparated from Denmark by the valour and addreſs of Guſtavus Vaſa; but Norway continues united to Denmark. The capital is Chriſtiania.

Norway Rat, in zoology. See Mus.

NORWICH, an ancient and populous city, the capital of Norfolk, with a market on Wedneſday, Friday, and Saturday. It is ſurrounded by a wall, now much decayed, and ſeated on the Yare, which runs through it, and is navigable to Yarmouth, without locks. Although of conſiderable extent, the population is not ſo great as might be expected, as it contains a number of gardens and orchards within the walls. It is a county of itſelf, governed by a mayor, and ſends two members to parliament. There are, beſide the cathedral, 36 pariſh churches, ſome of which were formerly covered with thatch; two churches for the Flemings, ſome diſſenting meeting-houſes, and a Roman catholic chapel. It has a ſtately caſtle, on a hill, which is the ſhire-houſe and the county gaol; the aſſizes for the city being held at the Guildhall. Here is alſo a city and county hoſpital, a theatre-royal an elegant aſſembly-room, and a lofty market-houſe of freeſtone. The ancient dukes of Norfolk had a palace here, which is ſtill in exiſtence as a work-houſe. Here alſo is a free-ſchool, founded by Edward VI. and ſeveral other charitable foundations. Near this city are the ruins of the caſtle of Kett, the tanner, by whoſe rebellion, in the reign of Edward VI. the city was reduced to a ruinous ſtate. Norwich long took the lead, in point of conſequence, among the inland towns: for this it was indebted to its great manufactures of crapes, bombazines, and ſtuffs of various kinds, which are ſtill conſiderable, though ſomewhat declined, on account of the rivalſhip of the cotton branches. It is 43 miles N. of Ipſwich, and 109 NE of London. E. lon. 1. 20. N. lat. 52. 40.

NOSE, the organ of ſmell. See Anatomy. The uſes of the noſe are, its giving us the ſenſe of ſmelling; its ſerving in the great office of reſpiration, and in modelling the voice; in receiving the abundant humours from the eyes, and in adding to the beauty of the face.

The noſe was by the Augurs particularly attended to in forming conjectures concerning future good or ill ſucceſs. The tingling of the right or left ſide of it, for inſtance, was thought to have different ſignifications as it happened to different ſexes, or perſons in different conditions.

In Tartary, the greateſt beauties are thoſe who have the leaſt noſes. Ruybrock mentions the wife of the great Jenghiz Khan as a celebrated beauty, becauſe ſhe had only two holes for a noſe. The Crim-Tartars break the noſes of their children while young, as thinking it a great piece of folly to have their noſes ſtand before their eyes. In moſt other countries, China excepted, great noſes are an honour.

In what the beauty of the noſe conſiſts, different nations have different opinions: and the following reflections of Sir Joſhua Reynolds on this ſubject, are perhaps the moſt philoſophical account of the beauty of form that is to be found in any language. "I ſuppoſe (ſays Sir Joſhua) it will be eaſily granted, that no man can judge whether any animal be beautiful in its kind, or deformed, who has ſeen only one of that ſpecies; that is as concluſive in regard to the human figure; ſo that if a man born blind was to recover his ſight, and the moſt beautiful woman was brought before him, he could not determine whether ſhe was handſome or not; nor, if the moſt beautiful and moſt deformed were produced, could he any better determine to which he ſhould give the preference, having ſeen only thoſe two. To diſtinguiſh beauty, then, implies the having ſeen many individuals of that ſpecies. If it is aſked, how is more ſkill acquired by the obſervation of greater numbers? I anſwer, that, in conſequence of having ſeen many, the power is acquired even without ſeeking after it, of diſtinguiſhing between accidental blemiſhes and excreſcenſes, which are continually varying the ſurface of Nature's works, and the invariable general form which Nature moſt frequently produces, and always ſeems to intend in her productions.

"Thus amongſt the blades of graſs or leaves of the ſame tree, though no two can be found exactly alike, yet the general form is invariable: a naturaliſt, before he choſe one as a ſample, would examine many, ſince, if he took the firſt that occurred, it might have, by accident or otherwiſe, ſuch a form as that it would ſcarce be known to belong to that ſpecies; he ſelects, as the painter does, the moſt beautiful, that is, the moſt general form of nature.

"Every ſpecies of the animal as well as the vegetable creation may be ſaid to have a fixed or determinate form, towards which nature is continually inclining, like various lines terminating in the centre; or it may be compared to pendulums vibrating in different directions over one central point; and as they all croſs the centre, though only one paſſes through any other point, ſo it will be found that perfect beauty is oftener produced by nature than deformity: I do not mean than deformity in general, but than any one kind of deformity. To inſtance in a particular part of a feature: the line that forms the ridge of the noſe is beautiful when it is ſtraight; this then is the central form, which is oftener found than either concave, convex, or any other irregular form that ſhall be propoſed. As we are then more accuſtomed to beauty than deformity, we may conclude that to be the reaſon why we approve and admire it, as we approve and admire cuſtoms and faſhions of dreſs for no other reaſon than that we are uſed to them; ſo that though habit and cuſtom cannot be ſaid to be the cauſe of beauty, it is certainly the cauſe of our liking it: and I have no doubt, but that if we were more uſed to deformity than beauty, deformity would then loſe the idea now annexed to it, and take that of beauty; as if the whole world ſhould agree that *yes* and *no* ſhould change their meanings, *yes* would then deny, and *no* would affirm.

"Whoever undertakes to proceed further in this argument, and endeavours to fix a general criterion of beauty reſpecting different ſpecies, or to ſhow why one ſpecies is more beautiful than another, it will be required from him firſt to prove that one ſpecies is really more beautiful than another. That we preſer one to the other, and with very good reaſon, will be readily granted; but it does not follow from thence that we think it a more beautiful form; for we have no criterion of form by which to determine our judgment. He who ſays a ſwan is more beautiful than a dove, means little more than that he has more pleaſure in ſeeing a ſwan than a dove, either from the ſtatelineſs of its motions, or its being a more rare bird; and he who gives the preference to the dove, does it from ſome aſſociation of ideas of innocence that he always annexes to the dove: but if he pretends to defend the preference he gives to one or the other, by endeavouring to prove that this more beautiful form proceeds from a particular gradation of magnitude, undulation of a curve, or direction of a line, or whatever other conceit of his imagination he ſhall fix on as a criterion of form, he will be continually contradicting himſelf, and find at laſt that the great mother of nature will not be ſubjected to ſuch

narrow rules. Among the various reaſons why we prefer one part of her works to another, the moſt general, I believe, is habit and cuſtom: cuſtom makes, in a certain ſenſe, white black, and black white; it is cuſtom alone determines our preference of the colour of the Europeans to the Ethiopians; and they, for the ſame reaſon, prefer their own colour to ours. I ſuppoſe nobody will doubt, if one of their painters was to paint the goddeſs of beauty, but that he would repreſent her black, with thick lips, flat noſe, and woolly hair: and it ſeems to me he would act very unnaturally if he did not; for by what criterion will any one diſpute the propriety of his idea? We indeed ſay, that the form and colour of the European is preferable to that of the Ethiopian; but I know of no other reaſon we have for it, but that we are more accuſtomed to it. It is abſurd to ſay, that beauty is poſſeſſed of attractive powers, which irreſiſtibly ſeize the correſponding mind with love and admiration, ſince that argument is equally concluſive in favour of the white and the black philoſopher.

"The black and white nations muſt, in reſpect of beauty, be conſidered as of different kinds, at leaſt a different ſpecies of the ſame kind; from one of which to the other, as I obſerved, no inference can be drawn.

"Novelty is ſaid to be one of the cauſes of beauty: that novelty is a very ſufficient reaſon why we ſhould admire, is not denied; but becauſe it is uncommon, is it therefore beautiful? The beauty that is produced by colour, as when we prefer one bird to another, though of the ſame form, on account of its colour, has nothing to do with this argument, which reaches only to form. I have here conſidered the word beauty as being properly applied to form alone. There is a neceſſity of fixing this confined ſenſe; for there can be no argument if the ſenſe of the word is extended to every thing that is approved. A roſe may as well be ſaid to be beautiful, becauſe it has a fine ſmell, as a bird becauſe of its colour. When we apply the word *beauty*, we do not mean always by it a more beautiful form, but ſomething valuable on account of its rarity, uſefulneſs, colour, or any other property. A horſe is ſaid to be a beautiful animal; but had a horſe as few good qualities as a tortoiſe, I do not imagine that he would be then eſteemed beautiful.

"A fitneſs to the end propoſed is ſaid to be another cauſe of beauty; but ſuppoſing we were proper judges of what form is the moſt proper in an animal to conſtitute ſtrength or ſwiftneſs, we always determine concerning its beauty before we exert our underſtanding to judge of its fitneſs.

"From what has been ſaid, it may be inferred, that the works of nature, if we compare one ſpecies with another, are all equally beautiful; and that preference is given from cuſtom, or ſome aſſociation of ideas; and that in creatures of the ſame ſpecies beauty is the medium or centre of all various forms." See the article BEAUTY, towards the end.

NOSOLOGY, is a Greek word ſignifying a diſcourſe or treatiſe of diſeaſes; otherwiſe called *pathology*. The importance of a comprehenſive and accurate noſology has been long and generally allowed. Baglivi, Boerhaave, Gorter, Gaubius, and Sydenham, have expreſſed their deſire of a work of this kind, the great object of which is to fix pathognomonics to every diſeaſe; or in which all diſeaſes are diſpoſed into certain claſſes, orders, and genera, founded on diſtinctions taken from the ſymptoms only, without regard to remote or proximate cauſes.

Under the article MEDICINE, we have mentioned ſome of the moſt accurate noſological arrangements; and have here only to add, that in 1776, Dr. Sagar, at Iglaw in Moravia, publiſhed a *Syſtema Morborum Symptomaticum*, octavo, which is an uſeful abridgment of the work of M. Sauvages, with ſome alterations and additions. See MEDICINE.

NOSTOCH, SHOT STARS; *tremella noſtoc*, (Lin. Spec. Plant. Dillenius de Muſcis, tab. 10. fig. 14. Flor. Danica, tab. 885. fig. 1.); *tremella inteſtinalis vel meſenterica*, (Lin. Spec. Plant. Dillen. de Muſc. tab. 10. fig. 16. Flor. Danic. tab. 885. fig. 2.)

A writer in the Gentleman's Magazine gives this account of it: "The ſubſtance in queſtion is not unfrequent in England, nor in all other parts of Europe, after rains, both in ſpring and autumn. Very large ſpots of it are ſeen in gravelly ſoils, and particularly on the tops of hills, and on open downs, and often it is found on gravel-walks.

"It is met with in ſome of the old authors, under the name of *noſtock*, as in Paracelſus and others; and the alchemiſts fancied there was ſomething wonderful in it, and that it would afford a menſtruum for gold. Noſtoch is ſaid to be a word ſynonymous to *Faculum alicujus ſtellæ, vel potius ejus repurgatione dejectum quid in terram; ſtos aeris; fragmentum nimbi*; as this ſubſtance was believed to fall from the ſky with the meteors that we often ſee, and call *falling-ſtars*. Hence the country people in Sweden have called it *ſky-fall*; and in England it is known by the name of *witches butter*, in common with ſome of the gelatinous liverworts.

"Paracelſus, Helmont, and others, ranked it with the *ternia-bin*, or manna, and thought it dropped, as that did, from heaven. It is deſcribed, and the chemical analyſis thereof given, by M. Geoffroy, in the Paris Memoirs for 1708, and is there ſaid to yield, beſides an acid phlegm, a portion of concrete volatile ſalt and ſome fixed ſalt. The diſtilled water from it was believed by ſome to poſſeſs ſingular virtues, in allaying pains of the joints; but there is certainly no room to attribute any extraordinary qualities to it.

"Since the days of Paracelſus it has been conſidered as a vegetable production; but the botaniſts have had difficulty to aſſign its place or genus in their ſeveral ſyſtems. Our own countryman, Dr. Merret, ſeems to have been among the firſt authors who ranked it among vegetables, and he calls it *Lichen humiditate intumeſcens, ſiccitate evaneſcens* (Pin. page 71.) Others have retained it among the plants of that genus to this day; as does the celebrated Dr. Haller, in his *Hiſtoriæ Stirp. Helvetiæ*, who calls it *Lichen gelatinoſus, plicatus, undulatus; laciniis criſpatis, granuloſis*, as there are ſeveral of the liverworts that have a gelatinous texture and appearance; though they differ much from the noſtoch, in not being ſo inſtantly dried up. It was put into Ray's Synopſis, by Dr. Dillenius, under the name of *Ulva terreſtris pinguis et fugax*, p. 64. but he afterwards changed that name for *tremella* in his *Hiſtoria Muſcorum*, where he calls it *tremella terreſtris ſinuoſa pinguis et fugax*, p. 52. tab. 10. f. 14. and reduces the lavers to the ſame genus. Micheli, an Italian botaniſt, famous for his attention to the Cryptogamia claſs of plants, makes it a *fungus*, as Magnol and Dr. Morriſon had done before him, and deſcribes and figures it, in his *Nova Plantarum Genera*, under the name of *Linkia terreſtris gelatinoſa, membranacea, vulgatiſſima*, p. 126. t. 67. f. 1. He deſcribes the ſeeds as lying in the form of little ſtrings of beads, coiled up within the plant, or rather in the folds thereof, and only to be diſcovered by the microſcope. Linnæus mentions it, firſt under the name of *Byſſus gelatinoſa fugax terreſtris*, in his *Flora Lapponica*; but he afterwards adopted Dillenius's term, though he does not make it a laver. Linnæus has called it, in all his ſubſequent works, *tremella (noſtoc) plicata, undulata*, under which name it ſtands in his *Species Plantarum*, p. 1157, and in Hudſon's *Flora Anglica*, p. 463, as alſo in a numerous ſet of other authors who follow his ſyſtem."

Another writer in the ſame work gives this account of it. "This ſubſtance is very rarely ſeen between the middle of April and the month of October. It is moſt frequently to be found on the high paſture lands, where the ground is inclined to wet,

and on the moors and commons in the north of England. The time we always meet with it is after a very wet night, when the air in the morning ſuddenly clears up, and a ſharp froſt enſues. The frogs that then happen to be out are immediately ſeized by the froſt, and turned into this jelly-like ſubſtance. For as I have had occaſion ſometimes to go out very early, I have found ſeveral parts of the frog not yet diſſolved among the jelly, ſuch as feet, legs, and thighs; yet in a little time afterwards the change was fully completed. The quantity of jelly produced from one ſingle frog is almoſt beyond belief, even to five or ſix times its bulk when in its natural ſtate.

"I communicated this diſcovery to an acquaintance, who has ſince had frequent opportunities of obſerving and examining this production; and we are fully aſſured, that, whatever opinion the learned may have of it, it certainly proceeds from the above-mentioned cauſe wherever found.

"Moſt people that I have converſed with on the ſubject, are of opinion that this jelly falls from the ſtars, or out of the higher regions of the air; which notion, however abſurd, many are credulous enough to believe."

Naturaliſts had for ſome years begun to doubt whether theſe gelatinous ſubſtances were of a vegetable or animal nature, when at length Mr. J. Platt of Oxford, in his letter printed in the Gentleman's Magazine for 1776, page 402, threw ſuch light on the ſubject as, to us at leaſt, is perfectly ſatisfactory.

"From a child I remember ſeeing the meteors ſhooting in the air, which appearance, by my comrades, was called *ſtar-ſhooting*, believing the ſtars no larger than their apparent magnitude. This jelly-like ſubſtance, mentioned in your magazine, was believed to be the droſs of theſe meteors, and took the name of *ſtar-ſhot*, which paſſed for certain with me till I had arrived at the age of 24, when I was engaged in buſineſs that required my frequently paſſing over both meadows and paſture-grounds, where in ſpring and autumn I ſaw many portions of this ſuppoſed alga or noſtoch, but never more than one or two contiguous, moſtly near the water, when the meadows were or had been juſt before flooded. My conjectures were various until I ſaw a crow pecking of ſomething in a field, which I heard to cry; when turning my horſe to the place, I found a frog of the common ſize, which the crow (of the carrion kind) would ſoon have killed and gorged, had I not diſturbed her, and chaſed her away.

"About this time I found in a meadow the bowels of a frog indigeſted, and compact as the chitterlings of a calf or pig; but white as the paper I write upon, though not tranſlucid. I took it up, and placed it in a paper expoſed to the air; leaving it in ſome graſs where I found it, till my return that way in three days time, when I ſaw it changed to that tremulous jelly-like ſubſtance, the alga or ſtar-ſhot. I was much pleaſed with this diſcovery, and took it home in my pocket wrapped in paper, where I ſhowed it to a ſociety of young perſons of which I was a member, who agreed with my ſentiments of its being the indigeſtible part of a frog diſgorged by ſome bird of prey.

"To corroborate my ſentiments of this alga being the bowels of a frog, I luckily ſaw ſome of it lying by the ſide of a brook, where I lighted and took it up, and to my great ſurpriſe found attached to the jelly the head, heart, liver, and one leg of the frog, which had been (I preſume) diſgorged by ſome carrion crow, who frequented the flooded grounds to pick up worms and other vermin. There was alſo ſome of it found in an apple-tree at Wyſton Magna, near Leiceſter, where I then lived, which, no doubt, was diſgorged by ſome owl."

Dr. Darwin, in his Poem on the Loves of the Plants, is of the ſame opinion with Mr. Platt, that theſe gelatinous ſubſtances are of an animal nature, and that the different appearances they put on are owing to various circumſtances, viz. the different birds who feed on frogs, the quantity they devour at a time, and the ſtate of digeſtion before they are voided.

NOSTRADAMUS (Michel), an able phyſician and a celebrated aſtrologer, was a Provencial, and deſcended of a noble family, and born December 14, 1503, at St. Remy, in the dioceſe of Avignon. By his grandfather he was initiated in the ſtudy of the mathematics. He afterwards completed his courſes of humanity and philoſophy at Avignon; and, going thence to Montpelier, he there applied himſelf to phyſic, till being forced away by the plague in 1525, he took his route towards Thouloufe, and paſſed on till he came to Bourdeaux. This courſe held him five years; during which he undertook the cure of all ſuch patients as were willing to put themſelves under his care. After this he returned to Montpelier, and was created doctor of his faculty in 1529, and then reviſited the ſame places where he had practiſed phyſic before. At Agen he contracted an acquaintance with Julius Cæſar Scaliger, which induced him to make ſome ſtay in that town, and there he entered into matrimony; but having buried his wife, and two children which ſhe brought him, he quitted Agen after a reſidence of about four years. He returned into Provence, and fixed himſelf firſt at Marſeilles; but his friends having provided an advantageous match for him at Salon, he tranſported himſelf thither in 1544. In 1546, Aix being afflicted with the plague, he went thither at the ſolicitation of the inhabitants, and was of great ſervice; particularly by a powder of his own invention: ſo that the town in gratitude gave him a conſiderable penſion for ſeveral years after the contagion ceaſed. Returning afterwards to Salon, he became a recluſe, and made uſe of his leiſure to apply himſelf to his ſtudies. He had a long time followed the trade of a conjurer occaſionally; and now he began to think himſelf inſpired, and miraculouſly illuminated with a proſpect into futurity. As faſt as theſe illuminations had diſcovered to him any future event, he entered it in writing, in ſimple proſe, but by enigmatical ſentences, as he declared himſelf; but reviſing them afterwards, he thought the ſentences would appear more reſpectable, and would favour more of a prophetic ſpirit, if they were expreſſed in verſe. This opinion determined him to throw them all into quatrains, and he afterwards ranged them into centuries. When this was done, he heſitated about making them public, till reflecting that the time of many events which he had foretold was very near at hand, he determined to print them. This he did with a dedication addreſſed to his ſon Cæſar, an infant only ſome months old, in the form of a letter or preface, dated March 1, 1555. This firſt edition, which is included in ſeven centuries, was printed by Rigault at Lyons. He prefixed his name in Latin, but gave to his ſon Cæſar the name as it is pronounced, *Notradame*.

The public were divided in their ſentiments of this work: many looked upon the author as a ſimple viſionary or a fool; while he was accuſed of the black art, or black magic, by others, and treated as an impious perſon, who held a commerce with the devil: at the ſame time there were not wanting ſuch, and thoſe in great numbers, who believed him to be really and truly endued with the ſupernatural gift of prophecy. Laſtly, ſome were found who remained in ſuſpenſe, and refrained from giving any judgment at all upon the point. However, Henry II. and queen Catharine of Medicis his mother, were reſolved to ſee our prophet; and, receiving orders to that effect, he preſently repaired to Paris. He was very graciouſly received at court; and, beſides the extraordinary reſpect that was paid to him, received a preſent of 200 crowns. He was ſent afterwards to Blois, to make a viſit to his majeſty's children there, and report what he ſhould be able to diſcover concerning their deſtinies. No doubt he exerted himſelf to the utmoſt on the occaſion; but what his ſentence was is not known: however,

it is certain, he returned to Salon loaded with honour and preſents. Animated with this ſucceſs, he augmented his work from 300 quatrains to the number of a complete milliade, and publiſhed it with a dedication to the king in 1558. That prince dying the next year of a wound which he received, as is well known, at a tournament, the book of our prophet was immediately conſulted; and in the 35th quatrain of the firſt century this unfortunate event was found predicted in the following verſe:

Le lion jeune le vieux ſurmontera,
En champ bellique par ſingulier duel,
Dans cage d'or les yeux lui crevera,
Deux claſſes une puis mourir, mort cruelle.

So remarkable a prediction added new wings to his fame; and he was honoured ſhortly after with a viſit from Emanuel duke of Savoy and the princeſs Margaret of France his conſort. From this time Noſtradamus found himſelf even over-burdened with viſitors, and his fame made every day new acquiſitions. Charles IX. coming to Salon, was eager above all things to have a ſight of him. Noſtradamus, who then was in waiting as one of the retinue of the magiſtrates, being inſtantly preſented to his majeſty, complained of the little eſteem his countrymen had for him; whereupon the monarch publicly declared, that he ſhould hold the enemies of Noſtradamus to be his enemies, and deſired to ſee his children. Nor did that prince's favour ſtop here; in paſſing, not long after, through the city of Arles, he ſent for Noſtradamus, preſented him with a purſe of 200 crowns, together with a brevet, conſtituting him his phyſician in ordinary, with the ſame appointment as the reſt. But our prophet enjoyed theſe honours only for the ſpace of ſixteen months, for he died July 2, 1566, at Salon. Beſides his "Centuries," we have the following compoſitions of his: *A Treatiſe de fardemens & de ſenteurs*, 1552.—*A Book of ſingular Receipts, pour entretenir la ſanté du corps*, 1556.—*A Piece des confitures*, 1557.—*A French Tranſlation of the Latin of Gaïen's Paraphraſe, exhorting Minedolus to ſtudy, eſpecially to that of phyſic*, 1552. Some years before his death, he publiſhed a ſmall inſtruction for huſbandmen, ſhowing the beſt ſeaſons for their ſeveral labours, which he intitled, *The Almanac of Noſtradamus*. Laſtly, after his death there came out *The eleventh and twelfth Centuries of his Quatrains*, added to the former ten, which had been printed three times in two ſeparate parts. It is only in theſe firſt editions that our author's Centuries are found without alterations, additions, &c. It is to this work that the following diſtich of Stephen Jodelle alludes.

Noſtra damus cum falſa damus, nam fallere noſtrum eſt.
Et cum falſa damus, nil niſi Noſtra damus.

NOSTRE (Andrew le), comptroller of the buildings of the French king, and deſigner of his gardens, diſtinguiſhed himſelf by carrying the art of laying out gardens to great perfection. He was born at Paris in 1631; and was near 40 years of age when M. Fouquet, ſuperintendant of the finances, gave him an opportunity of becoming known by the fine gardens of Vaux-le-Vicomte. He was afterwards employed by Louis XIV. at Verſailles, Triannon, St. Germains, &c. and diſcovered an admirable taſte in all his works. In 1678 he went to Rome, with the permiſſion of the French king, to improve his ſkill; but he found nothing there comparable to what he himſelf had done. Pope Innocent XI. reſolved to ſee Le Noſtre, and gave him a pretty long audience; at the concluſion of which Le Noſtre ſaid, "I have ſeen the two greateſt men in the world, your holineſs, and the king my maſter." There is a great difference, anſwered the pope: "The king is a great victorious prince; and I am a poor prieſt, the ſervant of the ſervants of God." Le Noſtre, charmed with this anſwer, and forgetting whom he was with, clapped the pope on the ſhoulder, ſaying, "Reverend father, you look extremely well, and will live to bury all the ſacred college." The pope laughed at his prediction. Le Noſtre, charmed more and more at the goodneſs of the ſovereign pontiff, and the ſingular eſteem he ſhowed for the king, threw his arms about the pope's neck and kiſſed him. It was his cuſtom to behave in the ſame manner to all who ſpoke in praiſe of Louis XIV. and he even embraced the king himſelf whenever that prince returned from the country. Le Noſtre had alſo a talent for painting. He preſerved his good ſenſe and vivacity of mind to the end of his life; and died at Paris in 1700, aged 87.

NOTÆ, ſigns uſed in writing, which have the force of many letters. This contrivance for expedition is of great antiquity. It was known to the Greeks, and from them derived to the Romans. By whom the invention was brought into Rome is not preciſely aſcertained; but the moſt general opinion is, that in matters of importance Tully firſt made uſe of notes or ſhort-hand writing, when Cato made an oration in order to oppoſe Julius Cæſar relative to the conſpiracy of Catiline. Cicero, who was at that time conſul, placed *notarii*, or expert ſhort-hand writers, in different parts of the ſenate-houſe, to take down the ſpeech; and this was the firſt public occaſion which we find recorded of employing ſhort-hand writers among the Romans. It is unneceſſary to obſerve, that hence proceeded the name of *notary*, ſtill in uſe.

There were three kinds of notes for ſhort-hand writing uſed by the ancients, either for diſpatch or ſecrecy. The firſt and moſt ancient was that of hieroglyphics, which are rather images or repreſentations of things than of words. See Hieroglyphics.) The Chineſe characters are of this kind, and may with greater propriety be called *notæ* than *litteræ*, as appears from what hath been already advanced. The ſecond ſpecies of notes were called *ſingulariæ*, from their expreſſing words by ſingle letters. Sertorius Urſatus has compiled a very copious collection of ſuch abbreviations, of which work there are ſeveral editions. The third kind of notes were called *notæ Tironianæ*, from Tiro the freed-man of Cicero, who was excellently ſkilled in this art; and it is to him that we are indebted for the preſervation of Cicero's letters, of which a great part ſtill remain, and one entire book of them written to Tiro himſelf.

From books it appears, that notes were very frequent among the Romans, and continued in uſe to the 10th and 11th centuries. We have indeed but few books remaining that are written in ſhort-hand; but this is not ſurpriſing, when ſuch was the unhappy ſituation of early ages, that either ſuperſtition condemned them to the flames as the works of impious magicians or necromancers, or they were left to be devoured by vermin, through ignorance and ſtupidity, which was ſo very great, that ſome people, as Trithemius affirms, looked upon notes in thoſe days as the elements of the Armenian language. It is probable, however, that there are writings of this ſort ſtill extant, which might contribute to enrich the republic of letters.

There are ſeveral MSS. and inſtruments written in theſe kind of notæ, in the late royal library at Paris. In the year 1747, the learned and ingenious Monſ. Carpentier, engraved and publiſhed at Paris a capitulary, and 54 charters of Louis the Pious, emperor and king of France, written in theſe notæ Tironianæ. To this work the learned editor hath prefixed an Alphabetum Tironianum, together with a great number and variety of notes or marks for the different parts of ſpeech, and rules for acquiring the art of writing in theſe kind of notes. Valerius Probus, in his book *De Literis antiquis*, explains many of the characters uſed by the ſhort-hand writers; and there is a dictionary of them ſet forth by Janus Gruterus. See Stenography.

NOTARII, perſons employed by the Romans to take, by

notæ, trials and pleadings in their courts of Judicature, or to write as amanuenſes from the mouth of an author. Theſe notarii were of ſervile condition. Under the reign of Juſtinian, they were formed into a college or corporate body. Notarii were alſo appointed to attend the prefects, to tranſcribe for them. There were likewiſe *notarii domeſtici*, who were employed in keeping the accounts of the Roman nobility; and when the empire became Chriſtian, there were notaries for eccleſiaſtical affairs, who atteſted the acts of archbiſhops, biſhops, and other ſpiritual dignitaries. We find eccleſiaſtical notaries at Rome, under Pope Julius IV. and in the church of Antioch, about the year 370. From theſe notaries are derived the office of chancellor to the biſhops; afterwards almoſt every advocate was admitted a notary.

NOTARY (NOTARIUS), ſignifies a perſon, uſually ſome ſcrivener, who takes notes, or frames ſhort draughts, of contracts, obligations, charter-parties, or other writings. At preſent we call him a *notary-public*, who publicly atteſts deeds or writings, in order to make them authentic in another nation: but he is principally employed in buſineſs concerning merchants; as making proteſts of bills of exchange, &c. And noting a bill, is where he goes to take notice of a merchant's refuſal to accept or pay the ſame.

NOTATION, in arithmetic and algebra, the method of expreſſing numbers or quantities by ſigns or characters appropriated for that purpoſe. See ARITHMETIC and ALGEBRA.

NOTES, in muſic, characters which mark the ſounds, *i. e.* the elevations and fallings of the voice, and the ſwiftneſs and ſlowneſs of its motions.

NOTE is likewiſe uſed for a mark made in a book or writing, where there occurs ſomething remarkable and worthy of particular notice: as alſo for an obſervation or explication of ſome paſſage in an author added in the margin, at the bottom of the page, or elſewhere; in which ſenſe it ſtands contradiſtinguiſhed to *text*.

NOTE is alſo a minute, or ſhort writing, containing ſome article of buſineſs; in which ſenſe we ſay, promiſſory note, note of hand, bank-note, &c.

NOTHUS, ſignifies *ſpurious*, or *baſtard*; whence it is figuratively applied by phyſicians to ſuch diſeaſes as, though in reſpect of a ſimilitude of ſymptoms, &c. they have the ſame denomination as ſome others, yet are of a different origin, ſeat, or the like, from the ſame.

NOTHUS, a Perſian prince, and grandfather to Darius Codomannus. He is worthy of being mentioned only as he was progenitor to that ſovereign whoſe overthrow conferred upon Alexander the title of *Great*.

NOTION, a word which in common language is conſidered as of the ſame import with idea. This, however, is improper. Notion comprehends the meaning of idea, but it denotes much more. We have a notion of ſpirit, of power, of ſolidity; but of theſe things we can have no ideas. Ideas are relicts of ſenſation; but there are objects of knowledge which fall under the cognizance of no ſenſe; of theſe objects, however, we may have very diſtinct notions either direct or relative. See METAPHYSICS.

NOTITIA, in literary hiſtory, a book that gives an account of a particular country, city, or other place: ſuch is the *Notitia Imperii Romani, Notitia Romæ Antiquæ*, &c.

NOTO, an ancient, large, and handſome town of Sicily, and capital of the Val-di-Noto. It was entirely ruined by an earthquake in 1693; but the inhabitants built another town at ſome diſtance from it, which they call *Noto Nuovo*. E. lon. 14. 0. N. lat. 36. 50.

NOTO *(Val-di)*, one of the three valleys or provinces into which Sicily is divided; and it lies between the ſea, Val-di-Demona, and Val-di-Mazara. Noto is the capital town.

NOTONECTA, the boat fly; a genus of inſects belonging to the order of hemyptera. See Plate 1. Barbut gives the following character of this genus. "The roſtrum is inflected; the antennæ are ſhorter than the thorax; the four wings, which are coriaceous from their baſe to their middle, are folded together croſs-wiſe; the hind feet are hairy, and formed for ſwimming. To which may be added, that the tarſi are compoſed of two articulations, and all the ſix feet are equally formed for ſwimming. The abdomen is terminated by four little horns or appendices." He alſo deſcribes the notonecta glauca Linn. n° 1. in theſe words, "This inſect has a head ſomewhat round, of which the eyes ſeem to take up the greateſt part. Thoſe eyes are brown and very large, the reſt of the head being yellow. In the fore part it has a ſharp trunk that projects, and is inflected between the fore-feet. On the ſides are ſeen the antennæ, very ſmall, yellowiſh, and that ſpring from under the head. The thorax, which is broad, ſhort, and ſmooth, is yellow on the fore and black on the back part. The eſcutcheon is large, of a rough black, and as it were nappy. The elytra, rather large, and croſſed over each other, are a mixture of brown and yellow, not unlike the colour of ruſt, which makes it look cloudy. The under part of the body is brown; and at the extremity of the abdomen are to be ſeen a few hairs. The feet, ſix in number, are of a light brown, the two hindermoſt having on the leg and tarſus hairs that give them the ſhape of fins, nor are they terminated by nails. The four anterior ones are ſomewhat flat, and ſerve the animal to ſwim with; but at their extremity they have nails and no hairs. This inſect is ſeen in ſtagnating waters, where it ſwims on its back, and preſents its abdomen upwards; for which reaſon it has been called by the Greek name of *notonecta*. The hinder feet, longer than the reſt, ſerve it as paddles. It is very nimble, and dives down when you go to take hold of it; after which, it riſes again to the ſurface of the water. It muſt be cautiouſly handled if one would avoid being pricked by it, for the point of its roſtrum is exceeding ſharp and intolerably painful, but it goes off in a few minutes. The larva very much reſembles the perfect inſect." Such is the account that Mr. Barbut gives of this beautiful nimble little creature, which we thought it our duty to lay before our readers, as this gentleman ſeems to have been particularly attentive to the ſubject. To this account, however, we ſhall add the following. Its legs are long; when taken out of the water it hops: it is very common in the ponds of water in Hyde-park, and in ſeveral other places about London. It is of a very particular form, being flattiſh at the belly, and riſing to a ridge on the middle of the back; ſo that when it ſwims, which is almoſt always on the back, its body has much the reſemblance of a boat in figure, and whence its vulgar name. It is eight lines long, three broad, and two and a half thick. The belly is jointed, ſtriated, and, as Barbut obſerves, hairy. Nature has provided it with an offenſive weapon reſembling a ſting, which it thruſts out when hurt from a large opening at the tail. The head is large and hard. The eyes of nearly a triangular form. The noſe is a long, green, hollow probocſcis, ending in a hard and ſharp point, which in its natural poſture remains under the belly, and reaches to the middle pair of legs. The outer pair of its wings are of a pale fleſh-colour, with ſpots of a dead white; theſe are long, narrow, and ſomewhat tranſparent; they terminate in a roundiſh point, and perfectly cover the whole body. The triangular piece which ſtands between the top of the wings is hard, and perfectly black: the inner wings are broader and ſhorter than the outer ones; they are thin and perfectly tranſparent, and are of a pale pearl colour. The hinder pair being greatly longer than all the reſt, they ſerve as oars; and nature has tufted them with hair at the end for that purpoſe. This creature moſtly lives in the water, where it preys on ſmall inſects, killing them and ſucking their

juices with its probofcis, in the manner of the water-ſcorpion and many other aquatic inſects; and it ſeizes its prey violently, and darts with incredible ſwiftneſs to a conſiderable diſtance after it.

Though it generally lives in the water, it ſometimes, however, crawls out in good weather; and drying its wings by expanding them in the ſun, takes flight, and becomes an inhabitant of the air, not to be known for the ſame creature, unleſs to thoſe who had accurately obſerved it before; when tired of flying, or in danger of an enemy, it immediately plunges into the water. We are told that there are 14 ſpecies of it, ſeven of which are common in Europe in waters, &c.

NOTTEBURG, a town of Ruſſia, in the province of Ingria, ſeated on an iſland in the lake Ladoga, at the place where the river Nieva proceeds from this lake. It is ſtrong, has a good citadel, and was capital of the province before Peterſburg was built. E. lon. 31. 40. N. lat. 60. 0.

NOTTINGHAMSHIRE, a county of England, bounded on the eaſt by Lincolnſhire, on the ſouth-eaſt and ſouth by Leiceſterſhire, on the weſt by Derbyſhire, and on the north and north-weſt by Yorkſhire. It extends in length 48 miles, 25 in breadth, and 110 in compaſs; containing 560,000 acres, 8 hundreds, 9 market-towns, 168 pariſhes, 450 villages, about 17460 houſes, and 95000 inhabitants. No county in England enjoys a pleaſanter and healthier air. As for the ſoil, it differs widely in different parts of the county. Towards the weſt, where lies the foreſt of Sherwood, it is ſandy; and therefore that part of the county is called by the inhabitants the *Sand:* but the ſouth and eaſt parts, watered by the Trent and the rivulets that fall into it, are clayey; and for that reaſon are called by the inhabitants the *Clay*. The latter is fruitful both in corn and paſture; but the former produces little beſides wood, coal, and ſome lead. The county has a variety of commodities and manufactures, as wool, leather, tallow, butter, cheeſe, coal, marl, cattle, malt, liquorice, ſtockings, glaſs, earthen-wares, and ſtrong ale. The principal rivers are the Trent, and Idle. The Trent, whoſe name is ſuppoſed to be derived from the French or Latin word ſignifying *thirty*, either becauſe it receives thirty ſmaller rivers, or has thirty different ſorts of fiſh in it, is inferior to no river in England, but the Severn, Thames, and Humber. It enters the county on the ſouth-weſt, and paſſes through it to the north-eaſt, where it enters Lincolnſhire, and after a long courſe falls at laſt into the Humber. The Idle riſes in Sherwood-foreſt; and after traverſing the northern part of the county, falls into the Trent upon the borders of Yorkſhire and Lincolnſhire.

The ſpacious foreſt of Sherwood lies in the weſt part of the county, and indeed takes up the greateſt part of it. It was formerly ſo thick, that it was hardly paſſable; but now it is much thinner. It feeds an infinite number of deer and ſtags; and has ſome towns in it, of which Mansfield is the chief. It abounds in coal, and a road lies through it for thirty miles together. Since the reign of king Edward I. the nobility and gentry have had grants of it. It was governed by a great number of officers under the late earl of Cheſterfield, chief foreſter; whoſe anceſtor, Sir John Stanhope, had a grant of it, with liberty to deſtroy and kill at pleaſure, reſerving only an hundred deer in the whole walk. The duke of Newcaſtle is now ſteward and keeper. The principal town is

NOTTINGHAM, which gives name to the county. It is a handſome town, and a county of itſelf by charter. The name is derived from the Saxon word *Snottingham*, which ſignifies *caves*, from the caves and apartments anciently dug in the rocks on which the town ſtands. Theſe, being ſoft, eaſily yield to the ſpade and pick-axe; whence the townſmen have excellent cellars for the vaſt quantities of malt liquors made here, and ſent, as well as their malt, to moſt parts of England. The ſituation of the town is very pleaſant, having meadows on one hand, and hills of a gentle eaſy aſcent on the other. It is well ſupplied with fuel, both wood and coal, from the foreſt; and with fiſh by the Trent, which runs about a mile to the ſouth of it, and has been made navigable for barges: ſo that they receive by it not only great quantities of cheeſe from Warwickſhire and Staffordſhire; but all their heavy goods from the Humber, and even from Hull. Over the Trent is a ſtately ſtone-bridge of 19 arches, where the river is very large and deep, having received the addition of the Dove, the Derwent, the Irwaſh, and the Soar, three of them great rivers of themſelves, which fall into it after its paſſing by Burton in Staffordſhire.

The town is of great antiquity, and it had formerly a ſtrong caſtle, in which the Danes, in the time of the heptarchy, held out a ſiege againſt Buthred king of Mercia, Alfred, and Ethelred his brother, king of the Weſt Saxons.

Soon after the conqueſt, William either repaired this fortreſs or built a new one on the ſame ſpot, in the ſecond year of his reign, probably to ſecure a retreat on his expedition againſt Edwin Earl of Cheſter and Morcar Earl of Northumberland, who had revolted. He committed the cuſtody of it to William Peverell, his natural ſon, who has by ſome been conſidered as the founder. It ſtands on a ſteep rock, at the foot of which runs the river Leen.

Deering, in his hiſtory of Nottingham, ſeems very juſtly to explode the ſtory of the place called Mortimer's-hole, having been made as a hiding-place for him; and from his deſcription of it, ſhows that it was meant as a private paſſage to the caſtle, to relieve it with men or proviſions in a ſiege. He ſays that it is one continued ſtair-caſe, without any room, or even a place to ſit down on. It was by this paſſage that Edward III. got into the caſtle and ſurprized Mortimer and the queen; and from hence, and his being carried away through it, it has its name.

Edward IV. greatly enlarged the caſtle, but did not live to complete the buildings he begun. Richard III. finiſhed them.

It was granted by James I. to Francis Earl of Rutland, who pulled down many of the buildings; but it was ſtill of ſo much ſtrength, that Charles I. in 1642, pitched on it as the place for beginning his operations of war. He ſet up his ſtandard, firſt on the walls of the caſtle, but in two or three days removed it to a cloſe on the north-ſide of the caſtle, without the wall, on a round ſpot; after which it was for many years called Standard-cloſe, and ſince, from the name of one who rented it, Nevil's cloſe. Where the ſtandard was fixed, there ſtood a poſt for a conſiderable time. It is a common error that it was erected on a place called Derry-mount, a little further north than the cloſe juſt mentioned; this is an artificial hill raiſed on purpoſe for a windmill, which formerly was there. The caſtle was afterwards ſequeſtered by the parliament, and the trees in the park cut down.

This caſtle was ſo ſtrong that it was never taken by ſtorm. After the civil war, Cromwell ordered it to be demoliſhed. On the reſtoration, the duke of Buckingham, whoſe mother was daughter and heir of this Francis Earl of Rutland, had it reſtored to him, and ſold it to William Cavendiſh, marquis and afterwards duke of Newcaſtle. In 1674 he began the preſent building, but died in 1676, when the work was not far advanced. However, he had the building of it ſo much at heart, that he left the revenue of a conſiderable eſtate to be applied to that purpoſe, and it was finiſhed by Henry his ſon. The expence was about 14,000. It is one of the ſeats of the preſent duke of Newcaſtle.

In the park, weſt of the caſtle, and facing the river Leen, are ſome remains of an ancient building (if it may be ſo called) cut and framed in the rock. Dr. Stukely gives it, as he does moſt things, to the Britons. Many other ancient excavations have been found in other parts of the rocks.

The frames for knitting ſtockings were invented by one William Lea of this county, about the beginning of the laſt century; but he not meeting with the encouragement he expected (a caſe too common with the firſt inventors of the moſt uſeful arts), went with ſeveral of his workmen to France, on the invitation of Henry IV. The death of that king, and the troubles which enſued, prevented attention being given to the work. Lea died there, and moſt of his men returned to England. Other attempts were made to ſteal the trade, without better ſucceſs, and it has flouriſhed here ever ſince, and is now carried on to a very conſiderable extent. It is noted for its horſe-races on a fine courſe on the north ſide of the town. The corporation is governed by a mayor, recorder, ſix aldermen, two coroners, two ſheriffs, two chamberlains, and twenty-four common-council men, eighteen of the ſenior council, and ſix of the junior, a bell-bearer, and two pinders, one for the fields and the other for the meadows. The town being within the juriſdiction of the foreſt, the former of theſe pinders is town-woodward, and attends the foreſt courts. It has three neat churches, the chief of which is St. Mary's; and an almſ-houſe, endowed with 100l. a-year, for twelve poor people; with a noble town-houſe, ſurrounded with piazzas. A conſiderable trade is carried on in glaſs and earthen wares, and frame-ſtockings, beſides the malt, and malt-liquors, mentioned above. Marſhal Tallard, when a priſoner in England, was confined to this town and county. In the duke of Newcaſtle's park there is a ledge of rocks hewn into a church, houſes, chambers, dove-houſes, &c. The altar of the church is natural rock; and between that and the caſtle there is an hermitage of the like workmanſhip. Upon the ſide of a hill there is a very extraordinary ſort of a houſe, where you enter at the garret, and aſcend to the cellar, which is at the top of the houſe. Here is a noted hoſpital founded by John Plumtree, Eſq. in the reign of Richard II. for thirteen poor old widows. There are four handſome bridges over the Trent and Lind. To keep theſe in repair, and for other public purpoſes, the corporation has good eſtates. This town and Winchelſea both give title of earl to the noble family of Finch. Here David king of Scots, when a priſoner in England, reſided; and under-ground is a vault, called *Mortimer's hole*, becauſe Roger Mortimer earl of March is ſaid to have abſconded in it, when he was taken and hanged by order of Edward III. W. lon. 1. 5. N. lat. 53. 0.

NOVA-SCOTIA. See *Nova*-SCOTIA.

NOVA *Zembla*. See *Nova* ZEMBLA.

NOVALLE, a ſmall, rich, and populous town of Italy, between Padua and Treviſo. E. lon. 12. 5. N. lat. 45. 35.

NOVARA, an ancient and ſtrong city of Italy, in the duchy of Milan, and capital of the Novareſe. Some pretend that this city was built by the Trojans, and ſo called *quaſi Nova Ara*, becauſe they had erected there a temple to Venus. Tacitus mentions its being made a municipal city by the Romans; and there are many inſcriptions ſtill extant, which ſufficiently prove its ancient ſplendor. It is now a ſmall but well-built town, ſituated on a little eminence, in a fine country, betwixt two rivers, very well fortified, and is the ſee of a biſhop ſuffragan of Milan. It is remarkable for the ſeveral ſieges ſuſtained in paſt times, and for being the birth-place of Peter Lombard, maſter of the ſentences. E. lon. 8, 35. N. lat. 45, 25.

NOVATIAN, who made ſo much noiſe and ſo greatly diſturbed the peace of the church, was, we are told, firſt a Pagan philoſopher. He was baptized in bed when dangerouſly ill: recovering, however, he was afterwards ordained prieſt of the church of Rome, his biſhop having obtained this favour for him, which the clergy and people were far from being diſpoſed to grant. He does not appear to have had the good of the church much at heart; for with his wit, knowledge, and eloquence, he might have been peculiarly ſerviceable to her, had he not with cowardice ſhrunk from his duty when he dreaded perſecution. His ambition to be made a biſhop likewiſe miſled him: and what occaſioned the apoſtacy of moſt of the firſt hereſiarchs, alſo occaſioned his. On the death of Fabian biſhop of Rome, after writing a letter to St. Cyprian, he remained quiet whilſt the ſee was vacant; but the promotion of Cornelius to that dignity excited his envy and jealouſy to no common pitch. The conſequence was a ſeparation from the new biſhop, and from thoſe who profeſſed to believe, what Novatian ſtrenuouſly denied, that the church could receive thoſe again who had been guilty of idolatry. He ſoon got a number of followers among the laity, and ſome even among the clergy. Novatus, a prieſt of Carthage, was one of his party, and having been a party-man himſelf againſt St. Cyprian, brought his adherents with him. He got himſelf conſecrated Biſhop of Rome in a moſt infamous and clandeſtine manner, by three weak men whom he had moſt groſsly impoſed upon, and one of whom did penance for having been concerned in what was ſo contrary to order, decency, and the rules of the church.

His deſigns, however, in this diſgraceful affair did not ſucceed, for he was not acknowledged as biſhop of that diocefe; Cornelius being confirmed in it, whilſt he was condemned and excommunicated. He ſtill, however, taught his doctrine, and at length became the head of the party which bears his name. Beſides the letter mentioned above, St. Jerome ſays he wrote on the *Paſſover*, on the *Sabbath*, on *Circumciſion*, on the *High Prieſts*, on *Prayer*, on *Jewiſh meats*, and on *Firmneſs of mind*, &c. with a large treatiſe *on the Trinity*. None of them appear under his own name, and ſome are thought not to be his.

NOVATIANS, *Novatiani*, a ſect of ancient heretics, that aroſe towards the cloſe of the third century, ſo called from Novatian, a prieſt of Rome (ſee the preceding article). They were called alſo *Cathari*, from καθαρὸς, *pure*, q. d. Puritans. Novatian firſt ſeparated from the communion of pope Cornelius, on pretence of his being too eaſy in admitting to repentance thoſe who had fallen off in times of perſecution. Novatus coming to Rome, joined himſelf to the faction of Novatian; and both maintained, that there was no other admiſſion into the church but by the repentance in baptiſm; grounding their opinion on that of St. Paul: "It is impoſſible for thoſe "once enlightened, and who have taſted the heavenly gift, if "they fall away, to renew themſelves by repentance."

Not that they denied but a perſon fallen into any ſin, how grievous ſoever, might obtain pardon by repentance; for they themſelves recommend repentance in the ſtrongeſt terms: but their doctrine was, that the church had it not in its power to receive ſinners into its communion, as having no way of remitting ſins but by baptiſm; which once received could not be repeated.

In proceſs of time the *Novatians* ſoftened and moderated the rigour of their maſter's doctrine, and only refuſed abſolution to very great ſinners.

The two leaders were proſcribed, and declared heretics, not for excluding penitents from communion, but for denying that the church had a power of remitting ſins. See NOVATUS.

NOVATION, or INNOVATION, in the civil law, denotes the change of one kind of obligation for another; as when a promiſe is accepted inſtead of a written obligation.

NOVATUS, a prieſt of Carthage, in the third century, who, to avoid being puniſhed for a crime, joined with the deacon, named *Felicijſimus*, againſt St. Cyprian. He went to Rome in 251; and there found Novatian, who had acquired great reputation by his eloquence, but who murmured at his not being raiſed to the ſee of Rome in preference to Cornelius. Novatus contracted a friendſhip with him; and afterwards promoted the deteſtable conſecration of Novatian to the ſee of Rome. This irregular conſecration produced a very great ſchiſm: No-

vatus alſo maintained, that the church had not the power to receive thoſe to communion who were fallen into idolatry.

NOVEL, a fictitious narrative in proſe, which profeſſes to exhibit the natural workings of the human heart, the happineſs and miſery of private life, and, above all, the nature of the affection called *Love*, and the conſequence of indulging it in certain circumſtances. The novel ſprung out of the old romance, and has been cenſured for inſipidity, as its parent was for extravagance. (See ROMANCE.) That the greater part of thoſe abſurd things, which, under this title, are daily iſſuing from the preſs, deſerve all the contempt with which they can be treated, is a poſition which we feel not ourſelves inclined to controvert; but we cannot admit that any ſpecies of writing is in itſelf inſipid, merely becauſe numbers have attempted it without ſucceſs. The heroic poems of Blackmore are univerſally known to be contemptible performances; and if we had before us all the heroic poetry that has ever been written, how many thouſands of volumes ſhould we have as mean as either *Prince Arthur*, *King Arthur*, *Elize*, or *Alfred*? Yet no critic has hitherto dared to maintain, that heroic poetry is an inſipid ſpecies of writing.

But to the novel objections have been urged of more importance than its inſipidity. It has been often affirmed with learned ſolemnity, that the peruſal of novels tends to corrupt the youth of both ſexes; to produce effeminacy in men and extravagant notions of the happineſs of love in women; that it diverts the minds of the former from more ſerious and uſeful ſtudies, and expoſes the latter to the arts of ſeduction. That there are too many novels to which this objection is applicable in its full force, is a fact which we are afraid cannot be denied: but when it is admitted, let not theſe performances be again accuſed of inſipidity; for were they inſipid, they could have no ſuch conſequences. It is by laying faſt hold of the heart that they lead it aſtray. That a novel might be written ſo as to intereſt the heart in behalf of virtue, as much as any one has ever warped it to the ſide of vice, is a truth which no man will ever venture to call in queſtion who has any knowledge of human nature; and therefore we are decidedly of opinion, that there may be novels worthy at once of the peruſal of inexperienced youth and hoary wiſdom. A critic, by no means too indulgent to works of fancy, and among whoſe failings laxity of morals has never been numbered, thus expreſſes himſelf on the ſubject of novel-writing:—"Theſe familiar hiſtories may perhaps he made of greater uſe than the ſolemnities of profeſſed morality, and convey the knowledge of vice and virtue with more efficacy than axioms and definitions. But if the power of example is ſo great, as to take poſſeſſion of the memory by a kind of violence, and produce effects almoſt without the intervention of the will, care ought to be taken, that, when the choice is unreſtrained, the beſt examples only ſhould be exhibited; and that what is likely to operate ſo ſtrongly, ſhould not be miſchievous or uncertain in its effects."

We have ſaid, that the novel profeſſes above all things to exhibit the nature of love and its conſequences. Whether this be eſſential to ſuch performances, may perhaps be reaſonably queſtioned: but it has been made an important part of the drama in moſt novels, and, we think, with great propriety. It is the object of the noveliſt to give a true picture of life, diverſified only by accidents that daily happen in the world, and influenced by paſſions and qualities which are really to be found in converſing with mankind. To accompliſh this object, he conceives a hero or heroine, whom he places in a certain rank of life, endues with certain qualities of body and mind, and conducts, through many viciſſitudes of fortune, either to the ſummit of happineſs or to the abyſs of miſery, according to the paſſion which he wiſhes to excite in his readers. In the modern novel, this hero or heroine is never placed on a throne, or buried in a cottage; becauſe to the monarch and the cottager no difficulties occur which can deeply intereſt the majority of readers. But among the virtuous part of the intermediate orders of ſociety, that affection which we call *love* ſeldom fails, at ſome period of life, to take poſſeſſion of the hearts of both ſexes; and wherever it has place, it muſt be productive of happineſs or of miſery. In the proper management of this paſſion conſiſts much of the difficulty of the novel-writer. He muſt exhibit his hero as feeling all the pangs and pleaſures of love, as ſometimes animated with hope, and ſometimes ready to ſink into deſpair, but always exerting himſelf to obtain the gratification of his wiſhes. In doing this, care ſhould be taken, either that he never tranſgreſs the laws of virtue, or at leaſt that he never tranſgreſs them with impunity.

"It is juſtly conſidered as the greateſt excellency of art to imitate nature; but it is neceſſary to diſtinguiſh thoſe parts of nature which are moſt proper for imitation: greater care is ſtill required in repreſenting life, which is ſo often diſcoloured by paſſion or deformed by wickedneſs. If the world be promiſcuouſly deſcribed, I cannot perceive (ſays the great critic already quoted) of what uſe it can be to read the account; or why it may not be as ſafe to turn the eye immediately upon mankind, as upon a mirror which ſhows all that preſents itſelf without diſcrimination. It is therefore not a ſufficient vindication of a character, that it is drawn as it appears; for many characters ought never to be drawn: nor of a narrative, that the train of events is agreeable to obſervation; for that obſervation which is called knowledge of the world will be found much more frequently to make men cunning than good. The purpoſe of theſe writings is ſurely not only to ſhow mankind, but to provide that they may be ſeen hereafter with leſs hazard; to teach the means of avoiding the ſnares which are laid by TREACHERY for INNOCENCE, without inſuring any wiſh for that ſuperiority with which the betrayer flatters his vanity; to give the power of counteracting fraud, without the temptation to practiſe it; to initiate youth by meek encounters in the art of neceſſary defence; and to increaſe prudence without impairing virtue.

"Many writers, for the ſake of following nature, ſo mingle good and bad qualities in their principal perſonages; that they are both equally conſpicuous; and as we accompany them through their adventures with delight, and are led by degrees to intereſt ourſelves in their favour, we loſe the abhorrence of their faults, becauſe they do not hinder our pleaſures, or perhaps regard them with ſome kindneſs for being united with ſo much merit.—There have been men indeed ſplendidly wicked, whoſe endowments threw a brightneſs on their crimes, and whom ſcarce any villany made perfectly deteſtable, becauſe they never could be wholly diveſted of their excellencies: but ſuch have been in all ages the great corruptors of the world; and their reſemblance ought no more to be preſerved than the art of murdering without pain.

"In narratives, where hiſtorical veracity has no place, there ſhould be exhibited the moſt perfect idea of virtue; of virtue not angelical, nor above probability (for what we cannot credit we ſhall never imitate), but the higheſt and pureſt that humanity can reach, which, exerciſed in ſuch trials as the various revolutions of things ſhall bring upon it, may, by conquering ſome calamities and enduring others, teach us what we may hope, and what we can perform. Vice (for vice is neceſſary to be ſhown) ſhould always diſguſt; nor ſhould the graces of gaiety, or the dignity of courage, be ſo united with it, as to reconcile it to the mind. Wherever it appears, it ſhould raiſe hatred by the malignity of its practices, and contempt by the meanneſs of its ſtratagems: for while it is ſupported by either parts or ſpirit, it will ſeldom be heartily abhorred."

If theſe obſervations be juſt, and to us they appear unanſwerable, Richardſon's *Lovelace* is a character which ought never

to have been drawn. In the graces of gaiety and the dignity of courage, in liberality without profuſion, in perſeverance and addreſs, he every where appears as the firſt of men; and that honour with which he protects the virtue of his *Roſe-bud*, if any inſtruction is to be drawn from it, can only lead the admirers of Richardſon to believe that another Clariſſa might be in perfect ſafety were ſhe to throw herſelf upon the honour of another Lovelace. Yet in the compoſition of this ſplendid character there is not one principle upon which confidence can ſecurely reſt; and Lovelace, whilſt he is admired by the youth of both ſexes, and eſcapes the contempt of all mankind, muſt excite in the breaſt of the cool moraliſt ſentiments of abhorrence and deteſtation. A French critic, ſpeaking of this character, ſays, "By turns I could embrace and fight with Lovelace. His pride, his gaiety, his drollery, charm and amuſe me: his genius confounds me and makes me ſmile; his wickedneſs aſtoniſhes and enrages me; but at the ſame time I admire as much as I deteſt him." Surely this is not the character which ought to be preſented to the inexperienced and ardent mind.

The moſt perfect characters which we at preſent recollect in any novel are Richardſon's Grandiſon and Fielding's Allworthy. The virtues of the former are perhaps tinctured with moral pedantry, if we may uſe the expreſſion; and the latter ſuffered himſelf to be long impoſed upon by the arts of the hypocrite and the philoſophical coxcomb; but without ſome defects they would not be human virtues, and therefore no objects of human imitation. Clariſſa is an excellent character: ſhe has as much perfection as can be expected in woman, whilſt ſhe exhibits, at the ſame time, ſome obvious defects.

As it is the object of the noveliſt to intereſt the heart, and to communicate inſtruction through the medium of pleaſure, his work, like a tragedy or comedy, ſhould be one, exhibiting a hero or heroine, whoſe ſucceſs every incident ſhould contribute to forward or to retard. In this reſpect no work of fancy has ever ſurpaſſed the Tom Jones of Fielding. It is conſtructed upon principles of the ſoundeſt criticiſm, and contains not a ſingle event which does not in ſome way contribute towards the winding up of the piece. A living author, deeply read in Grecian literature, and far from being prejudiced in behalf of any modern, has been heard to ſay, that had Ariſtotle ſeen Tom Jones, he would have pronounced it a poem perfect in its kind.

Againſt this ſentence another critic of name has entered his proteſt, and ſtrenuouſly maintained that nothing can be a poem which is not written in verſe. We ſhall judge of the truth of this concluſion by comparing it with the principles from which it is deduced. Having laid down as a maxim incontrovertible, that "the end of poetry is pleaſure, to which uſe itſelf muſt be ſubſervient," he very juſtly infers from this IDEA, that "poetry ſhould neglect no advantage that fairly offers itſelf, of appearing in ſuch a dreſs or mode of language as is moſt taking and agreeable to us. It follows (he ſays), from the ſame idea of the *end* which poetry would accompliſh, that not only rhythm, but NUMBERS properly ſo called, is eſſential to it, and that it cannot obtain its own purpoſe unleſs it be clothed in VERSE." He then proceeds to aſk, "What, from this concluſion, are we to think of thoſe *novels* or *romances* as they are called, which have been ſo current of late through all Europe? As they propoſe pleaſure for their end, and proſecute it, beſides, in the way of *fiction*, though without metrical numbers, and generally indeed in harſh and rugged proſe, one eaſily ſees what their pretenſions are, and under what idea they are ambitious to be received. Yet as they are wholly deſtitute of meaſured ſounds (to ſay nothing of their other numberleſs defects), they can at moſt be conſidered but as haſty, imperfect, and abortive poems: whether ſpawned from the dramatic or narrative ſpecies, it may be hard to ſay.

Unfiniſhed things, one knows not what to call,
Their generation 's ſo equivocal.

However, ſuch as they are, thoſe *novelties* have been generally well received: *ſome* for the real merit of their execution; *others*, for their amuſing ſubjects; all of them, for the gratification they afford, or at leaſt promiſe, to a vitiated, pallid, and ſickly imagination, that laſt diſeaſe of learned minds, and ſure prognoſtic of expiring letters. But whatever may be the temporary ſucceſs of theſe things (for they vaniſh as faſt as they are produced), good ſenſe will acknowledge no work of art but ſuch as is compoſed according to the laws of its kind."

Of this ſevere criticiſm the author himſelf has given us what amounts to a complete confutation. He tells us that the ancients looked for ſo much force and ſpirit of expreſſion in whatever they dignified with the name of *poem*, as ſometimes to make a queſtion "whether comedy were rightly referred to this claſs, becauſe it differed only in meaſure from mere proſe? Their doubt (he juſtly adds) might have been ſpared or at leaſt reſolved, if they had conſidered that comedy adopts as much of this force and ſpirit of words as is conſiſtent with the nature and dignity of that pleaſure which it pretends to give: for the name of *poem* will belong to every compoſition whoſe *primary* end is to pleaſe, provided it be ſo conſtructed as to afford *all* the pleaſure which its kind or ſort will permit."

If this deciſion be juſt, and we readily admit it, a well compoſed novel is intitled to the appellation of a *poem*, though it be written in proſe and in a ſtyle not remarkable for elevation. The buſineſs of the noveliſt is to intereſt the heart by a diſplay of the incidents of common life. In doing this, he muſt exhibit ſcenes that are probable, and record ſpeeches that are natural. He is not at liberty to invent, but only to ſelect objects, and to cull from the maſs of mankind thoſe individuals upon which the attention ought moſt to be employed. The more cloſely he adheres to this rule, the more deeply does he intereſt us in his narrative; becauſe every reader ſees at once that it is poſſible he may at ſome time or other be in circumſtances nearly reſembling thoſe of the hero of the tale. But the buſineſs of life is not tranſacted in pompous language, nor the ſpeeches of real lovers made in verſe either rhimed or blank. Were *Tom Jones* or *Clariſſa Harlowe* to be tranſlated into verſe, we ſhall venture to aſſert that they would quickly loſe their hold of the public mind; becauſe the hero and heroine would then appear in a light which every heart muſt feel to be unnatural.

It is well obſerved by Johnſon, that the taſk of the novel-writer "requires, together with that learning which is to be gained from books, that experience which can never be attained by ſolitary diligence, but muſt ariſe from general converſe and accurate obſervation of the living world. Their performances have, as Horace expreſſes it, *plus oneris quantum veniæ minus*, little indulgence, and therefore more difficulty. They are engaged in portraits of which every one knows the original, and can detect any deviation from exactneſs of reſemblance. Other writings are ſafe, except from the malice of learning; but theſe are in danger from every common reader; as the ſlipper ill executed was cenſured by a ſhoemaker who happened to ſtop in his way at the Venus of Apelles." It is in thus faithfully copying nature that the excellence of Fielding conſiſts. No man was ever better acquainted with the ſhades which diverſify characters, and none ever made his perſonages act and ſpeak more like real men and women in the particular circumſtances which he deſcribes.

"But the fear of not being approved as a juſt copier of human manners, is not the moſt important concern that an author of this claſs ought to have before him. Novels are written chiefly to the young, the ignorant, and the idle, to whom they ſerve as lectures of conduct and introduction into life. In every ſuch work, it ſhould therefore be carefully inculcated, that virtue is the higheſt proof of underſtanding, and the only ſolid baſis of greatneſs; and that vice is the natural

conſequence of narrow thoughts; that it begins in miſtake, and ends in ignominy: and ſince love muſt be introduced, it ſhould be repreſented as leading to wretchedneſs, whenever it is ſeparated from duty or from prudence."

Novel, in the civil law, a term uſed for the conſtitutions of ſeveral emperors, more particularly thoſe of Juſtinian. They were called *novels*, either from their producing a great alteration in the face of the ancient law, or becauſe they were made on new caſes, and after the reviſal of the ancient code.

NOVELTY, or Newness. Of all the circumſtances that raiſe emotions, not excepting beauty, nor even greatneſs, ſays Lord Kames, novelty hath the moſt powerful influence. A new object produces inſtantaneouſly an emotion termed *wonder*, which totally occupies the mind, and for a time excludes all other objects. Converſation among the vulgar never is more intereſting than when it turns upon ſtrange objects and extraordinary events. Men tear themſelves from their native country in ſearch of things rare and new; and novelty converts into a pleaſure the fatigues and even perils of travelling. To what cauſe ſhall we aſcribe theſe ſingular appearances? To curioſity undoubtedly; a principle implanted in human nature for a purpoſe extremely beneficial, that of acquiring knowledge; and the emotion of wonder raiſed by new and ſtrange objects inflames our curioſity to know more of ſuch objects. This emotion is different from *admiration*: novelty, wherever found, whether in a quality or action, is the cauſe of wonder: admiration is directed to the perſon who performs any thing wonderful.

During infancy, every new object is probably the occaſion of wonder, in ſome degree; becauſe, during infancy, every object at firſt ſight is ſtrange as well as new: but as objects are rendered familiar by cuſtom, we ceaſe by degrees to wonder at new appearances, if they have any reſemblance to what we are acquainted with; for a thing muſt be ſingular as well as new, to raiſe our wonder. To ſave multiplying words, we would be underſtood to comprehend both circumſtances when we hereafter talk of novelty.

In an ordinary train of perceptions where one thing introduces another, not a ſingle object makes its appearance unexpectedly: the mind thus prepared for the reception of its objects, admits them one after another without perturbation. But when a thing breaks in unexpectedly, and without the preparation of any connection, it raiſes an emotion known by the name of *ſurpriſe*. That emotion may be produced by the moſt familiar object, as when one unexpectedly meets a friend who was reported to be dead; or a man in high life, lately a beggar. On the other hand, a new object, however ſtrange, will not produce the emotion, if the ſpectator be prepared for the ſight: an elephant in India will not ſurpriſe a traveller who goes to ſee one; and yet its novelty will raiſe his wonder: an Indian in Britain would be much ſurpriſed to ſtumble upon an elephant feeding at large in the open fields; but the creature itſelf, to which he was accuſtomed, would not raiſe his wonder.

Surpriſe thus in ſeveral reſpects differs from wonder: unexpectedneſs is the cauſe of the former emotion; novelty is the cauſe of the latter. Nor differ they leſs in their nature and circumſtances, as will be explained by and by. With relation to one circumſtance they perfectly agree; which is, the ſhortneſs of their duration: the inſtantaneous production of theſe emotions in perfection, may contribute to that effect, in conformity to a general law, That things ſoon decay which ſoon come to perfection: the violence of the emotions may alſo contribute; for an ardent emotion, which is not ſuſceptible of increaſe, cannot have a long courſe. But their ſhort duration is occaſioned chiefly by that of their cauſes: we are ſoon reconciled to an object, however unexpected; and novelty ſoon degenerates into familiarity.

Whether theſe emotions be pleaſant or painful, is not a clear point. It may appear ſtrange, that our own feelings and their capital qualities ſhould afford any matter for a doubt: but when we are engroſſed by any emotion, there is no place for ſpeculation; and when ſufficiently calm for ſpeculation, it is not eaſy to recal the emotion with accuracy. New objects are ſometimes terrible, ſometimes delightful: the terror which a tyger inſpires is greateſt at firſt, and wears off gradually by familiarity: on the other hand, even women will acknowledge that it is novelty which pleaſes the moſt in a new faſhion. It would be raſh however to conclude, that wonder is in itſelf neither pleaſant nor painful, but that it aſſumes either quality according to circumſtances. An object, it is true, that hath a threatening appearance, adds to our terror by its novelty: but from that experiment it doth not follow, that novelty is in itſelf diſagreeable; for it is perfectly conſiſtent that we be delighted with an object in one view, and terrified with it in another. A river in flood ſwelling over its banks, is a grand and delightful object; and yet it may produce no ſmall degree of fear when we attempt to croſs it: courage and magnanimity are agreeable; and yet, when we view theſe qualities in an enemy, they ſerve to increaſe our terror. In the ſame manner, novelty may produce two effects clearly diſtinguiſhable from each other: it may, directly and in itſelf, be agreeable; and it may have an oppoſite effect indirectly, which is, to inſpire terror; for when a new object appears in any degree dangerous, our ignorance of its powers and faculties affords ample ſcope for the imagination to dreſs it in the moſt frightful colours. The firſt ſight of a lion, for example, may at the ſame inſtant produce two oppoſite feelings, the pleaſant emotion of wonder, and the painful paſſion of terror: the novelty of the object produces the former directly, and contributes to the latter indirectly. Thus, when the ſubject is analyſed, we find that the power which novelty hath indirectly to inflame terror, is perfectly conſiſtent with its being in every circumſtance agreeable. The matter may be put in the cleareſt light, by adding the following circumſtance. If a lion be firſt ſeen from a place of ſafety, the ſpectacle is altogether agreeable without the leaſt mixture of terror. If, again, the firſt ſight puts us within reach of that dangerous animal, our terror may be ſo great as quite to exclude any ſenſe of novelty. But this fact proves not that wonder is painful: it proves only, that wonder may be excluded by a more powerful paſſion. Every man may be made certain from his own experience, that wonder raiſed by a new object that is inoffenſive, is always pleaſant; and with reſpect to offenſive objects, it appears, from the foregoing deduction, that the ſame muſt hold as long as the ſpectator can attend to the novelty.

Whether ſurpriſe be in itſelf pleaſant or painful, is a queſtion not leſs intricate than the former. It is certain that ſurpriſe inflames our joy when unexpectedly we meet with an old friend; and not leſs our terror when we ſtumble upon any thing noxious. To clear that queſtion, the firſt thing to be remarked is, that in ſome inſtances an unexpected object overpowers the mind, ſo as to produce a momentary ſtupefaction: where the object is dangerous, or appears ſo, the ſudden alarm it gives, without preparation, is apt totally to unhinge the mind, and for a moment to ſuſpend all its faculties, even thought itſelf; in which ſtate a man is quite helpleſs; and if he move at all, is as like to run upon the danger as from it. Surpriſe carried to ſuch a height, cannot be either pleaſant or painful; becauſe the mind, during ſuch momentary ſtupefaction, is in a good meaſure, if not totally, inſenſible.

If we then inquire for the character of this emotion, it muſt be where the unexpected object or event produceth leſs violent effects. And while the mind remains ſenſible of pleaſure and pain, is it not natural to ſuppoſe, that ſurpriſe, like wonder, ſhould have an invariable character? It would appear, however, that ſurpriſe has no invariable character, but aſſumes that

of the object which raiſes it. Wonder being an emotion invariably raiſed by novelty, and being diſtinguiſhable from all other emotions, ought naturally to poſſeſs one conſtant character. The unexpected appearance of an object ſeems not equally intitled to produce an emotion diſtinguiſhable from the emotion, pleaſant or painful, that is produced by the object in its ordinary appearance: the effect it ought naturally to have, is only to ſwell that emotion, by making it more pleaſant or more painful than it commonly is. And that conjecture is confirmed by experience, as well as by language which is built upon experience: when a man meets a friend unexpectedly, he is ſaid to be agreeably ſurpriſed; and when he meets an enemy unexpectedly, he is ſaid to be diſagreeably ſurpriſed. It appears, then, that the ſole effect of ſurpriſe is to ſwell the emotion raiſed by the object. And that effect can be clearly explained: a tide of connected perceptions glide gently into the mind, and produce no perturbation; but an object breaking in unexpectedly, ſounds an alarm, rouſes the mind out of its calm ſtate, and directs its whole attention to the object, which, if agreeable, becomes doubly ſo. Several circumſtances concur to produce that effect: on the one hand, the agitation of the mind and its keen attention prepare it in the moſt effectual manner for receiving a deep impreſſion: on the other hand, the object, by its ſudden and unforeſeen appearance, makes an impreſſion, not gradually as expected objects do, but as at one ſtroke with its whole force. The circumſtances are preciſely ſimilar where the object is in itſelf diſagreeable.

The pleaſure of novelty is eaſily diſtinguiſhed from that of variety: to produce the latter, a plurality of objects is neceſſary; the former ariſes from a circumſtance found in a ſingle object. Again, where objects, whether coexiſtent or in ſucceſſion, are ſufficiently diverſified, the pleaſure of variety is complete, though every ſingle object of the train be familiar; but the pleaſure of novelty, directly oppoſite to familiarity, requires no diverſification.

There are different degrees of novelty, and its effects are in proportion. The loweſt degree is found in objects ſurveyed a ſecond time after a long interval; and that in this caſe an object takes on ſome appearance of novelty, is certain from experience: a large building of many parts variouſly adorned, or an extenſive field embelliſhed with trees, lakes, temples, ſtatues, and other ornaments, will appear new oftener than once: the memory of an object ſo complex is ſoon loſt, of its parts at leaſt, or of their arrangement. But experience teaches, that, even without any decay of remembrance, abſence alone will give an air of novelty to a once familiar object; which is not ſurpriſing, becauſe familiarity wears off gradually by abſence: thus a perſon with whom we have been intimate, returning after a long interval, appears like a new acquaintance. And diſtance of place contributes to this appearance, not leſs than diſtance of time: a friend, for example, after a ſhort abſence in a remote country, has the ſame air of novelty as if he had returned after a longer interval from a place nearer home: the mind forms a connection between him and the remote country, and beſtows upon him the ſingularity of the objects he has ſeen. For the ſame reaſon, when two things equally new and ſingular are preſented, the ſpectator balances between them; but when told that one of them is the product of a diſtant quarter of the world, he no longer heſitates, but clings to it as the more ſingular: hence the preference given to foreign luxuries, and to foreign curioſities, which appear rare in proportion to their original diſtance.

The next degree of novelty, mounting upward, is found in objects of which we have ſome information at ſecond hand; for deſcription, though it contribute to familiarity, cannot altogether remove the appearance of novelty when the object itſelf is preſented: the firſt ſight of a lion occaſions ſome wonder, after a thorough acquaintance with the correcteſt pictures and ſtatues of that animal.

A new object that bears ſome diſtant reſemblance to a known ſpecies, is an inſtance of a third degree of novelty: a ſtrong reſemblance among individuals of the ſame ſpecies, prevents almoſt entirely the effect of novelty, unleſs diſtance of place or ſome other circumſtance concur; but where the reſemblance is faint, ſome degree of wonder is felt, and the emotion riſes in proportion to the faintneſs of the reſemblance.

The higheſt degree of wonder ariſeth from unknown objects that have no analogy to any ſpecies we are acquainted with. Shakeſpeare in a ſimile introduces that ſpecies of novelty:

> As glorious to the ſight
> As is a winged meſſenger from heaven
> Unto the white up-turned wond'ring eye
> Of mortals, that fall back to gaze on him
> When he beſtrides the lazy-pacing clouds
> And ſails upon the boſom of the air.
>
> *Romeo and Juliet.*

One example of that ſpecies of novelty deſerves peculiar attention; and that is, when an object altogether new is ſeen by one perſon only, and but once. Theſe circumſtances heighten remarkably the emotion: the ſingularity of the ſpectator concurs with the ſingularity of the object, to inflame wonder to its higheſt pitch.

In explaining the effects of novelty, the place a being occupies in the ſcale of exiſtence is a circumſtance that muſt not be omitted. Novelty in the individuals of a low claſs is perceived with indifference, or with a very ſlight emotion: thus a pebble, however ſingular in its appearance, ſcarce moves our wonder. The emotion riſes with the rank of the object; and, other circumſtances being equal, is ſtrongeſt in the higheſt order of exiſtence; a ſtrange inſect affects us more than a ſtrange vegetable; and a ſtrange quadruped more than a ſtrange inſect.

However natural novelty may be, it is a matter of experience, that thoſe who reliſh it the moſt are careful to conceal its influence. Love of novelty, it is true, prevails in children, in idlers, and in men of ſhallow underſtanding: and yet, after all, why ſhould one be aſhamed of indulging a natural propenſity? A diſtinction will afford a ſatisfactory anſwer. No man is aſhamed of curioſity when it is indulged to acquire knowledge. But to prefer any thing merely becauſe it is new, ſhows a mean taſte which one ought to be aſhamed of: vanity is commonly at the bottom, which leads thoſe who are deficient in taſte to prefer things odd, rare, or ſingular, in order to diſtinguiſh themſelves from others. And in fact, that appetite, as above-mentioned, reigns chiefly among perſons of a mean taſte, who are ignorant of refined and elegant pleaſures.

Of this taſte we have ſome memorable inſtances in men of the higheſt and the beſt education. Lucian tells the following ſtory of Ptolemy I. which is as diſgraceful to him, as honourable to his ſubjects. This prince had ranſacked the world for two curioſities: one was a camel from Bactria all over black; the other a man, half black half white. Theſe he preſented to the people in a public theatre, thinking they would give them as much ſatisfaction as they did him; but the black monſter, inſtead of delighting them, affrighted them; and the party-coloured man raiſed the contempt of ſome and the abhorrence of others. Ptolemy, finding the Egyptians preferred ſymmetry and beauty to the moſt aſtoniſhing productions of art or nature without them, wiſely removed his two enormous trifles out of ſight; the neglected camel died in a little time, and the man he gave for a ſong to the muſician Theſpis.

One final cauſe of wonder, hinted above, is, that this emotion is intended to ſtimulate our curioſity. Another, ſomewhat different, is, to prepare the mind for receiving deep impreſſions

of new objects. An acquaintance with the various things that may affect us, and with their properties, is essential to our well-being; nor will a slight or superficial acquaintance be sufficient; they ought to be so deeply engraved on the mind, as to be ready for use upon every occasion. Now, in order to a deep impression, it is wisely contrived, that things should be introduced to our acquaintance with a certain pomp and solemnity productive of a vivid emotion. When the impression is once fairly made, the emotion of novelty, being no longer necessary, vanisheth almost instantaneously; never to return, unless where the impression happens to be obliterated by length of time or other means; in which case the second introduction hath nearly the same solemnity with the first.

Designing wisdom is nowhere more legible than in this part of the human frame. If new objects did not affect us in a very peculiar manner, their impressions would be so slight as scarce to be of any use in life: on the other hand, did objects continue to affect us as deeply as at first, the mind would be totally engrossed with them, and have no room left either for action or reflection.

The final cause of surprise is still more evident than of novelty. Self-love makes us vigilantly attentive to self-preservation; but self-love, which operates by means of reason and reflection, and impels not the mind to any particular object or from it, is a principle too cool for a sudden emergency; an object breaking in unexpectedly, affords no time for deliberation; and in that case, the agitation of surprise comes in seasonably to rouse self-love into action: surprise gives the alarm; and if there be any appearance of danger, our whole force is instantly summoned to shun or to prevent it.

NOVELLARA, a handsome town of Italy, and capital of a small district of the same name, with a handsome castle, where their sovereign resides. E. lon. 10. 37. N. lat. 45. 50.

NOVEMVIRI, nine magistrates of Athens, whose government lasted but for one year. The first of whom was called *archon*, or prince; the second *basilius*, or king; the third *polemarchus*, or general of the army: the other six were called *thesmothetæ*, or law-givers. They took an oath to observe the laws; and in case of failure, obliged themselves to bestow upon the commonwealth a statue of gold as big as themselves. Those who discharged their office with honour, were received into the number of the senators of Areopagus.

NOVI, a town of Italy, in the territory of Genoa, on the confines of the Milanese. It was taken by the Piedmontese in 1746. E. lon. 8. 48. N. lat. 44. 45.

Novi *Bazar*, a considerable town of Turkey in Europe, and in Servia, near the river Oresco. E. lon. 20. 24. N. lat. 43. 25.

NOVICE, a person not yet skilled or experienced in an art or profession. In the ancient Roman militia, *novicii*, or *novitii*, were the young raw soldiers, distinguished by this appellation from the veterans. In the ancient orders of knigthood, there were novices, or clerks in arms, who went through a kind of apprenticeship ere they were admitted knights. See KNIGHT.

NOVICE is more particularly used in monasteries for a religious yet in his, or her, year of probation, and who has not made the vows. In some convents, the sub-prior has the direction of the novices. In nunneries, the novices wear a white veil; the rest a black one.

NOVICIATE, a year of probation appointed for the trial of religious, whether or no they have a vocation, and the necessary qualities for living up to the rule; the observation whereof they are to bind themselves to by vow. The noviciate lasts a year at least; in some houses more. It is esteemed the bed of the civil death of a novice, who expires to the world by profession.

NOVIGRAD, a small but strong town of Upper Hungary, capital of a county of the same name, with a good castle, seated on a mountain near the Danube. E. lon. 18. 10. N. lat. 40. 50.

NOVIGRAD, a small but strong town of Dalmatia, with a castle, and subject to the Turks; seated on a lake of the same name, near the gulph of Venice. E. lon. 16. 45. N. lat. 44. 30.

NOVIGRAD, a very strong place of Servia, subject to the Turks; seated near the Danube. E. lon. 26. 5. N lat. 45. 5.

NOVIODUNUM (Cæsar), a town of the Ædui, commodiously seated on the Liguris: the *Nivernum* of Antonine. Now *Nevers* in the Orleannois, on the Loire.—A second *Noviodunum* of the Aulerci Diablintes, in Gallia Celtica, (Antonine); called *Noviodunum* (Ptolemy), and *Noningentum Rotrudūn* by the moderns: *Nogente le Rotrou*, capital of the duchy of Perche.—A third of the Bituriges, (Cæsar): Now *Nueve sur Baranion*; a village 15 miles to the north of Bourges, towards Orleans.—A fourth, of Mœsia Inferior (Ptolemy), situated on the Ister: now *Nivorz*, in Bessarabia.—A fifth, of Pannonia Superior (Antonine; now *Gurkfeld* in Carinthia.—A sixth, *Noviodunum Suessionum*, the same with *Augusta Suessionum*.—A seventh, *Noviodunum* of the Veromandui in Gallia Belgica, (Cæsar): now *Noyon* in the Isle of France, on the borders of Picardy.

NOUN, see GRAMMAR.

NOVOGOROD WELICKI, or *Great Novogorod*, according to Mr. Coxe, is one of the most ancient cities in Russia. It was formerly called *Great Novogorod*, to distinguish it from other Russian towns of a similar appellation; and now presents to the attentive and intelligent traveller a striking instance of fallen grandeur. According to Nestor, the earliest of the Russian historians, it was built at the same time with Kiof, namely, in the middle of the 5th century, by a Sclavonian horde, who, according to Procopius, issued from the banks of the Volga. Its antiquity is clearly proved by a passage in the Gothic historian Jornandes, in which it is called *Civitas Nova*, or New Town. We have little insight into its history before the ninth century, when Ruric the first great duke of Russia reduced it, and made it the metropolis of his vast dominion. The year subsequent to his death, which happened in 879, the seat of government was removed under his son Igor, then an infant, to Kiof; and Novogorod continued, for above a century, under the jurisdiction of governors nominated by the great dukes, until in 970, when Svatoslaf, the son of Igor, created his third son Vladimir duke of Novogorod: the latter, succeeding his father in the throne of Russia, ceded the town to his son Yaroslaf, who in 1036 granted to the inhabitants very considerable privileges, that laid the foundation of that extraordinary degree of liberty which they afterwards gradually obtained. From this period Novogorod was for a long time governed by its own dukes: these sovereigns were at first subordinate to the great dukes, who resided at Kiof and Volodimir; but afterwards, as the town increased in population and wealth, they gradually usurped an absolute independency. Its independency, however, was not perpetual. It continued, indeed, in a flourishing state until the middle of the 15th century: but the great dukes of Russia, whose ancestors had reigned over this town, and who still retained the title of dukes of Novogorod, having transferred their residence from Kiof to Volodimir, and afterwards to Moscow, laid claim to its feudal sovereignty; a demand which the inhabitants sometimes put off by composition, sometimes by resistance, but were sometimes compelled to acknowledge. At length, however, the great duke became absolute sovereign of Novogorod, though the ostensible forms of government were still preserved. It even then, however, continued to be the largest and most commercial city of Russia; a proof of which we have as late as the year 1554, from the following description of Richard Chanceler, who passed through it in 1554 in his way to Moscow. "Next unto Mos-

cow, the city of Novogorod is reputed the chiefeſt of Ruſſia; for although it be in majeſty inferior to it, yet in greatneſs it goeth beyond it. It is the chiefeſt and greateſt mart town of all Muſcovy; and albeit the emperor's ſeat is not there, but at Moſcow, yet the commodiouſneſs of the river, falling into that gulph which is called Sinus Finnicus, whereby it is well frequented by merchants, makes it more famous than Moſcow itſelf." An idea of its population during this period, when compared with its preſent declined ſtate, is manifeſt from the fact, that in 1508 above 15,000 perſons died of an epidemical diſorder: more than double the number of its preſent inhabitants. In its moſt flouriſhing condition it contained at leaſt 400,000 ſouls. Its ruin was brought on by Ivan Vaſilievitch II. and completed by the foundation of Peterſburgh. The preſent town is ſurrounded by a rampart of earth, with a range of old towers at regular diſtances, forming a circumference of ſcarcely a mile and an half; and even this inconſiderable circle includes much open ſpace, and many houſes which are not inhabited. As Novogorod was built after the manner of the ancient towns of this country in Aſiatic ſtyle, this rampart, like that of the Semlainogorod at Moſcow, probably incloſed ſeveral interior circles. Without it was a vaſt extenſive ſuburb, which reached to the diſtance of ſix miles, and included within its circuit all the convents and churches, the ancient ducal palace and other ſtructures, that now make a ſplendid but ſolitary appearance, as they lie ſcattered in the adjacent plain.

Novogorod ſtretches on both ſides of the Volkof, a beautiful river of conſiderable depth and rapidity, and ſomewhat broader than the Thames at Windſor. This river ſeparates the town two diviſions, the trading part, and the quarter of St. Sophia, which are united by means of a bridge, partly wooden and partly brick.

Novogorod *Welicki*, a province of Moſcow, bounded on the north by Ingria; on the eaſt part of the duchy of Belozero, and that of Tuera, which alſo bounds it on the ſouth, with the province of Rzeva; and on the weſt by Pleſcow. It is full of lakes and foreſts; however, there are ſome places which produce corn, flax, hemp, honey, and wax.

Novogorod *Serpſkoi*, a ſtrong town of the Ruſſian empire, and capital of a province of Siberia of the ſame name, ſeated on the river Dubica, in E. lon. 33. 20. N. lat. 52. 30.

NOVOGORODECK, a town of Lithuania, and capital of a palatinate of the ſame name. It is a large place, and ſituated in a vaſt plain, in E. lon. 25. 30. N. lat. 53. 45.

NOURISHMENT. See Nutrition.

Nourishment *of Vegetables*. See Agriculture and Plants; alſo the article Composts.

NOWED, in heraldry, ſignifies "knotted," from the Latin *nodatus*; being applied to the tails of ſuch creatures as are very long, and ſometimes repreſented in coat-armour as tied up in a knot.

NOX (fab. hiſt.), one of the moſt ancient deities among the heathens, daughter of Chaos. From her union with her brother Erebus, ſhe gave birth to the Day and the Light. She was alſo the mother of the Parcæ, Heſperides, Dreams, of Diſcord, Death, Momus, Fraud, &c. She is called by ſome of the poets the mother of all things, of gods as well as of men; and ſhe was worſhipped with great ſolemnity by the ancients. She had a famous ſtatue in Diana's temple at Epheſus. It was uſual to offer her a black ſheep, as ſhe was the mother of the Furies. The cock was alſo offered to her, as that bird proclaims the approach of day during the darkneſs of the night. She is repreſented as mounted on a chariot, and covered with a veil beſpangled with ſtars. The conſtellations generally went before her as her conſtant meſſengers. Sometimes ſhe is ſeen holding two children under her arms; one of which is black repreſenting Death, and the other white repreſenting Sleep. Some of the moderns have deſcribed her as a woman veiled in mourning, and crowned with poppies, and carried on a chariot drawn by owls and bats.

NOYON, an ancient town of France, in the department of Oiſe and late province of the Iſle of France. It gave birth to the famous Calvin; and was lately an epiſcopal ſee. It is ſeated near the Oiſe, 22 miles N. W. of Soiſſons, and 60 N. by E. of Paris. E. lon. 3 6. N. lat. 49. 35.

NUAYHAS, the Ague-tree; a name given by the Indians to a ſort of Bamboo cane, the leaves of which falling into the water, are ſaid to impregnate it with ſuch virtue, that the bathing in it afterwards will cure the ague. They uſe alſo a decoction of the leaves to diſſolve coagulated blood, giving it internally, and at the ſame time rubbing the bruiſed part externally with it. It is ſaid that this plant bears its flowers only once in its life; that it lives 60 years before thoſe make their appearance; but that when they begin to ſhow themſelves, it withers away in about a month afterwards; that is, as ſoon as it has ripened the ſeed. There ſeems to be ſomething of fiction in the account of may other particulars relating to this tree in the *Hortus Malabaricus*; but it ſeems certain, that the length of the ſtalks, or trunk, muſt be very great: for, in the gallery of Leyden, there is preſerved a cane of it 28 feet long; and another not much ſhorter in the Aſhmolean muſeum at Oxford, and which is more than eight inches in diameter: yet both theſe appear to be only parts of the whole trunk, they being nearly as large at one end as at the other.

NUBA, a race of black Pagans, in the neighbourhood of Sennaar, of whom we know nothing but what we have learned from Mr. Bruce. That celebrated traveller paſſed a day or two among them, in his way from Abyſſinia; and he tells us, that they are all ſoldiers of the *Mek* or king of Sennaar, cantoned in villages, which to the diſtance of four or five miles ſurround the capital. They are not the aborogines of that part of Africa; but "are either purchaſed or taken by force from Fazulco, and the provinces to the ſouth upon the mountains Dyre and Tegle." Though the ſlaves of a cruel and treacherous maſter, Mr. Bruce repreſents them as a gentle, honeſt, and hoſpitable people; and he ſays expreſsly, that on a journey he had ſeldom paſſed a more comfortable night, than one in which he took refuge from a ſtorm in a village of thoſe Nuba. He had a good ſupper, and a clean neat hut to ſleep in, while ſome of the Nuba watched for him all night, and took care of his beaſts and his baggage. "Having ſettlements and proviſions given them by the government of Sennaar, as alſo arms put into their hands, they never wiſh to deſert, but live a very domeſtic and ſober life, and are a much gentler ſort of negro than their maſters." (See Sennaar). Though the eſtabliſhed religion of Sennaar is that of Mahomet, the government has never attempted to convert the Nuba. On the contrary, a certain number of Pagan prieſts is maintained for them in every village, who have ſoldiers in pay to aſſiſt them in the affairs of their religion. This is a very ſingular inſtance of toleration among Mahometans, and what we ſhould little have expected from ſuch barbarous and ſanguinary wretches as thoſe who have the ſupreme power in Sennaar, had not our obſerving traveller informed us, that theſe men themſelves know almoſt nothing of the religion which they profeſs, and are in their hearts rather Pagans than Mahometans.

The idolatry of the Nuba is deſcribed as a mixture of Sabiiſm and ſtatue-worſhip: but what is very uncommon, their worſhip is chiefly paid to the moon, while they pay no attention to the ſun either riſing or ſetting, advancing to the meridian or receding from it. It is an old obſervation, that the worſhip of every people is tinctured by their natural diſpoſitions; and this is verified in the Nuba. "That their worſhip is performed with pleaſure and ſatisfaction, is obvious (ſays our author), every

night that the moon ſhines. Coming out from the darkneſs of their huts, they ſay a few words upon ſeeing her brightneſs, and teſtify great joy, by motions of their feet and hands, at the firſt appearance of the new moon." This is juſt what we ſhould have expected from their gentleneſs and hoſpitality. They worſhip likewiſe a tree and a ſtone: but our author could never diſcover what tree or ſtone; only he learned that neither of them exiſts in Sennaar, but in the country where the Nuba are born. Such of them as are natives of the villages where he ſaw them, become, like their maſters, nominal Mahometans.—The reſt practiſe the idolatrous worſhip of their anceſtors, and are much under the influence of their prieſts, from fear rather than from affection. They are immoderately fond of ſwine's fleſh, and maintain great herds of ſmall hogs, marked with black and white ſpots. Few of the Nuba advance higher than to be ſoldiers and officers in their own corps; and the Mek maintains about 12,000 of them near Sennaar to keep the Arabs in ſubjection. In a climate ſo violent as that which they inhabit, there is very little need of fuel; and it is happy for them that ſuch is the caſe, for in the whole country there is not a ſingle tree, nor turf, nor any thing reſembling it. They do not, however, "eat their meat raw like the Abyſſinians; but with the ſtalk of the dora or millet, and the dung of camels, they make ovens under ground, in which they roaſt their hogs whole, in a very cleanly manner, keeping the ſkins on till they are perfectly baked. They have neither flint nor ſteel with which to light their fire at firſt; but do it in a manner ſtill more expeditious, by means of two ſticks, brought, we are led to think, from Sennaar, and there picked out of the river when flooded. They make a ſmall hole in one of theſe ſticks, and point the other: then laying the former in a horizontal poſition, they apply the point of the latter to the hole; and, turning the perpendicular ſtick between their hands, as we do a chocolate-mill, both ſticks take fire and flame in a moment; ſo perfectly dry and prepared to take fire is every thing there on the ſurface of the earth."

NUBECULA, LITTLE CLOUD, in ſurgery, a term ſometimes uſed for a diſeaſe in the eye, wherein objects appear as through a cloud or miſt. The nubecula ſeems to ariſe from certain groſs particles detained in the pores of the cornea, or ſwimming in the aqueous humour, and thus intercepting the rays of light. *Nubecula* or *Nubes*, is alſo uſed for what we otherwiſe call *albugo*. See ALBUGO.

NUBECULA is uſed likewiſe for a matter in form of a cloud, ſuſpended in the middle of the urine.

NUBIA, a kingdom of Africa, bounded on the north by Egypt, on the eaſt by the Red Sea and part of Abyſſinia, on the weſt by the kingdoms of Tagua, Gaoga, and the deſert of Gerham. The river Nile runs through it; on the banks of which, and thoſe of the other rivers, it is pretty fruitful, but in other places barren, ſandy, and in want of water. To the weſt of the Nile is the deſert of Bahouda, which is five days journey over, being the uſual road from Egypt to Abyſſinia. Money is of no uſe in this country in the way of trade, it being all carried on by way of exchange. Their bread and drink is made of a ſmall round ſeed, called *doca* or *ſeff*, which is very ill taſted. Their houſes have mud walls, being very low, and covered with reeds. The habit of the better ſort is a veſt without ſleeves; and they have no coverings for their heads, legs, and feet. The common people wrap a piece of linen cloth about them, and the children go quite naked. They are a ſtupid debauched ſort of people, having neither modeſty, civility, nor religion, though they profeſs to be Mahometans.—The productions of this country are gold, elephants' teeth, civet, and ſandal wood; and they ſend a great many ſlaves into Egypt. The principal towns known to the Europeans are Dangola and Sennaar.

It is famous for a race of horſes the moſt powerful and docile in the world. Theſe animals are generally about 16 hands high; and by Mr. Bruce, who has given the moſt ſcientific account of them, they are ſaid to be the breed which was introduced into Nubia at the Saracen conqueſt, and has been preſerved unmixed to this day. Our author repreſents this as a much nobler animal than the Arabian horſe. "What figure (ſays he) the Nubian horſe would make in point of fleetneſs is very doubtful, his make being ſo entirely different from that of the Arabian; but if beautiful ſymmetry of parts, great ſize and ſtrength, the moſt agile, nervous, and elaſtic movements, great endurance of fatigue, docility of temper, and ſeeming attachment to men beyond that of any other domeſtic animal, can promiſe any thing for a ſtallion, the Nubian is above all compariſon the moſt eligible in the world." He thinks, and juſtly thinks, that an attempt ſhould at leaſt be made to import them into this kingdom. "The expence (he ſays) would not be great, though there might be ſome trouble and application neceſſary; but if adroitly managed, there would not be much even of that. The Nubians are very jealous in keeping up the pedigree of their horſes, which are black or white, but a vaſt proportion of the former to the latter." Our author never ſaw the colour which we call grey, *i. e.* dappled; but he has ſeen ſome bright bays, and ſome inclining to ſorrel. All noble horſes in Nubia are ſaid to be deſcended of one of the five upon which Mahomet and his four immediate ſucceſſors, Abu Becr, Omar, Atmen, and Ali, fled from Mecca to Medina the night of the Hegira. No one will pay much regard to this legendary tale, or believe that the ſtrength and beauty of this breed of horſes is owing to any virtue communicated to the firſt of them by the prophet and his apoſtles. Mr. Bruce accounts for their excellence upon rational principles. "The beſt horſes of the Arabian breed are found (he ſays) in the tribe of Mowelli and Annecy, which is about 36° north latitude. Dongala, which is in 20° latitude, ſeemed to him to be the centre of excellence for this noble animal." Hence he infers, that the bounds in which the horſe is in greateſt perfection, are between the 20th and 36th degrees of latitude, and between 30 degrees of longitude eaſt from Greenwich and the banks of the Euphrates. If to the effects of climate we add the manner of feeding the Nubian horſes, we ſhall perhaps have the true cauſe of their ſuperiority over all others. "They are kept fat upon dora, and ſuffered to eat nothing green but the ſhort roots of graſs that are to be found by the ſide of the Nile, after the ſun has withered it. This is dug out where it is covered with earth, and appears blanched, and laid in ſmall heaps once a-day on the ground before them."

NUBIAN DESERT, a vaſt tract of barren rocks and burning ſands, extending from Syene in Upper Egypt to Geon the capital of Berber in Nubia. As Syene is in latitude 24° 0′ 45″ north, and Geon in latitude 17° 57′ 22″, the length of this deſert from north to ſouth is 6° 3′ 23″, or upwards of 420 Engliſh miles. Its breadth from eaſt to weſt has not, as far as we know, been preciſely aſcertained. Through this horrid region, where nothing is to be ſeen which has the breath of life, muſt all travellers paſs from Sennaar to Egypt; in danger every moment of periſhing by thirſt, being overwhelmed by moving columns of ſand, ſuffocated by a hot and poiſonous wind, or cut in pieces by troops of wandering Arabs. The laſt European of whom we have heard that made the journey and lived to give an account of it, is Mr. Bruce; and the perſon muſt have neither taſte nor ſenſibility who can read unmoved his manly narrative.

No ſingle traveller, nor even a caravan, can enter with ſafety into this deſert, but under the protection of a Hybear; whoſe title and office are thus explained by Mr. Bruce: "A Hybear is a guide, from the Arabic word *Hubbar*, which ſignifies to in-

form, inſtruct, or direct, becauſe they are uſed to do this office to the caravans travelling through the deſert in all directions. They are men of great conſideration, knowing perfectly the ſituation and properties of all kinds of water to be met with on the route, the diſtance of wells, whether occupied by enemies or not; and if ſo, the way to avoid them with the leaſt inconvenience. It is alſo neceſſary that they ſhould know the places occupied by the Simoom, and the ſeaſons of its blowing (ſee SIMOOM), as well as thoſe occupied by moving ſands."—Under the conduct of one of theſe men, Mr. Bruce, with infinite fortitude and addreſs, paſſed through the deſert in the year 1772, ſurmounting dangers at which one ſhudders in his cloſet. Of theſe, the following, which we ſhall give in the nervous language of the author, may ſerve as an inſtance.

"We were here (at a place called *W'cadi al Halboub*) at once ſurpriſed and terrified by a ſight ſurely one of the moſt magnificent in the world. In that vaſt expanſe of deſert, from W. and to NW. of us, we ſaw a number of prodigious pillars of ſand at different diſtances, at times moving with great celerity, at others ſtalking on with a majeſtic ſlowneſs. At intervals we thought they were coming in a very few minutes to overwhelm us; and ſmall quantities of ſand did actually more than once reach us. Again, they would retreat ſo as to be almoſt out of ſight; their tops reaching to the very clouds. There the tops often ſeparated from the bodies; and theſe, once diſjoined, diſperſed in the air, and did not appear more. Sometimes they were broken in the middle as if ſtruck with a large cannon-ſhot. About noon they began to advance with conſiderable ſwiftneſs upon us, the wind being very ſtrong at north. Eleven of them ranged along-ſide of us about the diſtance of three miles. The greateſt diameter of the largeſt appeared to me at that diſtance as if it would meaſure ten feet. They retired from us with a wind at SE. leaving an impreſſion upon my mind to which I can give no name; though ſurely one ingredient in it was fear, with a conſiderable degree of wonder and aſtoniſhment."

If it be true, as the author of *A Philoſophical Inquiry into the Origin of our Ideas of the Sublime and Beautiful* affirms, that "the paſſion raiſed by the ſublime is aſtoniſhment, and that aſtoniſhment is that ſtate of the ſoul in which all its motions are ſuſpended with ſome degree of horror," ſurely a more ſublime ſpectacle was never preſented to mortal eyes, than that which was on this occaſion preſented to Mr. Bruce. It muſt have been awfully majeſtic; but few, we believe, would chooſe the pleaſure of contemplating ſuch a ſcene of magnificence at the hazard of that dreadful death with which at every moment it threatened our traveller and his attendants. He, indeed, had firmneſs of mind to ſtand ſtill and admire it; but his companions ſhrieked out; while ſome of them exclaimed that it was the day of judgment, and others that it was hell or the world ſet on fire. But for a more particular account of this phenomenon, as well as of the nature of the deſert and the proper way of paſſing it, we muſt refer to the work from which this ſhort ſketch is taken.

NUCLEUS, in general, denotes the kernel of a nut, or even any ſeed incloſed within a huſk. The term *nucleus* is alſo uſed for the body of a comet, otherwiſe called its *head*.

NUCTA, a dew, which falling in Egypt about St. John's day, is by the ſuperſtitious natives of the country conſidered as miraculous, and the peculiar gift of that ſaint. Its effects are indeed ſo beneficial, that this belief is little ſurpriſing among a people ſo totally ignorant of natural cauſes as the modern Egyptians; for it is acknowledged, by the moſt enlightened travellers, to ſtop the plague, and announce a ſpeedy and plentiful inundation of the country. Theſe effects are thus rationally accounted for by Mr. Bruce.

"In February and March, the ſun is on its approach to the zenith of one extremity of Egypt, and of courſe has a very conſiderable influence upon the other. The Nile having now fallen low, the water in certain old ciſterns, which, though they ſtill exiſt, are ſuffered to accumulate all the filth of the river, becomes putrid, and the river itſelf has loſt all its finer and volatile parts by the continued action of a vertical ſun; ſo that, inſtead of being ſubject to evaporation, it grows daily more and more inclined to putrefaction. About St. John's day it receives a plentiful mixture of the freſh and fallen rain from Ethiopia, which dilutes and refreſhes the almoſt corrupted river, and the ſun near at hand exerts its influence upon the water, which is now become light enough to be exhaled, though it has ſtill with it a mixture of the corrupted fluid. It is in February, March, or April only, that the plague begins in Egypt." Our philoſophical traveller does not believe it an endemical diſeaſe; but aſſigns very ſufficient reaſons for thinking that it comes from Conſtantinople with merchandiſe or with paſſengers at the very time of the year when the air, by the long abſence of dews, has attained a degree of putridity proper to receive it. In this ſtate of the atmoſphere, the infection continues to rage till the period of St. John's day, when it is ſuddenly ſtopped by the dews occaſioned by a refreſhing mixture of rain water, which is poured into the Nile at the beginning of the inundation. The firſt and moſt remarkable ſign of the change effected in the air, is the ſudden ſtopping of the plague. Every perſon, though ſhut up from ſociety for months before, buys, ſells, and communicates with his neighbour without any ſort of apprehenſion; and as far as our author could learn upon fair inquiry, it was never known that one fell ſick of the plague after the anniverſary of St. John. He admits that ſome have died of it after that period; but of them the diſeaſe had got ſuch hold, under the moſt putrid influence of the air, that they could not recover. To corroborate this theory, which attributes ſo much to the benign influence of the falling dew, he obſerves, that immediately after St. John's day the clothes of the many thouſands who have died during the late continuance of the plague are publicly expoſed in the market-place; and that all theſe, though conſiſting of furs, cotton, ſilk, and woollen cloths, which are the ſtuffs moſt retentive of infection, imbibing the moiſt air of the evening and the morning, are handled, bought, put on and worn, without any apprehenſion of danger, and without a ſingle accident being known to have happened to any one poſſeſſed of this happy confidence.

NUDITIES, in painting and ſculpture, thoſe parts of an human figure which are not covered with any drapery; or thoſe parts where the carnation appears.

NULLITY, in law, ſignifies any thing that is null or void: thus there is a nullity of marriage, where perſons marry within the degrees, or where infants marry without conſent of their parents or guardians.

NUMA POMPILIUS, the fourth ſon of Pompilius Pompo, an illuſtrious Sabine. He had married Tatia, the daughter of king Tatius, and together with her remained in his native country, preferring the tranquillity of a private life to the ſplendor of a court. Upon the death of his wife, with whom he had lived thirteen years, he gave himſelf up entirely to the ſtudy of wiſdom; and, leaving the city of Cures, confined himſelf to the country, wandering from ſolitude to ſolitude, in ſearch only of thoſe woods and fountains which religion had made ſacred. His reclufe life gave riſe to the fable, which was very early received among the Sabines, that Numa lived in familiarity with the nymph Egeria. Upon the death of Romulus, both the ſenate and people ſtrongly ſolicited him to be their king. They diſpatched Julius Proculus and Valerius Voleſus, two ſenators of diſtinction, to acquaint Numa with their reſolution, and make him an offer of the kingdom. The Sabine philoſopher rejected at firſt their propoſal; but being at laſt prevailed upon by the arguments and intreaties of the deputies, joined with thoſe of

his father and of Martius his near relation, he yielded; and having offered ſacrifices to the gods, ſet out for Rome, where he was received by all ranks of people with loud ſhouts of joy. Spurius Vettius, the interrex for the day, having aſſembled the curiæ, he was elected in due form, and the election was unanimouſly confirmed by the ſenate.

The beginning of his reign was popular; and he diſmiſſed the 300 body-guards which his predeceſſor had kept around his perſon, and obſerved, that he did not diſtruſt a people who had compelled him to reign over them. He was not, like Romulus, fond of war and military expeditions, but he applied himſelf to tame the ferocity of his ſubjects, to inculcate in their minds a reverence for the Deity, and to quell their diſſenſions by dividing all the citizens into different claſſes. He eſtabliſhed different orders of prieſts, and taught the Romans not to worſhip the Deity by images; and from his example no graven or painted ſtatues appeared in the temples or ſanctuaries of Rome for the ſpace of 160 years. He encouraged the report that was ſpread of his paying regular viſits to the nymph Egeria, and made uſe of her name to give ſanction to the laws and inſtitutions which he had introduced. He eſtabliſhed the college of the Veſtals, and told the Romans that the ſafety of the empire depended upon the preſervation of the ſacred *ancyle* or ſhield, which, as was generally believed, had dropped from heaven. He dedicated a temple to Janus, which, during his whole reign, remained ſhut as a mark of peace and tranquillity at Rome. After a reign of 42 years, in which he had given every poſſible encouragement to the uſeful arts, and in which he had cultivated peace, Numa died in the year of Rome 82. Not only the Romans, but alſo the neighbouring nations, were eager to pay their laſt offices to a monarch whom they revered for his abilities, moderation, and humanity. He forbad his body to be burnt according to the cuſtom of the Romans; but he ordered it to be buried near mount Janiculum, with many of the books which he had written. Theſe books were accidentally found by one of the Romans, about 400 years after his death; and as they contained nothing new or intereſting, but merely the reaſons why he had made innovations in the form of worſhip and in the religion of the Romans, they were burnt by order of the ſenate. He left behind him one daughter called Pompilia, who married Numa Martius, and became the mother of Ancus Martius the fourth king of Rome. Some ſay that he had alſo four ſons; but this opinion is ill-founded. The principal laws of king Numa, mentioned by different authors, are, 1. That the gods ſhould be worſhipped with corn and a ſalted cake. 2. That whoever knowingly killed a free man, ſhould be held as a parricide. 3. That no harlot ſhould touch the altar of Juno; and if ſhe did, that ſhe ſhould ſacrifice an ewe-lamb to that goddeſs, with diſhevelled hair. 4. That whoever removed a land-mark ſhould be put to death. 5. That wine ſhould not be poured on a funeral pile, &c.

NUMANTIA, a very noble city, the ornament of the Hither Spain, (Florus); celebrated for the long war of 20 years which it maintained againſt the Romans. The baſeneſs and injuſtice of the Romans during this war was truly diſgraceful to them, and altogether unworthy of a great and powerful people. The inhabitants obtained ſome advantages over the Roman forces, till Scipio Africanus was empowered to finiſh the war and to ſee the deſtruction of Numantia. He began the ſiege with an army of 60,000 men, and was bravely oppoſed by the beſieged, who were no more than 4000 men able to bear arms. Both armies behaved with uncommon valour, and the courage of the Numantines was ſoon changed into deſpair and fury. Their proviſions began to fail, and they fed upon the fleſh of their horſes, and afterwards on that of their dead companions, and at laſt they were obliged to draw lots to kill and devour one another. The melancholy ſituation of their affairs obliged them to ſurrender to the Roman general. Scipio demanded them to deliver themſelves up on the morrow; they refuſed, and when a longer time had been granted to their petitions, they retired and ſet fire to their houſes and deſtroyed themſelves, ſo that not even one remained to adorn the triumph of the conqueror. Some hiſtorians, however, deny that; and aſſert, that a number of Numantines delivered themſelves into Scipio's hands, and that 50 of them were drawn in triumph at Rome, and the reſt ſold as ſlaves. The fall of Numantia was more glorious than that of Carthage or Corinth, though the place was much inferior to them. It was taken by the Romans, A. U. C. 629; and the conqueror obtained the ſurname of *Numanticus*.

NUMBER, an aſſemblage of ſeveral units, or things of the ſame kind. See ARITHMETIC, and METAPHYSICS. Number, ſays Malcolm, is either abſtract or applicate: abſtract, when referred to things in general, without attending to their particular properties; and applicate, when conſidered as the number of a particular ſort of things, as yards, trees, or the like. When particular things are mentioned, there is always ſomething more conſidered than barely their numbers; ſo that what is true of numbers in the abſtract, or when nothing but the number of things is conſidered, will not be true when the queſtion is limited to particular things: for inſtance, the number two is leſs than three; yet two yards is a greater quantity than three inches: and the reaſon is, becauſe regard muſt be had to their different natures as well as number, whenever things of a different ſpecies are conſidered; for though we can compare the number of ſuch things abſtractedly, yet we cannot compare them in any applicate ſenſe. And this difference is neceſſary to be conſidered, becauſe upon it the true ſenſe, and the poſſibility or impoſſibility, of ſome queſtions depend. Number is unlimited in reſpect of increaſe; becauſe we can never conceive a number ſo great but ſtill there is a greater. However, in reſpect of decreaſe, it is limited; unity being the firſt and leaſt number, below which therefore it cannot deſcend.

Kinds and diſtinctions of NUMBERS. Mathematicians, conſidering number under a great many relations, have eſtabliſhed the following diſtinctions.

Broken numbers are the ſame with fractions.

Cardinal numbers are thoſe which expreſs the quantity of units, as 1, 2, 3, 4, &c. whereas ordinal numbers are thoſe which expreſs order, as 1ſt, 2d, 3d, &c.

Compound number, one diviſible by ſome other number beſides unity; as 12, which is diviſible by 2, 3, 4, and 6. Numbers, as 12 and 15, which have ſome common meaſure beſides unity, are ſaid to be compound numbers among themſelves.

Cubic number is the product of a ſquare number by its root: ſuch is 27, as being the product of the ſquare number 9 by its root 3. All cubic numbers, whoſe root is leſs than 6, being divided by 6, the remainder is the root itſelf; thus $27 \div 6$ leaves the remainder 3, its root; 215, the cube of 6, being divided by 6, leaves no remainder; 343, the cube of 7, leaves a remainder 1, which added to 6, is the cube root; and 512, the cube of 8, divided by 6, leaves a remainder 2, which added to 6, is the cube root. Hence the remainders of the diviſions of the cubes above 216, divided by 6, being added to 6, always gives the root of the cube ſo divided till that remainder be 5, and conſequently 11, the cube-root of the number divided. But the cubic numbers above this being divided by 6, there remains nothing, the cube-root being 12. Thus the remainders of the higher cubes are to be added to 12 and not to 6, till you come to 18, when the remainder of the diviſion muſt be added to 18; and ſo on *ad infinitum*.

Determinate number is that referred to ſome given unit, as a ternary or three: whereas an indeterminate one is that referred to unity in general, and is called *quantity*.

Homogeneal numbers are those referred to the same unit; as those referred to different units are termed *heterogeneal*.

Whole numbers are otherwise called *integers*.

Rational number is one commensurable with unity; as a number incommensurable with unity is termed *irrational*, or a *surd*.

In the same manner, a rational whole number is that whereof unity is an aliquot part; a rational broken number, that equal to some aliquot part of unity; and a rational mixed number, that consisting of a whole number and a broken one.

Even number, that which may be divided into two equal parts without any fraction, as 6, 12, &c. The sum, difference, and product, of any number of even numbers is always an even number.

An evenly even number is that which may be measured, or divided, without any remainder, by another even number, as 4 by 2.

An unevenly even number, when a number may be equally divided by an uneven number, as 20 by 5.

Uneven number, that which exceeds an even number, at least by unity, or which cannot be divided into two equal parts, as 3, 5, &c.

The sum or difference of two uneven numbers makes an even number; but the factum of two uneven ones makes an uneven number.

If an even number be added to an uneven one, or if the one be subtracted from the other, in the former case the sum, in the latter the difference, is an uneven number; but the factum of an even and uneven number is even.

The sum of any even number of uneven numbers is an even number; and the sum of any uneven number of uneven numbers is an uneven number.

Primitive or prime numbers are those divisible only by unity, as 5, 7, &c. And prime numbers among themselves, are those which have no common measure besides unity, as 12 and 19.

Perfect number, that whose aliquot parts added together make the whole number, as 6, 28; the aliquot parts of 6 being 3, 2, and 1 = 6; and those of 28 being 14, 7, 4, 2, 1, = 28.

Imperfect numbers, those whose aliquot parts added together make either more or less than the whole. And these are distinguished into abundant and defective: an instance in the former case is 12, whose aliquot parts 6, 4, 3, 2, 1, make 16; and in the latter case 16, whose aliquot parts 8, 4, 2, and 1, make but 15.

Plain number, that arising from the multiplication of two numbers, as 6, which is the product of 3 by 2; and these numbers are called the *sides of the plane*.

Square number is the product of any number multiplied by itself; thus 4, which is the factum of 2 by 2, is a square number.

Even square number added to its root makes an even number.

Polygonal or polygonous numbers, the sums of arithmetical progressions beginning with unity: these, where the common difference is 1, are called *triangular numbers*; where 2, *square numbers*; where 3, *pentagonal numbers*; where 4, *hexagonal numbers*; where 5, *heptagonal numbers*, &c.

Pyramidal numbers, the sums of polygonous numbers, collected after the same manner as the polygons themselves, and not gathered out of arithmetical progressions, are called *first pyramidal numbers*; the sums of the first pyramidals are called *second pyramidals*, &c.

If they arise out of triangular numbers, they are called *triangular pyramidal numbers*; if out of pentagons, *first pentagonal pyramidals*.

From the manner of summing up polygonal numbers, it is easy to conceive how the prime pyramidal numbers are found, *viz.* $\frac{(a-2)n^3+3n^2-(a-5)n}{6}$ expresses all the prime pyramidals.

The number nine has a very curious property, its products always composing either 9 or some lesser product of it. We have already given an account of this, with the examples from Hume, under the article NINE; and we need not repeat them. Did our limits permit us, we could instance in a variety of other properties numbers both curious and surprising. Such speculations are indeed by some men considered as trifling and useless: but perhaps they judge too hastily; for few employments are more innocent, none more ingenious, nor, to those who have a taste for them, more amusing.

Numbers were by the Jews, as well as the ancient Greeks and Romans, expressed by letters of the alphabet: hence we may conceive how imperfect and limited their arithmetic was, because the letters could not be arranged in a series, or in different lines, conveniently enough for the purposes of ready calculation. The invention of the cypher, or arithmetical figures, which we now make use of, has given us a very great advantage over the ancients in this respect.

Mankind, we may reasonably suppose, first reckoned by their fingers, which they might indeed do in a variety of ways. From this digital arithmetic, very probably, is owing the number 10, which constitutes the whole set of arithmetical figures.

The letters chiefly employed by the Romans to express numbers were, M, for 1000; D, for 500; C, for 100; L, for 50; V, for 5; X, for 10; and I, for 1.—M probably signified 1000, because it is the initial of *mille*; D stands for 500, because it is *dimidium mille*; C signifies 100, as being the first letter of the word *centum*; L stands for 50, because it is the half of C, having formerly been wrote thus ↆ; V signifies 5, because V is the fifth vowel; X stands for 10, because it contains $\overset{\mathrm{V}}{\Lambda}$ or V in a double form; I stands for one, because it is the first letter of *initium*. These however are fanciful derivations. See NUMERAL *Letters*.

The Jewish cabbalists, the Grecian conjurors, and the Roman augurs, had a great veneration for particular numbers, and the result of particular combinations of them. Thus three, four, six, seven, nine, ten, are full of divine mysteries, and of great efficacy.

Golden NUMBER. See CHRONOLOGY.

NUMBERS, in poetry, oratory, &c. are certain measures, proportions, or cadences, which render a verse, period, or song, agreeable to the ear.

Poetical numbers consist in a certain harmony, in the order, quantities, &c. of the feet and syllables, which make the piece musical to the ear, and fit for singing, for which all the verses of the ancients were intended. See POETRY.—It is of these numbers Virgil speaks in his ninth Eclogue, when he makes Lycidas say, *Numeros memini, si verba tenerem*; meaning, that, although he had forgot the words of the verses, yet he remembered the feet and measure of which they were composed.

Rhetorical or prosaic numbers are a sort of simple unaffected harmony, less glaring than that of verse, but such as is perceived and affects the mind with pleasure. The numbers are that by which the style is said to be easy, free, round, flowing, &c. Numbers are things absolutely necessary in all writing, and even in all speech. Hence Aristotle, Tully, Quintilian, &c. lay down abundance of rules as to the best manner of intermixing dactyles, spondees, anapests, &c. in order to have the numbers perfect. The substance of what they have said, is reducible to what follows. 1. The style becomes numerous by

the alternate diſpoſition and temperature of long and ſhort ſyllables, ſo as that the multitude of ſhort ones neither render it to haſty, nor that of long ones too ſlow and languid: ſometimes, indeed, long and ſhort ſyllables are thrown together deſignedly without any ſuch mixture, to paint the ſlowneſs or celerity of any thing by that of the numbers; as in theſe verſes of Virgil: "*Illi inter ſeſe magna vi brachia tollunt*;" and "*Radit iter liquidum, celeres neque commovet alas.*" 2. The ſtyle becomes numerous, by the intermixing words of one, two, or more ſyllables; whereas the too frequent repetition of monoſyllables renders the ſtyle pitiful and grating. It contributes greatly to the numerouſneſs of a period, to have it cloſed by magnificent and well-ſounding words. 4. The numbers depend not only on the nobleneſs of the words in the cloſe, but of thoſe in the whole tenor of the period. 5. To have the period flow eaſily and equally, the harſh concurrence of letters and words is to be ſtudiouſly avoided, particularly the frequent meeting of rough conſonants; the beginning the firſt ſyllable of a word with the laſt of the preceding; the frequent repetition of the ſame letter or ſyllable; and the frequent uſe of the like ending words. Laſtly, the utmoſt care is to be taken leſt, in aiming at oratorial numbers, you ſhould fall into poetical ones; and, inſtead of proſe, write verſe.

Book of NUMBERS, the fourth book of the Pentateuch, taking its denomination from its numbering the families of Iſrael. A great part of this book is hiſtorical, relating to ſeveral remarkable paſſages in the Iſraelites' march through the wilderneſs. It contains a diſtinct relation of their ſeveral movements from one place to another, or their 42 ſtages through the wilderneſs, and many other things, whereby we are inſtructed and confirmed in ſome of the weightieſt truths that have immediate reference to God and his providence in the world. But the greateſt part of this book is ſpent in enumerating thoſe laws and ordinances, whether civil or ceremonial, which were given by God, but not mentioned before in the preceding books.

NUMERAL LETTERS, thoſe letters of the alphabet which are generally uſed for figures; as I, one; V, five; X, ten; L, fifty; C, a hundred; D, five hundred; M, a thouſand &c. It is not agreed how the Roman numerals originally received their value. It has been ſuppoſed, as we have obſerved in the end of the article NUMBER, that the Romans uſed M to denote 1000, becauſe it is the firſt letter of *mille*, which is Latin for 1000; and C to denote 100. becauſe it is the firſt letter of *centum*, which is Latin for 100. It has alſo been ſuppoſed, that D, being formed by dividing the old M in the middle, was therefore appointed to ſtand for 500, that is, half as much as the M ſtood for when it was whole; and that L being half a C, was, for the ſame reaſon, uſed to denominate 50. But what reaſon is there to ſuppoſe, that 1000 and 100 were the numbers which letters were firſt uſed to expreſs? And what reaſon can be aſſigned why D, the firſt letter in the Latin word *decem*, ten, ſhould not rather have been choſen to ſtand for that number, than for 500, becauſe it had a rude reſemblance to half an M? But if theſe queſtions could be ſatisfactorily anſwered, there are other numeral letters which have never yet been accounted for at all. Theſe conſiderations render it probable that the Romans did not, in their original intention, uſe letters to expreſs numbers at all; the moſt natural account of the matter ſeems to be this:

The Romans probably put down a ſingle ſtroke, I, for one, as is ſtill the practice of thoſe who ſcore on a ſlate or with chalk: this ſtroke, I, they doubled, trebled, and quadrupled, to expreſs 2, 3, and 4: thus, II. III. IIII. So far they could eaſily number the ſtrokes with a glance of the eye. But they preſently found, that if more were added, it would ſoon be neceſſary to tell the ſtrokes one by one: for this reaſon, when they came to 5, they expreſſed it by joining two ſtrokes together in an acute angle thus, V; which will appear the more probable, if it be conſidered that the progreſſion of the Roman numbers is from 5 to 5, *i. e.* from the fingers on one hand to the fingers on the other.—Ovid has touched upon the original of this in his *Faſtorum* lib. iii. and *Vitruv.* lib. c. 1. has made the ſame remark.

After they had made this acute angle V. for five, they added the ſingle ſtrokes to it to the number of 4, thus, VI. VII. VIII. VIIII. and then, as the ſtrokes could not be further multiplied without confuſion, they doubled their acute angle, by prolonging the two lines beyond their interſection thus, X. to denote two fives, or ten. After this they doubled, trebled, and quadrupled, this double acute angle thus, XX. XXX. XXXX. they then, for the ſame reaſon which induced them firſt to make a ſingle and then to double it, joined two ſingle ſtrokes in another form, and inſtead of an acute angle, made a right angle L, to denote fifty. When this 50 was doubled, they then doubled the right angle thus Ɛ, to denote 100: and having numbered this double right angle four times, thus ƐƐ, ƐƐƐ ƐƐƐƐ; when they came to fifth number, as before, they reverted it, and put a ſingle ſtroke before it thus, ⱯƐ, to denote 500; and when this 500 was doubled, then they alſo doubled their double right angle, ſetting two double right angles oppoſite to each other, with a ſingle ſtroke between them, thus ƐⱯƆ to denote 1000: when this note for 1000 had been four times repeated, then they put down ⱯƆⱯ for 5,000, ƐⱯƆⱯƐ for 10,000, and ⱯƆⱯƆⱯ for 50,000, ƐⱯƆⱯƐⱯƆⱯƐ for 100,000, ⱯƆⱯƆⱯƆⱯƆⱯ for 500,000, and ƐⱯƆⱯƐⱯƆⱯƐⱯƆⱯƐ for one million.

That the Romans did not originally write M for 1000, and C for 100, but ſquare characters, as they are written above, we are expreſsly informed by Paulus Manutius; but the corners of the angles being cut off by the tranſcribers for diſpatch, theſe figures were gradually brought into what are now numeral letters. When the corners of ⱯƆ were made round, it ſtood thus CIↃ, which is ſo near the Gothic *m*, that it ſoon deviated into that letter; ſo ⱯƆ having the corner made round, it ſtood thus IↃ, and then eaſily deviated into D. E alſo became a plain C by the ſame means; the ſingle rectangle which denoted 50, was, without alteration, a capital L; the double acute angle was an X; the ſingle acute angle a V conſonant; and a plain ſingle ſtroke, the letter I.; and thus theſe ſeven letters, M, D, C, L, X, V, I. became numerals.

NUMERAL *Characters* of the Arabs, are thoſe figures which are now uſed in all the operations of arithmetic in every nation of Europe. We have elſewhere ſhown that the Arabs derived the uſe of them moſt probably from India, (ſee ARITHMETIC). This opinion, however, though very generally received, has been controverted with ſome ingenuity. A writer in the Gentleman's Magazine, at a period when that miſcellany was in its higheſt reputation, thus endeavours to prove that the Arabs derived their notations from the Greeks. "I maintain (ſays he) that the Indians received their numeral characters from the Arabians, and the Arabians from the Greeks, as from them they derived all their learning, which in ſome things they improved, but for the moſt part have altered. The numerical figures which they received from the Greeks are proof of this alteration; which is ſo great, that without particular attention one can ſcarce diſcover in them veſtiges of their origin. But when we compare them carefully, and without prejudice, we find in them manifeſt traces of the Greek figures. The Greek numerical figures were no other than the letters of their alphabet, A ſmall ſtroke was the mark of unity. The B, being abridged of its two extremities, produced the 2. If you incline the γ a little on its left ſide, and cut off its foot, and make the left horn round towards the left ſide, you will produce a 3: the Δ makes the 4, by raiſing the right leg perpendicularly, and lengthening it a little below the baſe, and lengthening the baſe on the left ſide. The

ε forms the 5, by turning the loweſt ſemicircle towards the right, which before was turned towards the left ſide. The number 5 forms the 6 by having its head taken off, and its body rounded. Z, by taking away the baſe, makes the 7. If we make the top and bottom of H round, we ſhall form an 8. The θ is the 9 with very little alteration. The cypher o was only a point, to which one of the figures was added to make it ſtand for ten times as much. It was neceſſary to mark this point very ſtrongly; and in order to form it better, a circle was made, which was filled up in the middle; but that circumſtance was afterwards neglected. Theophanes, an hiſtorian of Conſtantinople, who lived in the ninth century, ſays expreſsly, that the Arabians retained the Greek figures, having no characters in their language to repreſent all the numbers. The Greeks obſerved in their numbers the decuple pregreſſion, which the Arabians have retained. Certain characters are found in the Greek alphabet, which are not uſed in reading, but only in calculation, and for this reaſon they are ſtyled *Epiſemes*, that is to ſay, *notes*, *marks*, in order to diſtinguiſh them from letters. The number 6 derives its form from one of theſe epiſemes, which was called επισημον βαυ. This epiſeme forms the letter F among the Æolians and among the Latins. This was called the *Digamma*, ſo ſtyled from its figure, which ſeems to have been one Γ placed upon another.

That this reaſoning is plauſible will hardly be queſtioned; but whether it be concluſive, our readers muſt determine. It has not convinced ourſelves; but through the whole of this work we wiſh to ſtate candidly the different opinions held on every ſubject of curioſity and uſefulneſs.

NUMERATION, or NOTATION, in arithmetic, the art of expreſſing in characters any number propoſed in words, or of expreſſing in words any number propoſed in characters. See ARITHMETIC.

NUMERICAL, NUMEROUS, or *Numeral*, ſomething belonging to numbers; as numerical algebra is that which makes uſe of numbers, inſtead of letters of the alphabet. Alſo numerical difference is that by which one man is diſtinguiſhed from another. Hence a thing is ſaid to be numerically the ſame, when it is ſo in the ſtricteſt ſenſe of the word.

NUMIDA, in ornithology, a genus belonging to the order of gallinæ. On each ſide of the head there is a kind of coloured fleſhy horn; and the beak is furniſhed with cere near the noſtrils. The ſpecies called *meleagris*, or *Guinea hen*, is a native of Africa. It is larger than a common hen. Its body is ſloped like that of a partridge, and its colour is all over a dark grey, very beautifully ſpotted with ſmall white ſpecks; there is a black ring round the neck; its head is reddiſh, and it is blue under the eyes. They naturally herd together in large numbers, and breed up their young in common; the females taking care of the broods of others, as well as of their own. Barbut informs us, that in Guinea they go in flocks of 200 or 300, perch on trees, and feed on worms and graſhoppers; that they are run down and taken by dogs: and that their fleſh is tender and ſweet, generally white, though ſometimes black. They breed very well with us. Mr. Latham obſerves, "that the native place of this bird is, without doubt, Africa, and that it is the meleagris of old authors. It is ſuppoſed originally to have come from Nubia, and was eſteemed in the Roman banquets. It has been met with wild in flocks of two or three hundred by various travellers. Dampier found them in numbers in the iſland of Mayo; and Forſter ſpeaks of them as numerous at St. Jago; but they have been tranſported into the Weſt Indies and America, and are now in a wild ſtate in thoſe places, as well as domeſticated."

The White-breaſted one is a mere variety, of which there are many: it is moſtly found in Jamaica. The mitred, or numida mitrata, is a different and not a common ſpecies: it inhabits Madagaſcar and Guinea. Pallas ſeems to think that it may be the bird mentioned by Columella, as differing from the common one; and will account for Pliny's having thought the numida and meleagris to be different birds. The third ſpecies which Mr. Latham mentions is the creſted, or numida criſtata. This ſpecies likewiſe inhabits Africa. Perhaps it may have ſome relation to the creſted ſort which Marcgrave mentions to have ſeen, and which came from Sierra Leon. This had a kind of membranous collar about the neck, was of a bluiſh aſh-colour, and had a large roundiſh black creſt. Buffon, who deſcribes it at great length, calls it *la peintade*. Linnæus and Gmel. call it *Numida meleagris*, &c. Ray and Will. call it *gallus* and *gallina Guineenſis*, &c. Mr. Pennant contends, and ſeems to prove, that the pintados had been early introduced into Britain, at leaſt prior to the year 1277. But they ſeem to have been much neglected on account of the difficulty of rearing them; for they occur not in our ancient bills of fare. They have a double caruncle at the chaps, and no fold at the throat.

NUMIDIA, an ancient kingdom of Africa, bounded on the north by the Mediterranean Sea; on the ſouth by Gætulia, or part of Libya Interior; on the weſt by the Mulucha, a river which ſeparated it from Mauritania; and on the eaſt by the Tuſca, another river which bounded it in common with Africa Propria. Dr. Shaw has rendered it probable, that the river which formerly went under the denominations of *Malva*, *Malvana*, *Mulucha*, and *Molochath*, is the ſame with that now called MULLOOIAH by the Algerines; in which caſe, the kingdom of Numidia muſt have extended upwards of 500 miles in length: its breadth, however, cannot be ſo well aſcertained; but ſuppoſing it to have been the ſame with that of the preſent kingdom of Algiers, in the narroweſt part it muſt have been at leaſt 40 miles broad, and in the wideſt upwards of 100.

This country included two diſtricts; one inhabited by the *Maſſyli*, and the other by the *Maſæſyli*; the latter being alſo called in after times *Mautitania Cæſarienſis*, and the former *Numidia Propria*. The country of the Maſſyli, or, as ſome call it, *Terra Metagonitis*, was ſeparated from the proper territory of Carthage by its eaſtern boundary the river Tuſca, and from the kingdom of the Maſæſyli, or Mauritania Cæſarienſis, by the river Ampſaga. It ſeems to correſpond with that part of the province of Conſtantina lying between the Zaine and the Wed al Kibeer, which is above 130 miles long, and more than 100 broad. The ſea-coaſt of this province is for the moſt part mountainous and rocky, anſwering to the appellation given to it by Abulfeda, viz. *El Edzwaa, the high* or *lofty*. It is far from being equal in extent to the ancient country of the Maſæſyli, which, Strabo informs us, was yet inferior to the country of the Maſſyli. Its capital was Cirta, a place of very conſiderable note among the ancients.

The moſt celebrated antiquarians agree, that the tract extending from the iſthmus of Suez to the lake Tritonis was chiefly peopled by the deſcendants of Mizraim, and that the poſterity of his brother Put, or Phut, ſpread themſelves all over the country between that lake and the Atlantic ocean. To this notion Herodotus gives great countenance: for he tells us, that the Libyan Nomades, whoſe territories to the weſt were bounded by the Triton, agreed in their cuſtoms and manners with the Egyptians; but that the African, from that river to the Atlantic ocean, differed in almoſt all points from them. Ptolemy mentions a city called *Putea* near Adrametum; and Pliny, a river of Mauritania Tingitana, known by the name of *Fut*, or *Phut*; and the diſtrict adjacent to this river was called *Regio Phutenſis*, which plainly alludes to the name of *Phut*. That word ſignifies *ſcattered*, or *diſperſed*, which very well agrees with what Mela and Strabo relate of the ancient Numidians; ſo that we may, without any ſcruple, admit the aborigines of this country to have been the deſcendants of Phut.

The hiſtory of Numidia, during many of the early ages, is buried in oblivion. It is probable, however, that as the Phœnicians were maſters of a great part of the country, theſe tranſactions had been recorded, and generally known to the Carthaginians. King Jarbas probably reigned here as well as in Africa Propria, if not in Mauritania, and other parts of Libya, when Dido began to build Byrſa. It appears from Juſtin, that about the age of Horodotus the people of this country were called both *Africans* or *Libyans* and *Numidians*. Juſtin likewiſe intimates, that about this time the Carthaginians vanquiſhed both the Moors or Mauritanians and Numidians; in conſequence of which they were excuſed from paying the tribute which had hitherto been demanded of them.

After the concluſion of the firſt Punic war, the African troops carried on a bloody conteſt againſt their maſters the Carthaginians; and the moſt active in this rebellion, according to Diodorus Siculus, were a part of the Numidian nation named *Micatanians*. This ſo incenſed the Carthaginians, that after Hamilcar had either killed or taken priſoners all the mercenaries, he ſent a large detachment to ravage the country of thoſe Numidians. The commandant of that detachment executed his orders with the utmoſt cruelty, plundering the diſtrict in a terrible manner, and crucifying all the priſoners without diſtinction that fell into his hands. This filled the reſt with ſuch indignation and reſentment, that both they and their poſterity ever afterwards bore an implacable hatred to the Carthaginians.

In the time of the ſecond Punic war, Syphax king of the Maſæſyli entered into an alliance with the Romans, and gave the Carthaginians a conſiderable defeat. This induced Gala, king of the Maſſyli, to conclude a treaty with the Carthaginians, in conſequence of which his ſon Maſiniſſa marched at the head of a powerful army to give Syphax battle. The conteſt ended in favour of Maſiniſſa; 30,000 of the Maſſæſyli were put to the ſword, and Syphax driven into Mauritania; and the like bad ſucceſs attended Syphax in another engagement, where his troops were entirely defeated and diſperſed.

The fortune of war however occaſioned many viciſſitudes in this conteſt, and gave the opponents of Maſiniſſa a temporary ſuperiority; but hiſtorians at length relate that, after a junction was formed with the Romans, by the aſſiſtance of Lælius, Maſiniſſa at laſt reduced Syphax's kingdom. According to Zonaras, Maſiniſſa and Scipio, before the memorable battle of Zama, by a ſtratagem deprived Hannibal of ſome advantageous poſts; which, with a ſolar eclipſe happening during the heat of the action, and not a little intimidating the Carthaginian troops, greatly contributed to the victory the Romans obtained. At the concluſion therefore of the ſecond Punic war, he was amply rewarded by the Romans for the important ſervices he had done them. As for Syphax, after the loſs of his dominions, he was kept in confinement for ſome time at Alba; from whence being removed in order to grace Scipio's triumph, he died at Tibur in his way to Rome. Zonaras adds, that his corpſe was decently interred: that all the Numidian priſoners were releaſed; and that Vermina, by the aſſiſtance of the Romans, took peaceable poſſeſſion of his father's throne. However, part of the Maſæſylian kingdom had been before annexed to Maſiniſſa's dominions, in order to reward that prince for his ſingular fidelity and cloſe attachment to the Romans.

This ſeems to be countenanced by the epitomizer of Livy, who gives us ſufficiently to underſtand, that Syphax's family, for a conſiderable time after the concluſion of the ſecond Punic war, reigned in one part of Numidia. For he intimates, that Archobarzanes, Syphax's grandſon, and probably Vermina's ſon, hovered with a powerful army of Numidians upon the Carthaginian frontiers a few years before the beginning of the third Punic war. This he ſeems to have done, either in order to cover them, or to enable the Carthaginians to make an irruption into Maſiniſſa's territories. Cato, however, pretended that theſe forces, in conjunction with thoſe of Carthage, had a deſign to invade the Roman dominions, which he urged as a reaſon to induce the conſcript fathers to deſtroy the African republic.

Nothing further would be requiſite to complete the hiſtory of this famous prince, than to exhibit to our readers view ſome points of his conduct towards the decline, and at the cloſe, of life; the wiſe diſpoſitions made after his death by Æmilianus, in order to the regulation of his domeſtic affairs; and ſome particulars relating to his character, genius, and habit of body, drawn from the moſt celebrated Greek and Roman authors: but our limits do not admit of it.

Cæſar, after the reduction of Africa Propria, made himſelf maſter of Numidia, which he reduced to a Roman province, appointing Criſpus Salluſtius to govern it in quality of proconſul.

NUMISMATOGRAPHIA, a term uſed for the deſcription and knowledge of ancient coins and medals, whether of gold, ſilver, or braſs. See Coins and Medals.

NUMITOR, the ſon of Procas king of Alba, and the brother of Amulius. Procas before his death made him and Amulius joint heirs to the crown, on condition of their reigning annually by turns: but Amulius, on getting poſſeſſion of the throne, excluded Numitor, whoſe ſon Lauſus he ordered to be put to death, and obliged Rhea Sylvia, Numitor's only daughter, to become a veſtal. This princeſs becoming pregnant, declared that ſhe was with child by the god Mars; and afterwards brought forth Rhemus and Romulus, who at length killed Amulius, and reſtored Numitor to the throne, 754 B. C. See Rhemus and Romulus.

NUMMUS, a piece of money otherwiſe called *ſeſtertius*.

NUN, the ſon of Eliſhamah, and father of Joſhua, of the tribe of Ephraim. The Greeks gave him the name of *Naue* inſtead of Nun. This man is known in ſacred hiſtory only by being the father of Joſhua.

Nun, a woman, in ſeveral Chriſtian countries, who devotes herſelf, in a cloiſter or nunnery, to a religious life. See the article Monk. There were women, in the ancient Chriſtian church, who made public profeſſion of virginity, before the monaſtic life was known in the world, as appears from the writings of Cyprian and Tertullian. Theſe, for diſtinction's ſake, are ſometimes called *eccleſiaſtical virgins*, and were commonly inrolled in the canon or matricula of the church. They differed from the monaſtic virgin chiefly in this, that they lived privately in their fathers houſes, whereas the others lived in communities: but their profeſſion of virginity was not ſo ſtrict as to make it criminal in them to marry afterwards, if they thought fit. As to the conſecration of virgins, it had ſome things peculiar in it: it was uſually performed publicly in the church by the biſhop. The virgin made a public profeſſion of her reſolution, and then the biſhop put upon her the accuſtomed habit of ſacred virgins. One part of this habit was a veil, called the *ſacrum velamen*; another was a kind of mitre or coronet worn upon the head. At preſent, when a woman is to be made a nun, the habit, veil, and ring of the candidate are carried to the altar; and ſhe herſelf, accompanied by her neareſt relations, is conducted to the biſhop, who, after maſs and an anthem (the ſubject of which is, "that ſhe ought to have her lamp lighted, becauſe the bridegroom is coming to meet her)," pronounces the benediction: then ſhe riſes up, and the biſhop conſecrates the new habit, ſprinkling it with holy water. When the candidate has put on her religious habit, ſhe preſents herſelf before the biſhop, and ſings, on her knees, *Ancilla Chriſti ſum*, &c.; then ſhe receives the veil, and afterwards the ring, by which ſhe is married to Chriſt; and laſtly, the crown of virginity. When ſhe is crowned, an anathema is denounced againſt all who ſhall attempt to make her break her vows. In ſome few inſtances, perhaps, it may have happened that

nunneries, monaſteries, &c. may have been uſeful as well to morality and religion as to literature: in the groſs, however, they have been highly prejudicial; and however well they might be ſuppoſed to do when viewed in theory, in fact they are unnatural and impious. It was ſurely far from the intention of Providence to ſeclude youth and beauty in a cloiſtered ruin, or to deny them the innocent enjoyment of their years and ſex.

NUNCIO, or NUNTIO, an ambaſſador from the pope to ſome Catholic prince or ſtate, or a perſon who attends on the pope's behalf at a congreſs, or an aſſembly of ſeveral ambaſſadors.

NUNCUPATIVE, in the ſchools, ſomething that is only nominal, or has no exiſtence but in name.

NUNCUPATIVE *Will* or *Teſtament*, a will made verbally, and not put in writing. See the articles WILL and TESTAMENT.

NUNDINA, a goddeſs among the ancient heathens, ſuppoſed to have the care of the purification of infants. And becauſe male infants were purified nine days after their birth, her name is derived from *novus*, or the ninth, though female infants were purified the eighth day; which purification was called *luſtration* by the Romans.

NUNDINAL, *Nundinalis*, a name which the Romans gave to the eight firſt letters of the alphabet uſed in their kalendar. This ſeries of letters, A, B, C, D, E, F, G, H, is placed and repeated ſucceſſively from the firſt to the laſt day of the year: one of theſe always expreſſed the market-days, or the aſſemblies called *nundinæ*, *quaſi novendinæ*, becauſe they returned every nine days. The country people, after working eight days ſucceſſively, came to town on the ninth, to ſell their ſeveral commodities, and to inform themſelves of what related to religion and government. Thus the nundinal day being under A on the firſt, ninth, ſeventeenth, and twenty-fifth days of January, &c. the letter D will be nundinal letter of the year following. Theſe nundinals bear a very great reſemblance to the dominical letters, which return every eight days, as the nundinals did every nine.

NUNDOCOMAR, a Rajah in Bengal, and head of the Bramins, who, in 1775, was condemned to an ignominious death by Engliſh laws newly introduced, in an Engliſh court of juſtice newly eſtabliſhed, for a forgery charged to have been committed by him many years before. That he was guilty of the deed cannot be queſtioned; but there was ſurely ſomething hard in condemning a man by an *ex poſt facto* law. He bore his fate with the utmoſt fortitude, in the full confidence that his ſoul would ſoon be re-united to the univerſal ſpirit whence it had ſprung.

Monte NUOVO, in the environs of Naples, blocks up the valley of Averno. "This mountain (Mr. Swinburne tells us) aroſe in the year 1538; for after repeated quakings the earth burſt aſunder, and made way for a deluge of hot aſhes and flames, which riſing extremely high, and darkening the atmoſphere, fell down again and formed a circular mound four miles in circumference, and 1000 feet high, with a large cup in the middle. The wind riſing afterwards, wafted the lighter particles over the country, blaſted vegetation, and killed the animals who grazed; the conſequence was, that the place was deſerted, till Don Pedro de Toledo, viceroy of Naples, encouraged the inhabitants by example and otherwiſe to return.

"Part of Monte Nuovo is cultivated, but the larger portion of its declivity is wildly overgrown with prickly-broom, and rank weeds that emit a very fetid ſulphureous ſmell. The water is ſhallow, its inſide clad with ſhrubs, and the little area at the bottom planted with fig and mulberry trees; a moſt ſtriking ſpecimen of the amazing viciſſitudes that take place in this extraordinary country. I ſaw no traces of lava or melted matter, and few ſtones within.

"Near the foot of this mountain the ſubterraneous fires act with ſuch immediate power, that even the ſand at the bottom of the ſea is heated to an intolerable degree."

NUPTIAL RITES, the ceremonies attending the ſolemnization of marriage, which are different in different ages and countries. We cannot omit here a cuſtom which was practiſed by the Romans on theſe occaſions; which was this: Immediately after the chief ceremonies were over, the new-married man threw *nuts* about the room for the boys to ſcramble for. Various reaſons have been aſſigned for it; but that which moſt generally prevails, and ſeems to be the moſt juſt, is, that by this act the bridegroom ſignified his reſolution to abandon trifles, and commence a ſerious courſe of life; whence *nucibus relictis* in this ſenſe became a proverb. They might alſo be an emblem of fertility.

The ancient Greeks had a perſon to conduct the bride from her own to the bridegroom's houſe; and hence he was called by the Greeks *Nymphagogos*, which term was afterwards uſed both by the Romans and the Jews.

NUREMBURG, or NURENBERG, a free imperial city of Germany, capital of the circle of Franconia, with a univerſity. It is ſix miles in circumference, ſurrounded by high walls, flanked with 365 towers; and the river Pegnitz, over which are 12 ſtone bridges, runs through the middle, and divides it into two parts. The government is ariſtocratical; and the townſmen are divided into eight quarters, each of which has a captain. The burgeſſes are very induſtrious, and the beſt workmen in arts: their maps and prints are in high eſteem, as well as their muſical and mathematical inſtruments; nor are they leſs curious in clockwork, and in the ſeveral manufactures of iron, ſteel, ivory, wood, and alabaſter. The beſt toys are made here, which are commonly known in England by the name of Dutch toys. Here is a famous academy for painting, an anatomical theatre, and a public library. The ancient and ſuperb caſtle or palace, which the inhabitants bought of the burgraves, is ſtill ſtanding at the extremity of the city; and the arſenal is one of the beſt in Germany. The houſes are built of freeſtone, and are four or five ſtories high. Though their religion is the Lutheran, the church of the Holy Ghoſt has a variety of relics, as alſo the imperial crown and ſceptre, the globe of the empire, the ſword of St. Maurice, the imperial mantle, the white robe of the emperors, called the dalmatic, the golden ſurplice, the mantle of the choir, and the gloves, ſlippers, and hereditary crown of the emperor Rodolph II. All theſe rarities are placed in a cheſt, which is ſuſpended by a rope in the dome, and they are never taken down but at the coronation of an emperor, or when any perſon of high diſtinction wants to ſee them. No Jews are ſuffered to lodge a ſingle night here; nor can they enter the city at all without paying a certain tax. Nuremburg, in proceſs of time, has obtained a conſiderable territory, 100 miles in circumference, in which are two large foreſts. It is 55 miles N. W. of Ratiſbon, 62 N. of Augſburg and 250 W. by N. of Vienna. E. lon. 11. 12. N. lat. 49. 27.

NURSERY, in gardening, is a piece of land ſet apart for raiſing and propagating all ſorts of trees and plants to ſupply the garden and other plantations.

NURSING OF CHILDREN. See LACTATIO. The following obſervations are ſaid to be the reſult of long experience. A child, when it comes into the world, ſhould be laid (the firſt month) upon a thin matraſs, rather longer than itſelf, which the nurſe ſhould keep upon her lap, that the child may always lie ſtraight, and only ſit up as the nurſe ſlants the matraſs. To ſet a child quite upright before the end of the firſt month, is hurtful. Afterwards the nurſe will begin to ſet it up and dance it by degrees. The child muſt be kept as dry as poſſible.

The cloathing ſhould be very light, and not much longer

than the child, that the legs may be got at with eaſe, in order to have them often rubbed in the day with a warm hand or flannel, and in particular the inſide of them. Rubbing a child all over takes off ſcruf, and makes the blood circulate.

Rubbing the ankle-bones and inſide of the knees will ſtrengthen thoſe parts, and make the child ſtretch its knees and keep them flat.

A nurſe ought to keep a child as little in her arms as poſſible, leſt the legs ſhould be cramped, and the toes turned inwards. Let her always keep the child's legs looſe. The oftener the poſture is changed, the better.

Toſſing a child about, and exerciſing it in the open air in fine weather, is of the greateſt ſervice. In cities, children are not to be kept in hot rooms, but to have as much air as poſſible. Want of exerciſe is the cauſe of rickets, large heads, weak joints, a contracted breaſt, and diſeaſed lungs, beſides a numerous train of other ills.

The child's fleſh is to be kept perfectly clean, by conſtantly waſhing its limbs, and likewiſe its neck and ears; beginning with warm water, till by degrees it will not only bear, but like to be waſhed with cold.

Riſing early in the morning is good for all children, provided they awake of themſelves, which they generally do; but they are never to be waked out of their ſleep, and as ſoon as poſſible to be brought to regular ſleeps in the day.

Children, till they are two or three years old, muſt never be ſuffered to walk long enough at a time to be weary.

Girls might be trained to the proper management of children, if a premium were given in free-ſchools, work-houſes, &c. to thoſe that brought up the fineſt child to one year old.

If the mother cannot ſuckle the child, get a wholeſome cheerful woman, with young milk, who has been uſed to tend young children. After the firſt ſix months, ſmall broths, and innocent foods of any kind, may do as well as living wholly upon milk.

With regard to the child's dreſs in the day, let it be a ſhirt; a petticoat of fine flannel, two or three inches longer than the child's feet, with a dimity top (commonly called a *bodice-coat*), to tie behind. Over this put a robe, or frock, or whatever you like beſt; provided it is faſtened behind, and not much longer than the child's feet, that their motions may be ſtrictly obſerved.

Caps may be worn till the hair is ſufficiently grown; but by no means till the child has got moſt of its teeth, as is the practice.

The child's dreſs for the night may be a ſhirt, a blanket to tie on, and a thin gown to tie over the blanket.

NUSANCE, or NUISANCE, in law, a thing done to the annoyance of another. Nuiſances are either public or private.—A public nuiſance is an offence againſt the public in general, either by doing what tends to the annoyance of all the king's ſubjects, or by neglecting to do what the common good requires: in which caſe, all annoyances and injuries to ſtreets, highways, bridges, and large rivers, as alſo diſorderly alehouſes, bawdy-houſes, gaming-houſes, ſtages for rope-dancers, &c. are held to be common nuiſances.—A private nuiſance is, when only one perſon or family is annoyed by the doing of any thing; as where a perſon ſtops up the light of another's houſe, or builds in ſuch a manner that the rain falls from his houſe upon his neighbour's.

NUT, among the botaniſts, denotes a PERICARPIUM of an extraordinary hardneſs, incloſing a kernel or ſeed.

NUTATION, in aſtronomy, a kind of tremulous motion of the axis of the earth, whereby, in each annual revolution, it is twice inclined to the ecliptic, and as often returns to its former poſition.

NUTCRACKER. See CORVUS, and Pl. 1. "This bird (ſays Buffon) is diſtinguiſhed from the jays and magpies by the ſhape of its bill, which is ſtraighter, blunter, and compoſed of two unequal pieces. Its inſtinct is alſo different; for it prefers the reſidence of high mountains, and its diſpoſition is not ſo much tinctured with cunning and ſuſpicion." They live upon hazel-nuts, acorns, wild berries, the kernels of pine-tops, and even on inſects. "Beſides the brilliancy of the plumage, the nutcracker is remarkable for the triangular white ſpots which are ſpread over its whole body, except the head. Theſe ſpots are ſmaller on the upper part, and broader on the breaſt; their effect is the greater, as they are contraſted with the brown ground.

"Theſe birds are moſt attached, as I have obſerved above, to mountainous ſituations. They are common in Auvergne, Savoy, Lorraine, Franche-Compté, Switzerland, the Begamaſque, in Auſtria, in the mountains which are covered with foreſts of pines. They alſo occur in Sweden, though only in the ſouthern parts of that country. The people in Germany call them Turkey birds, Italian birds, African birds; which language means no more than that they are foreign.

"Though the nutcrackers are not birds of paſſage, they fly ſometimes from the mountains to the plains. Friſch ſays, that flocks of them are often obſerved to accompany other birds into different parts of Germany, eſpecially where there are pine foreſts. But in 1754, great flights of them entered France, particularly Burgundy, where there are few pines; they were ſo fatigued on their arrival, that they ſuffered themſelves to be caught by the hand.

"We cannot find in writers of natural hiſtory any details with regard to their laying, their incubation, the training of their young, the duration of their life, &c. for they haunt inacceſſible ſpots, where they enjoy undiſturbed ſafety and felicity."

NUTHATCH, in ornithology. See SITTA, its generic name. In this place we ſhall only extract from Buffon an account of two ſpecies of foreign birds related to the nuthatch.

1. *The great hook-billed nuthatch.*—"It is the largeſt of the known nuthatches: its bill, though pretty ſtraight, is inflated at the middle, and a little hooked at the end; the noſtrils are round; the quills of the tail and of the wings edged with orange on a brown ground; the throat white; the head and back gray; the under ſide of the body whitiſh. Such are the principal properties of the bird. It was obſerved by Sloane in Jamaica.

"Its total length is about ſeven inches and a half; the bill, is eight lines and one-third; the upper mandible a little protuberant near the middle; the mid toe, eight lines and one-third; the alar extent, eleven inches and a quarter; the tail about twenty-three lines.

2. *The ſpotted* or *Surinam nuthatch.*—"This is another American nuthatch, with a hooked bill; but differs from the preceding in ſize, plumage, and climate: it inhabits Dutch Guiana. See Pl. 1.

"The upper ſide of the head and of the body is of a dull aſh colour; the ſuperior coverts of the wings of the ſame colour, but terminated with white; the throat white; the breaſt and all the under ſide of the body cinereous, and more dilute than the upper ſide, with white ſtreakes ſcattered on the breaſt and ſides, which forms a ſort of ſpeckling; the bill and legs brown.

"Total length, about ſix inches; the bill, an inch; the *tarſus*, ſeven lines and a half; the mid toe, eight or nine lines, and longer than the hind toe, whoſe nail is the ſtrongeſt; the tail, about eighteen lines, conſiſting of twelve nearly equal quills, and exceeds the wings thirteen or fourteen lines."

NUTMEG. See MYRISTICA, its generic name, and Pl. 34. Vol. VI. The tree which produces this fruit was formerly thought

to grow only in the Banda Iſlands. It is now paſt a doubt, however, that it grows in the Iſle of France and in all or moſt of the iſles of the ſouth ſeas. It ſeems a little remarkable that this trade, which is certainly a lucrative one, ſhould have been ſo long monopolized by the Dutch. Their cunning and deſire to retain it in their own hands ſeem to account for the idea that ſo generally prevailed formerly that it grew only in their ſettlements. It was reported as early as the year 1751, upon what appeared at that time to be good grounds, that it was likely to be produced in the Weſt Indies. An Engliſh ſailor ſaid he had ſeen ſome trees in Jamaica, and the governor on inquiry found it ſo, and that they agreed exactly with the deſcription given of thoſe in the Spice Iſlands in the Eaſt Indies. This account, which was given in the Gentleman's Magazine for January 1751, we have never ſeen confirmed; and therefore we ſuppoſe that the expectations formed were either fruſtrated or premature: however, it is certain, as we have obſerved under the generic name, that a wild ſpecies of it grows at Tobago. To avoid repetition, or the appearance of prolixity, we muſt refer thoſe who wiſh for farther information reſpecting the trade in this article to M. P. Sonnerat's Account of a Voyage to the Spice Iſlands and New Guinea, which was printed at Paris in 1775, and tranſlated into Engliſh and printed at Bury St. Edmund's in 1781, &c. and to Bougainville's Voyage, and Dr. Hawkeſworth's compilation of Engliſh voyages.

The following account of the dangerous conſequences of uſing this article to exceſs, given by Dr. Jacob Schmidius, is publiſhed in the Gentleman's Magazine for 1767.

"A gentleman of Lower Sileſia, about thirty-ſix years old, of a good conſtitution, and who enjoyed a good ſtate of health, having felt, during ſome days, ſome colic pains, took it in his head, by way of remedy, to eat four nutmegs, which weighed all together two ounces, and he drank, in eating them, ſome glaſſes of beer; which he had no ſooner done, but he was ſeized with a great heat, a violent pain in the head, a vertigo and delirium, and was inſtantly deprived of the uſe of ſight, ſpeech, and of all his ſenſes. He was put to bed, where he remained two days and two nights; his body was oppreſſed with laſſitude, always drowſy, yet without being able to ſleep. The third day he was in that lethargic ſtate which is called a *coma vigil*, with a weak and intermitting pulſe. Cephalic remedies, cordials, and among others the ſpirit of cephalic vitriol, and the eſſence of caſtoreum, were adminiſtered in good ſpirit of ſal-ammoniac. The fourth day he recovered a little, but had abſolutely loſt his memory, ſo as not to remember the leaſt thing he had done in his life. A continued fever then came on, accompanied by an obſtinate watchfulneſs; a palpitation of the heart ſeemed to be the fore-runner of other ſymptoms, and he was finally ſtruck with a palſy in all his limbs.

At the expiration of eight days, he recovered the uſe of reaſon, and ſaid, that during the firſt four days of his illneſs he ſeemed to himſelf to have conſtantly a thick veil before his eyes, and that a great number of ſparks and flaſhes continually iſſued from it. All the bad ſymptoms of this malady yielded at laſt ſucceſſively to the continued uſe of remedies ſuited to his condition; and in three months time he was perfectly recovered, but he was particularly indebted for his cure to mercurial and ammoniacal remedies.

"According to chemical principles, it might perhaps be ſaid, that the aromatic and oily ſalt contained in nutmeg, of which this patient had taken too large a doſe, had immediately excited ſo great an agitation in the humours, and ſo rapid a motion in the animal ſpirits, as in ſome meaſure to partake of the nature of fire; and that a viſcid and narcotic ſulphur, which reſides likewiſe in the nutmeg, though in a leſs ſenſible manner, being carried at the ſame time into the maſs of blood, by ſuddenly fixing the animal ſpirits, and intercepting their courſe in the nerves, had afterwards cauſed the ſtupor in the limbs, the aphony and the palſy. But I leave others to explain theſe phenomena; my only view, by communicating this obſervation, being to ſhow that the immoderate uſe of nutmeg may be attended with very great danger."

NUTRITION, in the animal œconomy, is the repairing the continual loſs which the different parts of the body undergo.

The motion of the parts of the body, the friction of theſe parts with each other, and eſpecially the action of the air, would deſtroy the body entirely, if the loſs were not repaired by a proper diet, containing nutritive juices; which being digeſted in the ſtomach, and afterwards converted into chyle, mix with the blood, and are diſtributed through the whole body for its nutrition.

In young perſons, the nutritive juices not only ſerve to repair the parts that are damaged, but alſo to increaſe them, which is called *growth*.

In grown perſons, the cuticle is every-where conſtantly deſquamating, and again renewing; and in the ſame manner the parts rubbed off, or otherwiſe ſeparated from the fleſhy parts of the body, are ſoon ſupplied with new fleſh; a wound heals, and an emaciated perſon grows plump and fat.

Buffon, in order to account for nutrition, ſuppoſes the body of an animal or vegetable to be a kind of mould, in which the matter neceſſary to its nutrition is modelled and aſſimilated to the whole. But (continues he) of what nature is this matter which an animal or vegetable aſſimilates to its own ſubſtance? What power is it that communicates to this matter the activity and motion neceſſary to penetrate this mould? and, if ſuch a force exiſt, would it not be by a ſimilar force that the internal mould itſelf might be reproduced?

As to the firſt queſtion, he ſuppoſes that there exiſts in nature an infinite number of living organical parts, and that all organized bodies conſiſt of ſuch organical parts; that their production coſts nature nothing, ſince their exiſtence is conſtant and invariable; ſo that the matter which the animal or vegetable aſſimilates to its ſubſtance, is an organical matter of the ſame nature with that of the animal or vegetable, which conſequently may augment its volume without changing its form or altering the quality of the ſubſtance in the mould

As to the ſecond queſtion: There exiſt (ſays he) in nature certain powers, as that of gravity, that have no affinity with the external qualities of the body, but act upon the moſt intimate parts, and penetrate them throughout, and which can never fall under the obſervation of our ſenſes.

And as to the third queſtion, he anſwers, that the internal mould itſelf is reproduced, not only by a ſimilar power, but it is plain that it is the very ſame power that cauſes the unfolding and reproduction thereof: for it is ſufficient (proceeds he), that in an organized body that unfolds itſelf, there be ſome part ſimilar to the whole, in order that this part may one day become itſelf an organized body, altogether like that of which it is actually a part.

NUX MOSCHATA. See MYRISTICA and NUTMEG.

NUX *Piſtachia*. See PISTACHIA.

NUX *Vomica*, a flat, compreſſed, round fruit, about the breadth of a ſhilling, brought from the Eaſt Indies. It is found to be a certain poiſon for dogs, cats, &c. and it is not to be doubted that it would alſo prove fatal to mankind. Its ſurface is not much corrugated; and its texture is firm like horn, and of a pale greyiſh-brown colour. It is ſaid to be uſed as a ſpecific againſt the bite of a ſpecies of water-ſnake. It is conſiderably bitter and deleterious; but has been uſed in doſes from five to ten grains twice a day or ſo, in intermittents, particularly obſtinate quartans, and in contagious dyſentery. The *ſtrychnus Ignatii* is a tree of the ſame kind producing gourd like fruit, the ſeeds of which are improperly called St. Ignatius's beans.

Theſe, as alſo the woods or roots of ſome ſuch trees, called *lignum colubrinum* or *ſnakewood*, are very narcotic bitters like the nux vomica.

NUYTS (PETER), a native of Holland, and a leading character in that extraordinary tranſaction which happened between the Japaneſe and the Dutch about the year 1628. In 1627 Nuyts arrived in Batavia from Holland, and was in the ſame year appointed ambaſſador to the emperor of Japan by the governor and council of Batavia.

He repaired to that empire in 1628: and being a man of a haughty diſpoſition, and extremely vain, he believed it practicable to paſs upon the natives for an ambaſſador from the king of Holland. Upon his aſſuming this title he was much more honourably received, careſſed, and reſpected, than former miniſters had been. But he was ſoon detected, reprimanded, and reproached in the ſevereſt manner, ſent back to the port, and ordered to return to Batavia with all the circumſtances of diſgrace imaginable; notwithſtanding which, his intereſt was ſo great, that, inſtead of being puniſhed as he deſerved, he was immediately afterwards promoted to the government of the iſland of Formoſa, of which he took poſſeſſion the year following.

He entered upon the adminiſtration of affairs in that iſland with the ſame diſpoſition that he had ſhown while ambaſſador, and with the moſt implacable reſentment againſt the Japaneſe; neither was it long before an opportunity offered, as he thought, of revenging himſelf to the full. Two large Japaneſe ſhips, with upwards of five hundred men on board, came into the port; upon which he took it into his head to diſarm and unrig them, in the ſame manner as the Dutch veſſels are treated at Japan. The Japaneſe did all they could to defend themſelves from this ill uſage; but at laſt, for want of water, they were forced to ſubmit. Governor Nuyts went ſtill farther. When they had finiſhed their affairs at Formoſa, and were deſirous of proceeding, according to their inſtructions, to China, he put them off with fair words and fine promiſes till the monſoon was over. They began then to be very impatient, and deſired to have their cannon and ſails reſtored, that they might return home; but the governor had recourſe to new artifices, and, by a ſeries of falſe promiſes, endeavoured to hinder them from making uſe of the ſeaſon proper for that voyage.

The Japaneſe, however, ſoon perceived his deſign; and at length, by a bold attempt, accompliſhed what by fair means and humble entreaty they could not obtain; for, by a daring and well-concerted effort, they took him priſoner, and made him and one of the council ſign a treaty for ſecuring their liberty, free departure, and indemnity, which was afterwards ratified by the whole council. Nuyts was firſt confined in Batavia, and afterwards delivered up to the Japaneſe, notwithſtanding the moſt earneſt intreaties on his part to be tried, and even to ſuffer any kind of death where he was, rather than to be ſent to Japan. He was ſent there, however, in 1634. He was ſubmitted to the mercy or diſcretion of the emperor; and the conſequence was, that, though impriſoned, he was well uſed, and could go any where, provided his guards were with him, which was more than he could poſſibly have expected. He now looked for nothing but the continuance of his confinement for life. On a particular occaſion, however, *i. e.* at the funeral of the emperor's father, at the requeſt of the Dutch, he was ſet free, and returned again to Batavia, to the ſurpriſe of that people, who, however, adopted ever after a very different conduct with reſpect to the Japaneſe.

NUZZER, or NUZZERANAH; a preſent or offering from an inferior to a ſuperior. In Hindoſtan no man ever approaches his ſuperior for the firſt time on buſineſs without an offering of at leaſt a gold or ſilver rupee in his right hand; which if not taken, it is a mark of diſfavour. Nuzzeranah is alſo uſed for the ſum paid to the government as an acknowledgement for a grant of lands or any public office.

NYCHTHEMERON, among the ancients, ſignified the whole natural day, or day and night, conſiſting of 24 hours or 24 equal parts. This way of conſidering the day was particularly adopted by the Jews, and ſeems to owe its origin to that expreſſion of Moſes, in the firſt chapter of Geneſis, "the evening and the morning were the firſt day."—Before the Jews had introduced the Greek language into their diſcourſe, they uſed to ſignify this ſpace of time by the ſimple expreſſion of a night and a day. It is proper here to obſerve, that all the eaſtern countries reckoned any part of a day of 24 hours for a whole day; and ſay a thing that was done on the third or ſeventh day, &c. from that laſt mentioned, was done after three or ſeven days. And the Hebrews, having no word which exactly anſwers to the Greek Νυχθημερον, ſignifying "a natural day of 24 hours," uſe *night and day*, or *day and night*, for it. So that to ſay a thing happened after three days and three nights, was, with them, the ſame as to ſay it happened after three days, or on the third day. This, being remembered, will explain what is meant by "the Son of Man's being three days and three nights in the heart of the earth."

NYCTALOPIA, an affection of the eye, in which the patient ſees objects by night which he cannot ſee by day, or *vice verſa*. The word is from νυξ, *night*, and ωψ, an *eye*.

NYCTANTHES, ARABIAN JASMINE: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking with the 44th order, *Sapiariæ*. The corolla and calyx are octofid; the perianthium dicoccous. There are five ſpecies; the moſt remarkable of which are, 1. The arbor triſtis, or ſorrowful tree. This tree, or ſhrub, the *pariaticu* of the Bramins, grows naturally in ſandy places in India, particularly in the iſlands of Ceylon and Java, where it is produced in great abundance, and attains the height of 18 or 20 feet. It riſes with a four-cornered ſtem, bearing leaves that are oval, and taper to a point. They ſtand oppoſite, on ſhort foot-ſtalks; are of a ſhining browniſh-green on the upper ſide, a more vivid green on the under, and of a taſte that is aſtringent and ſomewhat bitter. From the middle-rib, on the under-ſurface of the leaves, proceed on both ſides a number of coſtulæ, or ſmaller ribs, which run nearly to the margin, and mark the ſurface with the impreſſion of their arched furrows. The flowers, which are white and highly odoriferous, having a ſweet delectable ſmell emulating the beſt honey, conſiſt of one petal deeply divide into eight parts, which are narrower towards the ſtalk, and dilated towards the ſummit. They ſtand upon foot-ſtalks, which emerge from the origin of the leaves; are rigid, obliquely raiſed towards the top, grow oppoſite in pairs, and are divided into three ſhort leſſer branches, which each ſupports five flowers placed cloſe together, without partial foot-ſtalks. The fruit is dry, capſular, membranaceous, and compreſſed.

It is generally aſſerted of this plant, that the flowers open in the evening, and fall off the ſucceeding day. Fabricius and Paludanus, however, reſtrict the aſſertion, by affirming, from actual obſervation, that this effect is found to take place only in ſuch flowers as are immediately under the influence of the ſolar rays. Grimmius remarks in his *Laboratorium Ceylonicum*, that the flowers of this tree afford a fragrant water, which is cordial, refreſhing, and frequently employed with ſucceſs in inflammations of the eyes. The tube of the flower, when dried, has the ſmell of ſaffron; and, being pounded and mixed with ſanders-wood, is uſed by the natives of the Malabar coaſt for imparting a grateful fragrancy to their bodies, which they rub or anoint with the mixture.

2. The ſambac, noted, like the other ſpecies, for the fragrancy of its flowers, is a native likewiſe of India; and is cul-

tivated in our ſtoves, where it generally riſes with a twining ſtem to the height of 18 or 20 feet. The leaves are oppoſite, ſimple, and entire; but in different parts of the plant aſſume different forms: the lower leaves being heart-ſhaped and blunt; the upper, oval and ſharp. The flowers are white, inexpreſſibly fragrant, and generally appear with us in the warm ſummer-months. Strong loam is its proper ſoil. There is a variety of this ſpecies with a double flower, which is much larger and more fragrant than the former.

NYCTASTRATEGI, among the ancients, were officers appointed to prevent fires in the night, or to give alarm and call aſſiſtance when a fire broke out. At Rome they had the command of the watch, and were called *nocturni triumviri*, from their office and number.

NYCTICORAX, in ornithology, the night-raven; a ſpecies of of ARDEA.

NYE (PHILIP), an Engliſh non-conformiſt, a native of Suſſex, deſcended of a genteel family there, was born about 1596. After a proper foundation at the grammar-ſchool, he was ſent to Oxford, and entered a commoner of Brazen-Noſe college in 1615, whence he removed in a little time to Magdalen hall, under a puritanical tutor. He took the degrees in arts in 1619 and 1622, about which time he entered into holy orders, and was, ſome time in 1620, curate of St. Michael's church in Cornhill, London. Reſolving, however, to reject the conſtitution of the church of England, he became obnoxious to all the cenſures of the epiſcopal court; to avoid which, he went, with others of his perſuaſion, to Holland, in 1633. He continued for the moſt part at Arnheim, in Guelderland, till 1640; when, the power of the parliament beginning to prevail over the king, he returned home, and was ſoon after made miniſter of Kimbolton in Huntingdonſhire, by Edward Lord Kimbolton, then earl of Mancheſter. In 1643, he was appointed one of the aſſembly of divines, and became a great champion of the Preſbyterians, and a zealous aſſertor of the ſolemn league and covenant; and, having married the daughter of Stephen Marſhall, was ſent with his father-in-law into Scotland the ſame year, to expedite the taking of their covenant. Accordingly, he harangued that people, in ſome ſpeeches on the occaſion; in which he told them, among other things, that they were entered into ſuch a covenant and league as would never be forgotten by them and their poſterity, and both would have occaſion to remember it with joy; that it was ſuch an oath, for matter, perſons, and other circumſtances, that the like had not been in any age ſufficiently warranted both by human and divine ſtory: for, as God did ſwear for the ſalvation of men and kingdoms, ſo kingdoms muſt now ſwear for the preſervation and ſalvation of kingdoms, to eſtabliſh a Saviour Jeſus Chriſt in England, &c. After his return, both houſes of parliament took the covenant the ſame year; at which time he preached a ſermon in defence of it, ſhowing its warrant from ſcripture, and was rewarded for his good ſervice with the rectory of Acton near London, in the room of Dr. Daniel Featley, who was ejected from it. Not long after, however, Nye began to diſlike the proceedings of the ſaid aſſembly of divines, and diſſented from them, oppoſing the diſcipline intended to be ſettled by them; and, cloſing with the Independents when they became the reigning faction, he paid his court to the grandees of the army, who often made uſe of his counſel. In December 1647 he was ſent by them, with Stephen Marſhall, to the king at Cariſbrook-caſtle in the Iſle of Wight, in attendance upon the commiſſioners then appointed to carry the four dethroning votes, as they are now called, viz. 1. To acknowledge the war raiſed againſt him to be juſt: 2. To aboliſh epiſcopacy; 3. To ſettle the power of the militia in perſons nominated by the two houſes; 4. To ſacrifice all thoſe that had adhered to him; for which ſervice they were rewarded with no leſs than 500l. a-piece. Nye was alſo employed about that time by the ſame maſters to get ſubſcriptions from the apprentices in London, &c. againſt a perſonal treaty with the king, while the citizens of that metropolis were petitioning for one. April the next year, he was employed, as well as Marſhall and Joſeph Caryl, by the Independents, to invite the ſecured and ſecluded members to ſit in the houſe again, but without ſucceſs. In 1653 he was appointed one of the triers for the approbation of public preachers; in which office he not only procured his ſon to be clerk, but, with the aſſiſtance of his father-in-law, obtained for himſelf a living of 400l. a-year. In 1654, he was joined with Dr. Lazarus Seaman, Samuel Clark, Richard Vines, Obadiah Sedgwick, Joſeph Caryl, &c. as an aſſiſtant to the commiſſioners appointed by parliament to eject ſuch as were then called ſcandalous and ignorant miniſters and ſchoolmaſters in the city of London. After Charles II.'s reſtoration in 1660, it was debated by the healing parliament, for ſeveral hours together, whether he and John Goodwin ſhould be excepted for life; but the reſult was, that if Philip Nye, clerk, ſhould after the 1ſt of September, in the ſame year 1660, accept or exerciſe any office, eccleſiaſtical, civil, or military, he ſhould, to all intents and purpoſes, in law, ſtand as if he had been totally excepted for life. November 1662 he was vehemently ſuſpected to be engaged in Tongue's plot; but the ſuſpicion was never proved. He died in the pariſh of St. Michael's, Cornhill, London, in Sept. 27, 16[illegible]2, and was buried in the upper vault of the ſaid church. Wood ſays he was a dangerous and ſeditious perſon, a politic pulpit-driver of independency, an inſatiable eſurient after riches, and what not, to raiſe a family, and to heap up wealth.

NYLAND, a province of Finland in Sweden, lying on the gulf of Finland, to the weſt of the province of Carelia.

NYL-GHAU, in zoology, of the genus *Bos*, a native of the interior parts of India. "It ſeems (ſays Bewick in his Hiſt. of Quadr.) to be of a middle nature between the cow and the deer, and carries the appearance of both in its form. In ſize, it is as much ſmaller than the one, as it is larger than the other: its body, horns, and tail, are not unlike thoſe of a bull; and the head, neck, and legs, are ſimilar to thoſe of a deer. The colour in general is aſh or grey, from a mixture of black hairs and white: all along the ridge or edge of the neck, the hair is blacker, longer, and more erect, making a ſhort, thin, and upright mane, reaching down to the hump. Its horns are ſeven inches long, ſix inches round at the root, tapering by degrees, and terminating in a blunt point: the ears are large and beautiful, ſeven inches in length, and ſpread to a conſiderable breadth; they are white on the edge and on the inſide, except where two black bands mark the hollow of the ear with a zebra-like variety. The height of this animal at the ſhoulder is four feet one inch; behind the loins, it only meaſures four feet.

"The female differs conſiderably from the male both in height and thickneſs, being much ſmaller; in ſhape and colour, very much reſembling a deer; and has no horns. She has four nipples, and is ſuppoſed to go nine months with young. She commonly has one at a birth, but ſometimes two.

"Several of this ſpecies were brought to this country in the year 1767, which continued to breed annually for ſome years after. Dr. Hunter, who had one of them in his cuſtody for ſome time, deſcribes it as a harmleſs and gentle animal; that it ſeemed pleaſed with every kind of familiarity, always licked the hand that either ſtroked or fed it, and never once attempted to uſe its horns offenſively. It ſeemed to have much dependence on its organs of ſmell, and ſnuffed keenly whenever any perſon came in ſight: it did ſo likewiſe when food or drink was brought to it; and would not taſte the bread which was offered, if the hand that preſented it happened to ſmell of turpentine.

"Its manner of fighting is remarkable, and is deſcribed thus,

Two of the males at Lord Clive's, being put into an inclosure, were obſerved, while they were at ſome diſtance from each other, to prepare for the attack, by falling down upon their knees; they then ſhuffled towards each other, keeping ſtill upon their knees; and at the diſtance of a few yards they made a ſpring, and darted againſt each other with great force.

"The following anecdote will ſerve to ſhew, that during the rutting ſeaſon theſe animals are fierce and vicious, and not to be depended upon. A labouring man, without knowing that the animal was near him, went up to the outſide of the inclosure; the nyl-ghau, with the quickneſs of lightning, darted againſt the woodwork with ſuch violence, that he broke it to pieces, and broke off one of his horns cloſe to the root. The death of the animal, which happened ſoon after, was ſuppoſed to be owing to the injury he ſuſtained by the blow.

"Bernier ſays, that it is the favourite amuſement of the Mogul emperor to hunt the Nyl-ghau; and that he kills them in great numbers, and diſtributes quarters of them to his omrahs; which ſhows that they are eſteemed good and delicious food.

"The Nyl-ghau is frequently brought from the interior parts of Aſia, as a rare and valuable preſent to the nabobs and other great men at our ſettlements in India.

"It remains to be conſidered, whether this rare animal might not be propagated with ſucceſs in this country. That it will breed here is evident from experience; and if it ſhould prove docile enough to be eaſily trained to labour, its great ſwiftneſs and conſiderable ſtrength might be applied to the moſt valuable purpoſes." We have given a ſpirited repreſentation of this animal in Pl. 1.

NYMPH, in mythology, an appellation given to certain inferior goddeſſes, inhabiting the mountains, woods, waters, &c. ſaid to be the daughters of Oceanus and Tethys. All the univerſe was repreſented as full of theſe nymphs, who are diſtinguiſhed into ſeveral ranks or claſſes. The general diviſion of them is into celeſtial and terreſtrial; the former of which were called *uraniæ*, and were ſuppoſed to be intelligences that governed the heavenly bodies or ſpheres. The terreſtrial nymphs, called *epigciæ*, preſided over ſeveral parts of the inferior world; and were divided into thoſe of the water and thoſe of the earth. The nymphs of the water were the *oceanitides*, or nymphs of the ocean; the *nereids*, the nymphs of the ſea; the *naiads* and *ephydriades*, the nymphs of the fountains; and the *limniades*, the nymphs of the lakes. The nymphs of the earth were the *oreades*, or nymphs of the mountains; the *napææ*, nymphs of the meadows; and the *dryads* and *hamadryads*, who were nymphs of the foreſts and groves. Beſides theſe, we meet with nymphs who took their names from particular countries, rivers, &c. as the *Cithæroniades*, ſo called from mount Cithæron in Bœotia: the *Dodonides*, from Dodona; *Tiberiades*, from the Tiber, &c.—Goats were ſometimes ſacrificed to the nymphs; but their conſtant offerings were milk, oil, honey, and wine.

We have the following account of nymphs in Chandler's Greece. "They were ſuppoſed to enjoy longevity, but not to be immortal. They were believed to delight in ſprings and fountains. They are deſcribed as ſleepleſs, and as dreaded by the country people. They were ſuſceptible of paſſion. The Argonauts, it is related, landing on the ſhore of the Propontis to dine in their way to Colchos, ſent Hylas, a boy, for water, who diſcovered a lonely fountain, in which the nymphs Eunica, Malis, and Nycheia were preparing to dance; and theſe ſeeing him were enamoured, and, ſeizing him by the hand as he was filling his vaſe, pulled him in. The deities, their copartners in the cave, are ſuch as preſided with them over rural and paſtoral affairs.

"The old Athenians were ever ready to cry out, 'A god! or a goddeſs!' The tyrant Piſiſtratus entered the city in a chariot with a tall woman dreſſed in armour to reſemble Minerva, and regained the Acropolis, which he had been forced to abandon, by this ſtratagem; the people worſhipping, and believing her to be the deity whom ſhe repreſented. The nymphs, it was the popular perſuaſion, occaſionally appeared; and nympholepſy is characterized as a frenzy, which aroſe from having beheld them. Superſtition diſpoſed the mind to adopt deluſion for reality, and gave to a fancied viſion the efficacy of full conviction. The foundation was perhaps no more than an indirect, partial, or obſcure view of ſome harmleſs girl, which had approached the fountain on a like errand with Hylas, or was retiring after ſhe had filled her earthen pitcher.

"Among the ſacred caves on record, one on mount Ida in Crete was the property of Jupiter, and one by Lebadea in Bœotia of Trophonius. Both theſe were oracular, and the latter bore ſome reſemblance to that we have deſcribed. It was formed by art, and the mouth ſurrounded with a wall. The deſcent to the landing-place was by a light and narrow ladder, occaſionally applied and removed. It was ſituated on a mountain above a grove; and they related, that a ſwarm of bees conducted the perſon by whom it was firſt diſcovered. But the common owners of caves were the nymphs, and theſe were ſometimes local. On Cithœron in Bœotia, many of the inhabitants were poſſeſſed by nymphs called *Sphragitides*, whoſe cave, once alſo oracular, was on a ſummit of the mountain. Their dwellings had generally a well or ſpring of water; the former often a collection of moiſture condenſed or exuding from the roof and ſides; and this, in many inſtances, being pregnant with ſtony particles, concreated, and marked its paſſage by incruſtation, the ground-work in all ages and countries of idle tales framed or adopted by ſuperſtitious and credulous people.

"A cave in Paphlagonia was ſacred to the nymphs who inhabited the mountains about Heraclea. It was long and wide, and pervaded by cold water, clear as cryſtal. There alſo were ſeen bowls of ſtone, and nymphs and their webs and diſtaffs, and curious work, exciting admiration. The poet who has deſcribed this grotto, deſerves not to be regarded, as ſervilely copying Homer; he may juſtly claim to rank as an original topographer.

"The piety of Archidamus furniſhed a retreat for the nymphs, where they might find ſhelter and proviſion, if diſtreſſed; whether the ſun parched up their trees, or Jupiter enthroned in clouds upon the mountain-top ſcared them with his red lightning and terrible thunder, pouring down a deluge of rain, or brightening the ſummits with his ſnow."

NYMPH, among naturaliſts, that ſtate of winged-inſects between their living in the form of a worm and their appearing in the winged or moſt perfect ſtate. The eggs of inſects are firſt hatched into a kind of worms or maggots; which afterwards paſs into the nymph-ſtate, ſurrounded with ſhells or caſes of their own ſkins: ſo that, in reality, theſe nymphs are only the embryo inſects, wrapped up in this covering; from whence they at laſt get looſe, though not without great difficulty. During this nymph-ſtate the creature loſes its motion. Swammerdam calls it *nympha aurelia*, or ſimply *aurelia*; and others give it the name of *chryſalis*, a term of the like import. See the article CHRYSALIS.

NYMPH-*Bank*, ſituated about 10 leagues off the coaſt of the county of Waterford, and province of Munſter in Ireland, is a great fiſhing place, and 11 leagues SSE. from the high head of Dungarvan. It abounds with cod, ling, ſkate, bream, whiting, and other fiſh; which was diſcovered by Mr. Doyle, who on July 15, 1736 ſailed to it, in company with ſeven men, on board the Nymph, a ſmall veſſel of about 12 guns. This place is well adapted for a fiſhing company, the great public advantages of which muſt be very evident.

NYMPHÆ, in anatomy, two membranaceous parts, ſitu-

ated on each ſide the rima. They are of a red colour, and cavernous ſtructure, ſomewhat reſembling the wattles under a cock's throat. They are ſometimes ſmaller, ſometimes larger; and are contiguous to the præputium of the clitoris, and joined to the interior ſide of the labia. See ANATOMY.

NYMPHÆA, the WATER-LILY: a genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 54th order, *Miſcellaneæ*. The corolla is polypetalous; the calyx tetraphyllous or pentaphyllous; the berry multilocular and truncated. There are four ſpecies; of which the moſt remarkable are, 1, 2—The *lutea* and *alba*, or yellow and white water-lilies; both of which are natives of Britain, growing in lakes and ditches. Linnæus tells us, that ſwine are fond of the leaves and roots of the former; and that the ſmoke of it will drive away crickets and blattæ, or cock-roaches, out of houſes.—The root of the ſecond has an aſtringent and bitter taſte, like thoſe of moſt aquatic plants that run deep into the mud. The Highlanders make a dye with it of a dark cheſnut colour. 3. The *lotus*, with heart-ſhaped toothed leaves, a plant thought to be peculiar to Egypt, is thus mentioned by Herodotus: "When the river Nile is become full, and all the grounds round it are a perfect ſea, there grows a vaſt quantity of lilies, which the Egyptians call *lotus*, in the water. After they have cut them, they dry them in the ſun; then, having parched the ſeed within the lotus, which is moſt like the poppy, they make bread of it, baking it with fire. The root alſo of the lotus is eatable, eaſily becoming ſweet, being round, and of the ſize of an apple." M. Savary mentions it as growing in the rivulets and on the ſides of the lakes; and that there are two ſorts or varieties of the plant, the one with a white, the other with a blueiſh flower. "The calyx (he ſays) blows like a large tulip, and diffuſes a ſweet ſmell, reſembling that of the lily. The firſt ſpecies produces a round root like that of a potatoe; and the inhabitants of the banks of the lake Menzall feed upon it. The rivulets in the environs of Damietta are covered with this majeſtic flower, which riſes upwards of two feet above the water. 4. In the Eaſt and Weſt Indies grows a ſpecies of this plant, named *nelumbo* by the inhabitants of Ceylon. The leaves which reſt upon the ſurface of the water are ſmooth, undivided, perfectly round, thick, target-ſhaped, and about one foot and a half in diameter. The footſtalk of the leaves is prickly; and inſerted, not into their baſe, or margin, as in moſt plants, but in the centre of the lower diſk or ſurface. From this centre, upon the upper ſurface, iſſue, like rays, a great number of large ribs, or nerves, which towards the circumference are divided and ſubdivided into a ſmall number of very minute parts. The flowers are large, fleſh-coloured, and conſiſt of numerous petals, diſpoſed, as in the other ſpecies of water-lily, in two or more rows. The ſeed-veſſel is ſhaped like a top, being broad and circular above, narrow and almoſt pointed below. It is divided into ſeveral diſtinct cells, which form ſo many large round holes upon the ſurface of the fruit; each containing a ſingle ſeed.—With the flower of this plant, which is ſacred among the heathens, they adorn the altars of their temples: they paint their gods ſitting upon it; and make uſe of ſuch pictures to animate the minds of the pious on their death-bed, and to raiſe their affections to heaven. The ſtalks, which are uſed as a pot-herb, are of a wonderful length. The root is very long, extends itſelf tranſverſely, is of the thickneſs of a man's arm, jointed and fibrous, with long intervals betwixt the joints. The fibres ſurround the joints in verticilli or whirls. 5. A ſpecies of nymphæa, called by the Chineſe *lien-hoa* and *nenufar*, is highly extolled in that country for its excellent virtues, and ranked by their phyſicians among thoſe plants which are employed in the compoſition of *the liquor of immortality*. The ſeeds are there eaten as we eat filberds in Europe: they are more delicate when they are green, but harder of digeſtion; they are preſerved in many different ways with ſugar. The root of this plant is alſo admitted by the Chineſe to their tables: in whatever manner it be prepared, it is equally wholeſome. Great quantities of it are pickled with ſalt and vinegar, which they reſerve to eat with their rice. When reduced to powder, it makes excellent ſoup with water and milk. The leaves of the nenufar are much uſed for wrapping up fruits, fiſh, ſalt proviſions, &c. When dry, the Chineſe mix them with their ſmoking tobacco, to render it ſofter and milder.

The high veneration in which the *nymphæa lotos* was held by the Egyptians, is fully known; and at this hour it is equally venerated by the Hindoos. Sir William Jones, in ſpeaking of Brimha, Viſhnou, and Shiva, as emblematical repreſentations of the Deity, ſays,

"The firſt operations of theſe three powers are evidently deſcribed in the different Pouranas by a number of allegories; and from them we may deduce the Ionian philoſophy of primæval water, the doctrine of the mundane egg, and the veneration paid to the nymphæa or lotos, which was anciently revered in Egypt, as it is at preſent in Hindoſtan, Tibet, and Nepal. The Tibetians are ſaid to embelliſh their temples and altars with it; and a native of Nepal made proſtrations before it on entering my ſtudy where the fine plant and beautiful flowers lay for examination."

NYMPHÆA, amongſt the ancients. It is doubtful what ſtructures theſe were; ſome take them to have been grottos, deriving their name from the ſtatues of the nymphs with which they were adorned; but that they were conſiderable works, appears from their being executed by the emperors Ammian, Victor, Capitolinus; or by the city prefects. In an inſcription, the term is written *nymfium*. None of all theſe nymphæa has laſted down to our time. Some years ſince, indeed, a ſquare building of marble was diſcovered between Naples and Veſuvius, with only one entrance, and ſome ſteps that went down to it. On the right hand as you enter, towards the head, there is a fountain of the pureſt water; along which, by way of guard as it were, is laid a naked Arethuſa of the whiteſt marble; the bottom or ground is of variegated marble, and encompaſſed with a canal fed by the water from the fountain: the walls are ſet round with ſhells and pebbles of various colours; by the ſetting of which, as by ſo many ſtrokes in a picture, are expreſſed the 12 months of the year, and the four political virtues; alſo the rape of Proſerpine; Pan playing on his reed, and ſoothing his flock; beſides the repreſentations of nymphs ſwimming, ſailing, and wantoning on fiſhes, &c.

It ſeems pretty evident that the nymphæa were public baths; for at the ſame time that they were furniſhed with pleaſing grottos, they were alſo ſupplied with cooling ſtreams, by which they were rendered exceedingly delightful, and drew great numbers of people to frequent them. Silence ſeems to have been a particular requiſite there, as appears by this inſcription, *Nymphis loci; bibe, lava, tace*. That building between Naples and Veſuvius mentioned above, was certainly one of theſe nymphæa.

NYMPHÆUM, (Plutarch); the name of a ſacred place, near Apollonia in Illyricum, ſending forth continually fire in detached ſtreams from a green valley and verdant meadows. Dio Caſſius adds, that the fire neither burns up nor parches the earth, but that herbs and trees grow and thrive near it, and therefore the place is called *nymphæum*: near which was an oracle of ſuch a nature, that the fire, to ſhow that the wiſh was granted, conſumed the frankincenſe thrown into it; but repelled it, in caſe the deſire was rejected. It was there that a ſleeping ſatyr was once caught and brought to Sylla as he returned from the Mithridatic war. This monſter had the ſame features as the poets aſcribe to the ſatyr. He was interrogated by Sylla and by his

interpreters; but his articulations were unintelligible, and the Roman ſpurned from him a creature which ſeemed to partake of the nature of a beaſt more than that of a man.

NYMPHÆUM, in antiquity, a public hall magnificently decorated, for entertainment, &c. and where thoſe who wanted convenience at home held their marriage-feaſts; whence the name.

NYMPHIDIUS (SABINUS), a perſon of mean deſcent, but appointed by Nero colleague of Tigellinus in the command of the prætorian guards. About the time, however, that the German legions revolted from this deſpicable prince, he was alſo betrayed by Nymphidius and abandoned by his guards.

Nymphidius began now to entertain thoughts of ſeizing the ſovereignty himſelf. However, he did not immediately declare his ambitious views; but pretending to eſpouſe the cauſe of Galba, aſſured the guards that Nero was fled, and promiſed them ſuch ſums as neither Galba nor any other was able to diſcharge. This promiſe ſecured for the preſent the empire to Galba, occaſioned afterwards the loſs of it, and, finally, produced the deſtruction of Nymphidius and the guards themſelves. After Nero's death, however, and on the acknowledgment of Galba as emperor, he renewed his ambition; and having, by his immenſe largeſſes, gained the affections of the prætorian guards, and perſuading himſelf that Galba, by reaſon of his infirmities and old age, would never reach the capital, uſurped all the authority at Rome. Preſuming upon his intereſt, he obliged Tigellinus, who commanded, jointly with him the prætorian guards, to reſign his commiſſion. He made ſeveral magnificent and expenſive entertainments, inviting ſuch as had been conſuls or had commanded armies, diſtributed large ſums among the people, and with ſhows and other diverſions, which he daily exhibited, gained ſo great an intereſt with all ranks, that he already looked upon himſelf as ſovereign. The ſenate, dreading his power, conferred extraordinary honours upon him, ſtyled him their *Protector*, attended him when he appeared in public, and had recourſe to him for the confirmation of their decrees, as if he had been already inveſted with the ſovereign power. This baſe compliance elated him to ſuch a degree, that he uſurped, not leiſurely and by degrees, but all at once, an abſolute authority. He acted as ſovereign indeed, but he had not as yet openly declared his deſign of ſeizing the empire: his power, however, was great, and he uſed it in undermining Galba's power; he was, however, unſucceſsful, and the diſcloſure of his deſigns was much againſt him. Galba was again acknowledged and proclaimed, and he, notwithſtanding his artifices, detected and ſlain by the ſoldiers who were proclaiming Galba. See NERO.

NYON, a conſiderable town of Switzerland, in the canton of Bern, and capital of a bailiwick of the ſame name, with a caſtle. It ſtands delightfully upon the edge of the lake of Geneva, in the very point where it begins to widen, and in a moſt charming country commonly called *Pays de Vaud*. It was formerly called *Colonia Equeſtris Noiodunum*; and, as a proof of its antiquity, ſeveral Roman inſcriptions, and other ancient remains have been frequently diſcovered in the out-ſkirts of the town. E. lon. 5. 10. N. lat. 46. 24.

NYSA, or NYSSA (anc. geog.), a town of Ethiopia, at the ſouth of Egypt. Some place it in Arabia. This city, with another of the ſame name in India, was ſacred to the god Bacchus, who was educated there by the nymphs of the place, and who received the name of *Dionyſius*, which ſeems to be compounded of Διος and Νυσα, the name of his father, and that of the place of his education. The god made this place the ſeat of his empire, and the capital of the conquered nations of the eaſt. According to ſome geographers, there were no leſs than ten places of this name. One of theſe was famous on the coaſt of Eubœa for its vines, which grew in ſuch an uncommon manner, that if a twig was planted in the ground in the morning, it immediately produced grapes which were full ripe in the evening. A city of Thrace: another ſeated on the top of Mount Parnaſſus, and ſacred to Bacchus.

NYSLOT, a ſtrong town of Ruſſia, in Livonia, with a caſtle; ſeated on the river Narva, among large marſhes. E. lon. 26. 55. N. lat. 58. 46.

NYSSA, in botany: A genus of the order of dicœcia, belonging to the polygamia claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The hermaphrodite calyx is quinquepartite; there is no corolla; the ſtamina are five; there is one piſtil; the fruit a plum inferior. The male calyx is quinquepartite, no corolla, and ten ſtamina. There is only one ſpecies, the *nyſſa aquatica* or tupelo tree. It is a deciduous tree or ſhrub, a native of moiſt or watery places in America, and conſiſts of two varieties; 1. The *entire-leaved*; and, 2. The *ſerrated-leaved* tupelo.

The entire-leaved tupelo tree, in its native ſoil and climate, grows to near 20 feet high; in this country its ſize varies according to the nature of the ſoil or ſituation. In a moiſt rich earth, well ſheltered, it comes near to 20 feet; in others, that are leſs ſo, it makes ſlower progreſs, and in the end is proportionally lower. The branches are not very numerous; and it riſes with a regular trunk, at the top of which they generally grow. The leaves are of a lanceolated figure, and of a fine light green colour. They end in acute points and are very ornamental, of a thickiſh conſiſtence, ſoft, grow alternately on pretty long foot-ſtalks, and often retain their verdure late in the autumn. The flowers, which are not very ornamental, are produced from the ſides of the branches, growing ſometimes ſingly, ſometimes many together, on a foot-ſtalk. They are of a greeniſh colour; and, in the countries where they naturally grow, are ſucceeded by oval drupes, incloſing oval, acute, furrowed nuts. In England they ſeldom produce fruit.

The ſerrated-leaved tupelo tree grows uſually nearly 30 feet in height; and divides into branches near the top like the other. The leaves are oblong, pointed, of a light-green colour, and come out without order on long footſtalks. The flowers come out from the wings of the leaves on long footſtalks. They are ſmall, of a greeniſh-colour; and are ſucceeded by oval drupes, containing ſharp-pointed nuts, about the ſize of a French olive.

The propagation of theſe trees is from ſeeds, which come from America. As ſoon as they arrive, they ſhould be ſown in large pots of light ſandy earth an inch deep. The gardener (no plants come up the firſt ſpring), after this work is done, ſhould plunge his pots up to their rims in the natural ground; and if it be a moiſt place, it will be the better. Weeding muſt be obſerved during the ſummer; and a few furze-buſhes ſhould be pricked round the pots in November, which will prevent the ground from freezing, and forward the coming up of the ſeeds. In the next ſpring, the pots ſhould be plunged into an hot-bed, and after that the ſeeds will ſoon appear. As much air as poſſible, and watering, ſhould be afforded them; and they muſt be hardened ſoon, to be ſet out. The pots ſhould then be plunged to their rims again in the natural mould; where they are to remain till October. Watering muſt be given them; and they ſhould alſo be ſhaded in the heat of the day. In October, they muſt be houſed, with other green-houſe plants, or elſe ſet under a hot-bed frame, or ſome other cover, during winter. The third ſpring they ſhould be taken out of the larger pots, and each planted in a ſmaller, in which their growth may be aſſiſted by a gentle heat in a bed; but if they are planted up to the rims in a moiſt place, and ſhaded in dry weather, they will grow very well. Though by this time they ſhould have become hardy, yet it will be proper to ſhelter them the winter following in bad weather. They will require little

more care during their ſtay in the pots, which, may be either two, three, or more years, if they are large enough; when in ſpring they may be turned out, with the mould, into the places where they are to remain, which ought always to be moiſt and properly ſheltered.

NYU-CHE, or KIN, an empire which aroſe in eaſtern Tartary in the beginning of the 13th century. From the founder of this empire the late Chineſe emperor Kang-hi ſaid that his family was deſcended. See CHINA and TARTARY.

O.

O The 14th letter and fourth vowel of our alphabet; pronounced as in the words *noſe, roſe*, &c. The ſound of this letter is often ſo ſoft as to require it double, and that chiefly in the middle of words; as *gooſe reproof*, &c. And in ſome words this *oo* is pronounced like *u* ſhort, as in *flood, blood*, &c.

As a numeral, O was ſometimes uſed for 11 among the ancients; and with a daſh over it thus, $\overline{O}$, for 11,000.

In the notes of the ancients, O. CON. is read *opus conductum*; O. C. Q. *opera conſilioque*; O. D. M. *operæ, donum munus*; and O. L O. *opus locatum*.

The Greeks had two O's; viz. omicron, *o*, and omega, *ω*; the firſt pronounced on the tip of the lips with a ſharper ſound; the ſecond in the middle of the mouth, with a fuller ſound, equal to *oo* in our language. The long and ſhort pronunciation of our O are equivalent to the two Greek ones; the firſt, as in ſuppoſe; the ſecond, as in *o*bey.

O is uſually denoted long by a ſervile *a* ſubjoined, as *moan;* or by *e* at the end of the ſyllable, as *bone*; when theſe vowels are not uſed, it is generally ſhort.

Among the Iriſh, the Letter O, at the beginning of the name of a family, is a character of dignity annexed to great houſes. Thus, in the hiſtory of Ireland, we frequently meet with the *O Neals, O Carrols*, &c. conſiderable houſes in that iſland.

Cambden obſerves, that it is the cuſtom of the lords of Ireland to prefix an O to their names to diſtinguiſh them from the commonalty.

The ancients uſed O as a mark of triple time; from a notion that the ternary, or number 3, was the moſt perfect of numbers, and therefore properly expreſſed by a circle, the moſt perfect of figures.

It is not, ſtrictly ſpeaking, the letter O, but the figure of a circle O, or a double CO by which the modern ancients in muſic uſed to expreſs what they called *tempo perfetto*, or triple time. Hence the Italians call it *circolo*.

The ſeven antiphones, or alternate hymns of ſeven verſes, &c. ſung by the choir in the time of Advent, were formerly called *O*, from their beginning with ſuch an exclamation.

O is an adverb of calling, or interjection of ſorrow or wiſhing.

OAK, in botany. See QUERCUS. The oak has been long known by the title of *monarch of the woods*, and very juſtly. It was well known, and often very elegantly deſcribed, by the ancient poets.

The ancient Druids had a moſt profound veneration for oak trees. Pliny ſays, that "the Druids (as the Gauls call their magicians or wiſe men) held nothing ſo ſacred as the miſſletoe, and the tree on which it grows, provided it be an oak. They make choice of oak groves in preference to all others, and perform no rites without oak leaves; ſo that they ſeem to have the name of Druids from thence, if we derive their name from the Greek," &c. (See DRUIDS.) Maximus Tyrius ſays the Celtæ or Gauls worſhipped Jupiter under the figure of a lofty oak.

This uſeful tree grows to ſuch a ſurpriſing magnitude, that were there not many well authenticated inſtances of them in our own country, they would certainly appear difficult of belief. In the 18th volume of the Gentleman's Magazine we have the dimenſions of a leaf twelve inches in length and ſeven in

OAK

breadth, and all the leaves of the ſame tree were equally large. On the eſtate of Woodhall, purchaſed in 1775 by Sir Thomas Rumbold, bart. late governor of Madras, an oak was felled which ſold for 43l. and meaſured 24 feet round. We are alſo told of one in Millwood foreſt, near Chaddeſley, which was in full verdure in winter, getting its leaves again after the autumn ones fell off. In Hunter's Evelyn's Sylva, we have an account of a very remarkable oak at Greendale; which Gough, in his edition of Cambden, thus minutely deſcribes: "The Greendale oak, with a road cut through it, ſtill bears one green branch. Such branches as have been cut or broken off are guarded from wet by lead. The diameter of this tree at the top, whence the branches iſſue, is 14 feet 2 inches; at the ſurface of the ground 11½ feet; circumference there 35 feet; height of the trunk 53; height of the arch 10, width 6. Mr. Evelyn mentions ſeveral more oaks of extraordinary ſize in Workſop park."

In the Gentleman's Magazine for 1773 we have an account of one differing very eſſentially from the common one; it is frequent about St. Thomas in Devonſhire, and is in that county called *Lucombe oak*, from one William Lucombe who ſucceſſfully cultivated it near Exeter. It grows as ſtraight and handſome as a fir; its leaves are evergreen, and its wood as hard as that of the common oak. Its growth is ſo quick, as to exceed in 20 or 30 years the altitude and girth of the common one at 100. It is cultivated in various places; Cornwall, Somerſetſhire, &c.

M. du Hamel du Monceau, of the Royal Academy of Sciences at Paris (who wrote a treatiſe on huſbandry), gave an account in the year 1749 of an oak which he had kept in water eight years, and which yielded fine leaves every ſpring. The tree had, he ſays, four or five branches; the largeſt 19 or 20 lines round, and more than 18 inches long. It throve more in the two firſt years than it would have done in the beſt earth; it afterwards loſt its vigour, and rather decayed; which he attributed to a defect in the roots rather than to want of aliment.

M. de Buffon made ſome experiments on oak-trees; the reſult of which is recorded in the Gentleman's Magazine, 1754. He had compared barked with unbarked trees; and proves, we think with ſucceſs, from a variety of trials, that timber barked and dryed ſtanding, is always heavier and conſiderably ſtronger than timber kept in its bark.

The bark of oak-trees was formerly thought to be extremely uſeful in vegetation. One load (Mr. Mills in his treatiſe on huſbandry informs us) of oak-bark, laid in a heap and rotted, after the tanners have uſed it for dreſſing of leather, will do more ſervice to ſtiff cold land, and its effects will laſt longer, than two loads of the richeſt dung; but this has been ſtrenuouſly controverted. (See OAK-*Leaves*).

The bark, in medicine, is alſo a ſtrong aſtringent; and hence ſtands recommended in hæmorrhagies, alvine fluxes, and other preternatural or immoderate ſecretions; and in theſe it is ſometimes attended with good effects. Some have alleged, that by the uſe of this bark every purpoſe can be anſwered which may be obtained from Peruvian bark. But after ſeveral very fair trials, we have by no means found this to be the caſe. Beſides the bark, the buds, the acorns, and their cups are uſed; as alſo the galls, which are excreſcences cauſed by inſects on

the oaks of the eaſtern countries, of which there are divers ſorts; ſome perfectly round and ſmooth, ſome rougher with ſmall protuberances, but all generally having a round hole in them. All the parts of the oak are ſtyptic, binding, and uſeful in all kinds of fluxes and bleedings, either inward or outward. The bark is frequently uſed in gargariſms, for the relaxation of the uvula, and for ſore mouths and throats: it is alſo uſed in reſtringent clyſters and injections, againſt the prolapſus uteri or ani. The acorns, beaten to powder, are frequently taken by the vulgar for pains in the ſide. The only officinal preparation is the aqua germinum quercus.

Oak-*Leaves*. The uſes of oak-bark in tanning, and in hot-beds, is generally known. For the latter of theſe purpoſes, however, oak-leaves are now found to anſwer equally well, or rather better. In the notes to Dr. Hunter's edition of Evelyn's Treatiſe on Foreſt-trees, we find the following directions for their uſe by W. Speechly: The leaves are to be raked up as ſoon as poſſible after they fall from the trees. When raked into heaps, they ſhould immediately be carried into ſome place near the hot-houſes, where they may lie to couch. Mr. Speechly ſays, it was his cuſtom to fence them round with charcoal hurdles, or any thing elſe, to keep them from being blown about the garden in windy weather. In this place they tread them well, and water them in caſe they happen to have been brought in dry. The heap is made ſix or ſeven feet thick, and covered over with old mats, or any thing elſe, to prevent the upper leaves from being blown away. In a few days the heap will come to a ſtrong heat. For the firſt year or two in which he uſed theſe leaves, our author did not continue them in the heap longer than ten days or a fortnight: but by this method of management they ſettled ſo much when brought to the hot-houſe, that a ſupply was very ſoon required; and he afterwards found, that it was proper to let them remain five or ſix weeks in the heaps before they are brought to the hot-houſe. In getting them into the pine-pots, if they appear dry, they are to be watered, and again trodden down exceedingly well, in layers, till the pits are quite full. The whole is then covered with tan-bark, to the thickneſs of two inches, and well trodden down, till the ſurface becomes ſmooth and even. On this the pine pots are to be placed in the manner they are to ſtand, beginning with the middle row firſt, and filling up the ſpaces between the pots with tan. In this manner we are to proceed to the next row, till the whole be finiſhed; and this operation is performed in the ſame manner as when tan only is uſed. The leaves require no farther trouble through the whole ſeaſon; as they will retain a conſtant and regular heat for 12 months without ſtirring or turning; and our author informs us, that if he may judge from their appearance when taken out (being always entire and perfect), it is probable they would continue their heat through a ſecond year; but, as an annual ſupply of leaves is eaſily obtained, the experiment is hardly worth making. After this, the pines will have no occaſion to be moved, but at ſtated times of their management, viz. at the ſhifting them in their pots, &c. when at each time a little freſh tan ſhould be added to make up the deficiency ariſing from the ſettling of the beds; but this will be inconſiderable, as the leaves do not ſettle much after their long couching. During the firſt two years of our author's practice he did not uſe any tan, but plunged the pine pots into the leaves, and juſt covered the ſurface of the beds, when finiſhed, with a little ſaw-duſt, to give it a neatneſs. This method, however, was attended with one inconvenience; for by the caking of the leaves they ſhrunk from the ſides of the pots, whereby they became expoſed to the air, and at the ſame time the heat of the beds was permitted to eſcape.

"Many powerful reaſons (ſays Mr. Speechly) may be given why oak-leaves are preferable to tanner's bark.

"1. They always heat regularly; for during the whole time that I have uſed them, which is near ſeven years, I never once knew of their heating with violence; and this is ſo frequently the caſe with tan, that I affirm, and indeed it is well known to every perſon converſant in the management of the hot-houſe, that pines ſuffer more from this one circumſtance, than all the other accidents put together, inſects excepted. When this accident happens near the time of their fruiting, the effect is ſoon ſeen in the fruit, which is exceedingly ſmall and ill-ſhaped. Sometimes there will be little or no fruit at all; therefore gardeners who make uſe of tan only for their pines, ſhould be moſt particularly careful to avoid an over-heat at that critical juncture,—the time of ſhowing the fruit.

"2. The heat of oak leaves is conſtant; whereas tanner's bark generally turns cold in a very ſhort time after its furious heat is gone off. This obliges the gardener to give it frequent turnings in order to promote its heating. Theſe frequent turnings, not to mention the expence, are attended with the worſt conſequences; for by the continual moving of the pots backward and forwards, the pines are expoſed to the extremes of heat and cold, whereby their growth is conſiderably retarded; whereas, when leaves are uſed, the pines will have no occaſion to be moved but at the times of potting, &c. The pines have one peculiar advantage in this undiſturbed ſituation; their roots grow through the bottoms of the pots, and mat among the leaves in a ſurpriſing manner. From the vigour of the plants when in this ſituation, it is highly probable that the leaves, even in this ſtate, afford them an uncommon and agreeable nouriſhment.

"3. There is a ſaving in point of expence; which is no inconſiderable object in places where tan cannot be had but from a great diſtance.

"4. The laſt ground of preference is, that decayed leaves make good manure; whereas rotten tan is experimentally found to be of no value. I have often tried it both on ſand and clay, and on wet and dry land; and never could diſcover, in any of my experiments, that it deſerved the name of a manure; whereas decayed leaves are the richeſt, and of all others the moſt proper manure for a garden. Leaves mixed with dung make excellent hot-beds; and I find that beds compounded in this manner, preſerve their heat much longer than when made entirely with dung; and in both caſes, the application of leaves will be a conſiderable ſaving of dung, which is a circumſtance on many accounts agreeable."

Oak-*Leaf-Galls*. Theſe are of ſeveral kinds; the remarkable ſpecies called the *muſhroom-gall* is never found on any other vegetable ſubſtance but theſe leaves; and beſide this there are a great number of other kinds.

The double gall of theſe leaves is very ſingular, becauſe the generality of productions of this kind affect only one ſide of a leaf or branch, and grow all one way; whereas this kind of gall extends itſelf both ways, and is ſeen on each ſide of the leaf, in form of two protuberances, oppoſite the one to the other. Theſe are of differently irregular ſhapes, but their natural figure ſeems that of two cones, with broad baſes, and very obtuſe points, though ſometimes they are round, or very nearly ſo.

Theſe make their firſt appearance on the leaf in April, and remain on it till June or longer. They are at firſt green, but afterwards yellowiſh, and are ſofter to the touch than many other of the productions of this kind: they are uſually about the ſize of a large pea, but ſometimes they grow to the bigneſs of a nut. When opened, they are found to be of that kind which are inhabited each by one inſect only, and each contain one cavity. The cavity in this is, however, larger than in any other gall of the ſize, or even in many others of three times the ſize; the ſides of it being very little thicker than the ſubſtance of the leaf.

It is not eaſy to aſcertain the origin of the ſeveral ſpecies of flies which are at times ſeen in this manner to come out of the ſame ſpecies of galls. It ſeems the common courſe of nature, that only one ſpecies of inſect forms one kind of gall; yet it may be, that two or three kinds may give origin to the ſame kind. There is, however, another occaſion of our ſeeing different ſpecies come out of different galls of the ſame kind; and this is the effect of the enemies of the proper inhabitants.

It might appear that the parent fly, when ſhe had formed a gall for the habitation of her worm offſpring, had placed it in an impregnable fortreſs: but this is not the caſe; for it frequently happens, that a fly, as ſmall perhaps as that which gave origin to the gall, produces a worm which is of the carnivorous kind, as the other feeds on vegetable juices. This little fly, well knowing that where there is one of theſe protuberances on a leaf, there is a tender and defenceleſs inſect within, pierces the ſides of the gall, and depoſits her egg within it. This, when it hatches into a worm, feeds upon the proper inhabitant; and finally, after devouring it, paſſes into the chryſalis ſtate, and thence appears in the form of its parent fly, and is ſeen making its way out of the gall, in the place of the proper inhabitant.

On opening theſe leaf galls, which are properly the habitation only of one animal, it is common to find two, the ſtronger preying upon the body of the other, and ſucking its juices as it does thoſe of the leaf; often it is found wholly employed in devouring its unoffending neighbour at once: this is probably the caſe when its time of eating is nearly over; and, in fine, when we find the gall inhabited by only one inſect, or containing only one chryſalis, as it ought in its natural ſtate to do, we are never certain that this is the proper inhabitant, as it may be one of theſe deſtroyers who has eaten up the other, and ſupplied its place. See APHIS and *Oak* PUCERON.

OAK *Saw-duſt* is now found to anſwer the purpoſes of tanning as well, at leaſt, as the bark. See TANNING.

OAK *of Jeruſalem*. See CHENOPODIUM.

OAKHAM, OCKHAM, or *Oakum*, in ſea-language, denotes the matter of old ropes untwiſted and pulled out into looſe hemp, in order to be uſed in caulking the ſeams, tree-nails, and bends of a ſhip, for ſtopping or preventing leaks.

OAKHAMPTON, a town of Devonſhire, which ſends two members to parliament; ſituated in W. lon. 4. 5. N. lat. 50. 48.

OANNES, a being in Chaldean mythology, repreſented as half a man and half a fiſh. According to Berofus and other fabulous writers, this monſter was the civilizer of the Chaldeans; to whom he taught a ſyſtem of juriſprudence ſo perfect as to be incapable of improvement. In diſcharging the duties of his office, he ſpent the day on dry land, but retired every night into the ocean or the river. See MYTHOLOGY.

OAR, a long piece of timber, flat at one end and round or ſquare at the other; and which being applied to the ſide of a floating veſſel, ſerves to make it advance upon the water. That part of the oar which is out of the veſſel, and enters into the water, is called the *blade*, or *waſte-plat*; and that which is within-board is termed the *loom*, whoſe extremity being ſmall enough to be graſped by the rowers, or perſons managing the oars, is called the *handle*. To puſh the boat or veſſel forwards by means of this inſtrument, the rowers turn their backs forward, and dipping the blade of the oar in the water, pull the handle forward ſo that the blade at the ſame time may move aft in the water: but ſince the blade cannot be ſo moved without ſtriking the water, this impulſion is the ſame as if the water were to ſtrike the blade from the ſtern towards the head: the veſſel is therefore neceſſarily moved according to this direction. Hence it follows, that ſhe will advance with the greater rapidity, by as much as the oar ſtrikes the water more forcibly. Thus it is evident, that an oar acts upon the ſide of a boat or veſſel like a lever of the ſecond claſs, whoſe fulcrum is the ſtation upon which the oar reſts on the boat's gunnel. In large veſſels, this ſtation is uſually called the *row-port*; but in lights and boats it is always termed the *row-lock*.

OARISTUS, or OARISTYS, a term in the Greek poetry, ſignifying a dialogue between a huſband and his wife; ſuch as that in the ſixth book of the Iliad between Hector and Andromache. Scaliger obſerves, that the oariſtus is not properly any particular little poem, or entire piece of poetry; but always a part of a great one. He adds, that the paſſage now cited in Homer is the only proper oariſtus extant in the ancient poets.

OAT, in botany. See AVENA. Under the word AVENA it was obſerved, that the native place of the common oat, cultivated in our fields, is unknown; that the only account of it, in its natural ſtate, which we then had, is in Anſon's Voyage; and that the report of ſuch an author reſpecting facts in natural hiſtory is not intitled to implicit credit. We had not then ſeen the Travels of Mr. Bruce, whoſe botanical knowledge is very ſuperior to that of moſt voyagers, or we ſhould have mentioned his account of the oats which he found growing wild in Arooſſi, a ſmall territory in Abyſſinia, not far from the ſource of the Nile: (See NILE). "Wild oats (ſays he) grow up here ſpontaneouſly to a prodigious height and ſize, capable often of concealing both the horſe and his rider, and ſome of the ſtalks being little leſs than an inch in circumference. They have, when ripe, the appearance of ſmall canes. The inhabitants make no ſort of uſe of this grain in any period of its growth: the uppermoſt thin huſk of it is beautifully variegated with a changeable purple colour; the taſte is perfectly good. I often made the meal into cakes in remembrance of Scotland." Our author informs us, that the Abyſſinians could never be brought to reliſh theſe cakes, which they ſaid were bitter, burnt their ſtomachs, and made them thirſty. He is, however, decidedly of opinion, that the wild oat of Arooſſi is the oat in its original ſtate; and that it has degenerated everywhere in Europe. From the facts which he ſtates, this opinion ſeems to be well founded.

OATH, an affirmation or promiſe, accompanied with an invocation of God to witneſs what we ſay; and with an imprecation of his vengeance, or a renunciation of his favour, if what we affirm be falſe, or what we promiſe be not performed. The laws of all civilized ſtates have required the ſecurity of an oath for evidence given in a court of juſtice, and on other occaſions of high importance; and the Chriſtian religion utterly prohibits ſwearing, except when oaths are required by legal authority. Indeed no ſerious and reflecting theiſt, whether he admit the truth of revelation or not, can look upon ſwearing on trivial occaſions as any thing elſe than a ſin of a very heinous nature. To call upon that infinite and omnipreſent Being, who created and ſuſtains the univerſe, to witneſs all the impertinence of idle converſation, of which great part is commonly uttered at *random*, betrays a ſpirit ſo profane, that nothing ſhort of experience could make us believe it poſſible for a creature endowed with reaſon and reflection to be habitually guilty of a practice ſo impious. No man can plead in extenuation of this crime, that he is tempted to ſwear by the importunity of any appetite or paſſion implanted in the human breaſt: for the utterance of a profane oath communicates no pleaſure, and removes no uneaſineſs; it neither elevates the ſpeaker, nor depreſſes the hearer.

Quakers and *Moravians*, ſwayed by theſe conſiderations, and by the ſenſe which they put upon certain texts of Scripture, refuſe to ſwear upon any occaſion, even at the requiſition of a magiſtrate, and in a court of juſtice. Theſe ſcruples are groundleſs; and ſeem to proceed from an incapacity to diſtinguiſh between the proper uſe and abuſe of ſwearing. It is unqueſtion-

ably impious to call upon God to witneſs impertinences, or to uſe his tremendous name as a mere *expletive* in converſation; but it by no means follows, that we may not piouſly call upon him to witneſs truths of importance, or invoke his name with reverence and ſolemnity. No individual could, without groſs profaneneſs, pray for a thouſand times more wealth than he may ever have occaſion to uſe; but it was never thought profane to pray "day by day for our daily bread, for rain from heaven, and fruitful ſeaſons." If it be lawful to aſk of God theſe earthly bleſſings, becauſe he alone can beſtow them; it cannot ſurely be unlawful, where the lives or properties of our neighbours, or the ſecurity of government is concerned, to invoke him with reverence to witneſs the truth of our aſſertions, or the ſincerity of our intentions; becauſe of our truth in many caſes, and of our ſincerity in all, none but he can be the witneſs.

The text of Scripture upon which the Quakers chiefly reſt their argument for the unlawfulneſs of all ſwearing under the Goſpel, is our Saviour's prohibition, (Mat. v. 34.): "I ſay unto you, ſwear not at all." But whoever ſhall take the trouble of turning over his Bible, and looking at the context, will perceive, that it is only in *ordinary converſation*, and by no means in courts of juſtice, that our Lord prohibits his followers from ſwearing at all. There is no evidence whatever, that ſwearing by *heaven*, by *the earth*, by *Jeruſalem*, or by their own *heads*, was the form of a *judicial oath* in uſe among the Jews. On the contrary, we are told by *Maimonides*, that "if any man ſwear by heaven or by earth, yet this is not an oath;" which ſurely he could not have ſaid, had ſuch been the forms of judicial ſwearing. Indeed they could not have admitted ſuch forms into their courts without expreſsly violating the law of Moſes, who commands them to "Fear the Lord (JEHOVAH) their God, to ſerve him, and to ſwear by his NAME." But the Jews, as every one knows, had ſuch a reverence for the name *Jehovah*, that they would not pronounce it on ſlight occaſions, and therefore could not ſwear by that name in common converſation. Hence, to gratify their propenſity to common ſwearing, they invented ſuch oaths as, by *heaven*, by *earth*, by *Jeruſalem*, by *the life of thy head*, &c. and by this contrivance they thought to avoid the guilt of profaning the name of JEHOVAH. Theſe, however, being appeals to inſenſible objects, either had no meaning, or were in fact, as our Saviour juſtly argues, oaths by that God whoſe creatures they were; ſo that the Jew who ſwore them was ſtill guilty of profaneneſs towards the very JEHOVAH whoſe name his ſuperſtition would not permit him to pronounce. But what puts it beyond all doubt that the uſe of judicial oaths is not wholly prohibited in the goſpel, is the conduct of our Saviour himſelf as well as of his apoſtle St. Paul. When Jeſus was ſimply *aſked* by the high prieſt, what it was which certain falſe witneſſes teſtified againſt him; we are told by the evangeliſts, that "he held his peace:" but being *adjured* by the living God to declare whether he was the Chriſt. the Son of God, or not; he immediately anſwered the high prieſt, without objecting to the *oath* (for ſuch it was) upon which he was examined St Paul, in his Epiſtle to the Romans, ſays, "*God is my witneſs*, that, without ceaſing, I make mention of you in my prayers;" and to the Corinthians, ſtill more ſtrongly, "*I call God for a record upon my ſoul*, that, to ſpare you, I came not as yet to *Corinth*." Both theſe expreſſions are of the nature of oaths; and the author of the Epiſtle to the Hebrews ſpeaks of the cuſtom of ſwearing judicially without any mark of cenſure or diſapprobation: "Men verily ſwear by the greater; and an oath for confirmation is to them an end of all ſtrife."

But though a nation has an undoubted right to require the ſecurity of an oath upon occaſions of real importance, we do not heſitate to ſay, that, in our opinion, it is ſomething worſe than bad policy to multiply oaths, and to hold out to the people temptations to perjure themſelves. The ſecurity which an oath affords, depends entirely upon the reverence which attaches to it in the mind of him by whom it is given; but that reverence is much weakened by the frequency of oaths, and by the careleſs manner in which they are too often adminiſtered. Mr. Paley obſerves, with truth, that "the levity and frequency with which oaths are adminiſtered, has brought about a general inadvertency to the obligation of them, which both in a religious and political view is much to be lamented: and it merits (continues he) public conſideration, whether the requiring of oaths on ſo many frivolous occaſions, eſpecially in the cuſtoms, and in the qualification for petty offices, has any other effect than to make them cheap in the minds of the people. A pound of tea cannot travel regularly from the ſhip to the conſumer without coſting *half a dozen oaths* at leaſt; and the ſame ſecurity for the due diſcharge of his office, namely that of an oath, is required from a *church-warden* and an *archbiſhop*, from a *petty conſtable* and the *chief juſtice* of England. Let the law continue its own ſanctions, if they be thought requiſite; but let it ſpare the ſolemnity of an oath: and where it is neceſſary, from the want of ſomething better to depend upon, to accept a man's own word or own account, let it annex to prevarication penalties proportioned to the public conſequence of the offence."

That theſe pernicious conſequences of frequent oaths are not felt only in England, we have the evidence of another reſpectable writer, whoſe acuteneſs well qualified him to obſerve, whilſt his ſtation in ſociety furniſhed him with the beſt opportunities of obſerving, the effects of repeated ſwearing upon the morals of Scotchmen. "Cuſtomhouſe oaths (ſays Lord Kames) have become ſo familiar among us, as to be ſwallowed without a wry face; and is it certain that bribery and perjury in electing parliament-members are not approaching to the ſame cool ſtate? Men creep on to vice by degrees. Perjury in order to ſupport a friend has become cuſtomary of late years; witneſs fictitious qualifications in the electors of parliament-men, which are made effectual by perjury: yet ſuch is the degeneracy of the preſent times, that no man is the worſe thought of upon that account. We muſt not flatter ourſelves, that the poiſon will reach no farther: a man who boggles not at perjury to ſerve a friend, will in time become ſuch an adept, as to commit perjury in order to ruin a friend when he becomes an enemy."

Beſides the frequency of oaths, we have mentioned the irreverent manner in which they are too often adminiſtered as one of the cauſes which make them cheap in the eſtimation of the people. In this view, the *form* of the oath, and the *ceremonies* with which it is required to be taken, are of conſiderable importance. "The forms of oaths in Chriſtian countries (ſays Mr. Paley) are very different; but in none, I believe, worſe contrived either to convey the meaning or to impreſs the obligation of an oath, than in England. In that country the juror, after repeating the promiſe or affirmation which the oath is intended to confirm, adds, 'ſo help me God;' or more frequently the ſubſtance of the oath is repeated to the juror by the officer or magiſtrate who adminiſters it; adding in the concluſion, 'ſo help you God.' The energy of the ſentence reſides in the particle *ſo*; *ſo*, i. e *hac lege*, 'upon condition of my ſpeaking the truth, or performing this promiſe, may God help me, and not otherwiſe.' The juror, whilſt he hears or repeats the words of the oath, holds his right hand upon a Bible, or other book containing the four goſpels. The concluſion of the oath ſometimes runs, '*ita me Deus adjuvet, et hæc ſancta evangelia*,' or 'ſo help me God, and the contents of this book;' which laſt clauſe forms a connection between the words and action of the juror, which before was wanting. The juror then kiſſes the book."

This obſcure and elliptical form, the excellent author juſtly obſerves, is ill calculated to impreſs the juror with reverence: and he ſeems to think great preference due to the form of judi-

cial oaths in Scotland. In that country the juror holds up his right hand towards heaven, and ſwears by Almighty God, and as he ſhall anſwer to God at the great day of Judgment, "that he will tell the truth, the whole truth, and nothing but the truth, ſo far as he knows, or it ſhall be aſked of him." This, if adminiſtered with dignity and reverence, is an oath ſufficiently ſolemn and well calculated to have the proper effect upon the mind of the juror, as it brings immediately into his view the Author of his being and the awful day of final retribution when every man ſhall receive the things done in his body according to that he hath done, whether it be good or evil. But when the magiſtrate, as is too often the caſe, repeats this ſolemn invocation without riſing from his ſeat at the name of the ſupreme Being, and in a tone of careleſsneſs which may convey to the ignorant juror an opinion that he has himſelf no ſerious belief that there ever will be a great day of judgment, the form, however excellent, makes not its full impreſſion.

But let us ſuppoſe the oath to be adminiſtered with the greateſt dignity and reverence, the words of the promiſe itſelf appear to us by no means unexceptionable. In a trial on life and death, we ſhould be glad to know what this oath binds the witneſs to declare. Is he to tell *all that he knows* touching the matter in queſtion? or only all that ſhall be *aſked* of him? If he be obliged, in virtue of his oath, to tell all that he knows, the clauſe—"or it ſhall be aſked of you" is ſuperfluous, and calculated to miſlead. If he be bound to tell nothing more of the truth than what ſhall be aſked of him, the word *or* ſhould be changed into *and*; he ſhould ſwear "to tell the truth, &c. ſo far as he knows, *and* it ſhall be aſked of him." The court, we believe, conſiders the witneſs as bound to declare every thing which he knows touching the matter in queſtion. The greater part of witneſſes, on the other hand, conſider themſelves as bound no farther by their oath than to give true anſwers to ſuch queſtions as ſhall be aſked of them. They would do well, however, to remember, that as oaths are deſigned for the ſecurity of the *public*, they muſt be interpreted in the ſenſe in which the public intends them, otherwiſe they afford no ſecurity. But the ſenſe of the public is the law; and as it belongs to the court to declare what the mind of the law is, the witneſs, who has any doubt concerning the extent of the obligation impoſed on him by the words of this oath, ſhould apply to the court for a ſolution of that doubt, which will be a ſafe guide to him reſpecting the evidence which he is to give. Should the court, in reſolving the doubts of a witneſs, give an opinion concerning the ſenſe of any other part of the oath contrary to what he apprehends to be the deſign of the law in impoſing it, he is bound to diſregard ſuch opinion; becauſe it is only where he himſelf is doubtful that the court has a right to interfere, and becauſe in all moral queſtions men muſt be finally determined by their own judgment and conſcience.

There is one caſe, and but one, in which, whatever ſenſe be put upon the words of the oath, no witneſs is obliged to declare the *whole* truth. It is when ſuch declaration would tend to accuſe himſelf of ſome legal crime; for as the laws of Scotland and England conſtrain no man to become his own accuſer, they muſt be conſidered as impoſing the oath of teſtimony with this tacit reſervation "The exception, however, muſt be confined to *legal* crimes. A point of honour, of delicacy, or of reputation, may make a witneſs backward to diſcloſe ſome circumſtance with which he is acquainted; but is no excuſe for concealment, unleſs it could be ſhown, that the law which impoſes the oath, intended to allow this indulgence to ſuch motives. The exception is alſo withdrawn by compact between the magiſtrate and the witneſs, when an accomplice is admitted to give evidence againſt the partners of his crime." But theſe are a ſort of witneſſes to whom a ſenſible jury will always liſten with a very cautious ear.

Oaths are either *aſſertory* or *promiſſory*. Aſſertory oaths are required both to confirm our veracity in evidence, and to give ſecurity to the public that we *believe* certain propoſitions conceived to be of public importance. An oath in *evidence* binds the juror to declare what he *knows* to be true, and nothing *but* what he knows to be true. An oath required to aſſure the public of our *belief* in the *truth* of any propoſition, cannot, without the guilt of perjury, be taken by any man, who, at the time of ſwearing, has the ſlighteſt doubt whether the propoſition be really true. Such an oath, however, though it unqueſtionably requires the ſincerity of the juror's belief at the time when it is given, cannot oblige him to continue in that belief as long as he may live; for belief is not in any man's power: it is the neceſſary conſequence of evidence, which *compels* the aſſent of the mind according as it appears to preponderate on the one ſide or on the other. No man, therefore, can be juſtly accuſed of perjury for holding opinions contrary to thoſe which he may formerly have ſworn to believe; becauſe his belief at the time of emitting his oath may have been the neceſſary reſult of the evidence which then appeared before him; and his change of opinion may have reſulted with the ſame neceſſity from ſuperior evidence which had been ſince thrown into the oppoſite ſcale, and made it preponderate. On this account we cannot help thinking, that all aſſertory oaths, except ſuch as are neceſſary to confirm teſtimony reſpecting *facts*, ought either to be aboliſhed or expreſſed with great caution. Of truths intuitively certain or capable of rigid demonſtration, no man of common ſenſe can entertain a doubt; and therefore the public never requires from individuals the ſolemnity of an oath as an aſſurance of their believing ſuch truths. But with reſpect to the truth of propoſitions which admit of nothing ſuperior to moral evidence on either ſide, a man of the moſt ſteady virtue may think differently at different periods of his life; and in ſuch caſes, the effect of an oath, if it have any effect, can only be either to ſhut the man's eyes againſt the light, or to make his integrity be cauſeleſsly queſtioned by thoſe who ſhall obſerve his change of belief.

Promiſſory oaths cannot, without the guilt of perjury, be given by him who, at the time of ſwearing, knows that it will not be in his power to fulfil the promiſe, or who does not ſeriouſly intend to fulfil it. A promiſſory oath cannot, without great guilt, be given by any man, who at the time of ſwearing believes the object of the promiſe to be in itſelf unlawful; for if he ſeriouſly mean to fulfil his oath, he calls upon Almighty God to witneſs his intention to commit a crime. Promiſſory oaths, give to the public greater ſecurity than a ſimple promiſe; becauſe the juror having the thoughts of God and of religion more upon his mind at the one time than at the other, offends with a higher hand, and in more open contempt of the divine power, knowledge, and juſtice, when he violates an oath, than when he breaks a promiſe. Yet it is certain that promiſſory oaths though more ſolemn and ſacred, cannot be binding when the promiſe without an oath would not be ſo in an inferior degree; for the ſeveral caſes of which, See PROMISE and ALLEGIANCE.

Coronation OATH. See KING.

OATHLAW, the name of a pariſh in Angus, about two miles from Forfar, chiefly remarkable for the remains of a Roman camp called *Battle dykes* (vulgarly *Black-dykes*), which is about a mile weſt of the church.

OBADIAH, or the *Prophecy of* OBADIAH, a canonical book of the Old Teſtament, which is contained in one ſingle chapter, and is partly an invective againſt the cruelty of the Edomites, who mocked and derided the children of Iſrael as they paſſed into captivity; and with other enemies their confederates, invaded and oppreſſed thoſe ſtrangers, and divided the ſpoil amongſt themſelves; and partly a prediction of the deliverance

of Iſrael, and of the victory and triumph of the whole church over her enemies.

Obadiah, the prophet, is believed to have been the ſame with the Governor of Ahab's houſe, mentioned in the firſt book of Kings (xviii. 3, &c.) who hid and fed the hundred prophets whom Jezebel would have deſtroyed; and ſome ſay, that he was that Obadiah whom Joſiah made overſeer of the works of the temple, (2. Chron. xxxiv. 12.) The truth is, that when he lived or propheſied is wholly uncertain: though moſt writers make him cotemporary with Hoſea, Amos, and Joel.

Obadiah, a valiant man of David's army, who came to join him in the wilderneſs, with ſeveral others of the tribe of Gad, (1 Chron. xii. 9.) This was alſo the name of one of thoſe whom king Jehoſhaphat ſent into the cities of Judah to inſtruct the people in their religion, (2. Chron. xvii. 7.) It was alſo the name of one of the principal men of Judah, who ſigned the covenant that Nehemiah renewed with the Lord, (Nehem. x. 5.)

OBED-EDOM, ſon of Jeduthun, a Levite, (1. Chr. xvi. 38.) and father of Shemaiah, Jehozabad, Joah, Sacar, Nathaneel, Ammiel, Iſſachar, and Peulthai. He had a numerous family, ſays the ſcripture, (1. Chr. xxvi. 4.) becauſe the Lord bleſſed him; and this is the occaſion of this bleſſing. When David transferred the ark of the covenant to the city of Jeruſalem, Uzzah having raſhly laid hands on the ark, which he thought to be in danger of falling, was ſmitten of God, and died upon the ſpot. David, terrified at this accident, durſt not remove the ark into the place he had provided for it in his own houſe, but ſet it up in the houſe of Obed-edom, which was near the place where Uzzah had been ſtruck dead. But the preſence of the ark not only created no temporal misfortune to the family of this Levite, but on the contrary the Lord heaped upon him all ſorts of bleſſings; which encouraged David ſome months after to remove it to the place he had appointed for it. Afterwards Obed-edom and his ſons were aſſigned to be keepers of the doors of the temple, (1. Chron. xv. 18, 21.) In the ſecond book of Samuel, (vi. 10.) Obed-edom is called the Gittite, probably becauſe he was of Gathrimmon, a city of the Levites beyond Jordan, (Joſh. xxi. 24, 25.)

OBELISK, in architecture, a truncated, quadrangular, and ſlender pyramid, raiſed as an ornament, and frequently charged either with inſcriptions or hieroglyphics. Obeliſks appear to be of very great antiquity, and to have been firſt raiſed to tranſmit to poſterity precepts of philoſophy, which were cut in hieroglyphical characters: afterwards they were uſed to immortalize the great actions of heroes, and the memory of perſons beloved. The firſt obeliſk mentioned in hiſtory was that of Ramaſes king of Egypt, in the time of the Trojan war, which was 40 cubits high. Phius, another king of Egypt, raiſed one of 55 cubits; and Ptolemy Philadelphus, another of 88 cubits, in memory of Arſinoë. Auguſtus erected one at Rome in the Campus Martius, which ſerved to mark the hours on an horizontal dial, drawn on the pavement. They were called by the Egyptian prieſts the *fingers of the ſun*, becauſe they were made in Egypt alſo to ſerve as ſtyles or gnomons to mark the hours on the ground. The Arabs ſtill call them *Pharaoh's needles*; whence the Italians call them *aguglia*, and the French *aiguilles*.

The famous obeliſks called the *devil's arrows*, now reduced to three, the fourth having been taken down in the laſt century, ſtand about half a mile from the town of Borough-Bridge to the ſouth-weſt, in three fields, ſeparated by a lane, 200 feet aſunder, nearly on high ground ſloping every way. Mr. Drake urges many arguments for their Roman antiquity, and plainly proves them to be natural and brought from Plumpton quarries about five miles off, or from Ickly 16 miles off. The croſs in the town, 12 feet high, is of the ſame kind of ſtone. The eaſternmoſt or higheſt is 22 feet and an half high by 4 broad, and $4\frac{1}{2}$ in girth; the ſecond $21\frac{1}{2}$ by $5\frac{1}{4}$; the third $16\frac{1}{2}$ by 84. Stukeley's meaſures differ. The flutings are cut in the ſtone, but not through: the talleſt ſtands alone, and leans to the ſouth. Plot and Stukeley affirm them to be Britiſh monuments, originally hewn ſquare. Dr. Gale ſuppoſed that they were Mercuries, which have loſt their heads and inſcriptions; but in a MS. note in his Antoninus, he acknowledges that he was miſinformed, and that there was no cavity to receive a buſt.

On the north ſide of Penrith in the church-yard are two ſquare obeliſks, of a ſingle ſtone each, 11 or 12 feet high, about 12 inches diameter and 12 by 8 at the ſides, the higheſt about 18 inches diameter, with ſomething like a tranſverſe piece to each, and mortiſed into a round baſe. They are 14 feet aſunder, and between them is a grave incloſed between four ſemicircular ſtones of the unequal lengths of five, ſix, and four and an half, and two feet high, having on the outſides rude carving, and the tops notched. This is called the *Giant's grave*, and aſcribed to Sir Ewan Cæſarius, who is ſaid to have been as tall as one of the columns, and capable of ſtretching his arms from one to the other, to have deſtroyed robbers and wild boars in Englewood foreſt, and to have had an hermitage hereabouts called *Sir Hugh's parlour*; but the conjectures reſpecting them are ſo various and contradictory, that our readers will readily excuſe our enlarging on them.

A little to the weſt of theſe is a ſtone called the *Giant's Thumb*, ſix feet high, 14 inches at the baſe contracted to 10, which is no more than a rude croſs, ſuch as is at Langtown in Cumberland and elſewhere: the circle of the croſs 18 inches diameter. M. Pouchard, in the Memoirs of the Academy of Inſcriptions, gives a very curious account of ſome celebrated Egyptian obeliſks. We cannot afford room to follow him; but thoſe who wiſh for further information on the ſubject, and who are not poſſeſſed of the original, will find a very good account of them in the Gentleman's Magazine for June 1748.

OBJECT, in philoſophy, ſomething apprehended or preſented to the mind by ſenſation or imagination. See Metaphysics.

Object-*Glaſs of a Teleſcope* or *Microſcope*, the glaſs placed at the end of the tube which is next the object. See Optics and Microscope.

OBJECTION, ſomething urged to overthrow a poſition, or a difficulty raiſed againſt an allegation or propoſition of a perſon we are diſputing with.

OBJECTIVE is uſed in the ſchools, in ſpeaking of a thing which exiſts no otherwiſe than as an object known. The exiſtence of ſuch a thing is ſaid to be objective.

OBIT (Lat.) ſignifies a funeral ſolemnity, or office for the dead, moſt commonly performed when the corpſe lies in the church uninterred. Alſo the anniverſary office, (2 Cro. 51. Dyer 313). The anniverſary of any perſon's death was called the *obit*; and to obſerve ſuch day with prayers and alms, or other commemoration, was the keeping of the obit. In religious houſes they had a regiſter, wherein they entered the obits or obitual days of their founders and benefactors; which was thence termed the *obituary*. The tenure of obit or chantry lands is taken away and extinct by 1 Edw. VI. c. 14. and 15 Car. II. c. 9.

OBLATI, in church-hiſtory, were ſecular perſons, who devoted themſelves and their eſtates to ſome monaſtery, into which they were admitted as a kind of lay-brothers. The form of their admiſſion was putting the bell-ropes of the church round their necks, as a mark of ſervitude. They wore a religious habit, but different from that of the monks.

OBLIGATION, in general, denotes any act whereby a perſon becomes bound to another to do ſomething; as to pay a ſum of money, be ſurety, or the like. Obligations are of three kinds, *viz.* natural, civil, and mixed. Natural obligations are entirely founded on natural equity; civil obligations on civil

authority alone, without any foundation in natural equity; and mixed obligations are thoſe which, being founded on natural equity, are farther enforced by a civil authority.

In a legal ſenſe, obligation ſignifies a bond, wherein is contained a penalty, with a condition annexed for the payment of money, &c. The difference between it and a bill is, that the latter is generally without a penalty or condition, though it may be made obligatory: and obligations are ſometimes by matter of record, as ſtatutes and recognizances. See the article BOND.

Moral OBLIGATION. See MORAL PHILOSOPHY.

OBLIQUE, in geometry, ſomething aſlant, or that deviates from the perpendicular. Thus an oblique angle is either an acute or obtuſe one, *i. e.* any angle except a right one.

OBLIQUE *Caſes*, in grammar, are all the caſes except the nominative. See GRAMMAR.

OBLIQUE *Line*, that which falling on another line, makes oblique angles with it, *viz.* one acute, and the other obtuſe.

OBLIQUE *Planes*, in dialling, are thoſe which decline from the zenith, or incline towards the horizon. See DIAL.

OBLIQUE *Sailing*, in navigation, is when a ſhip ſails upon ſome rhumb between the four cardinal points, making an oblique angle with the meridian; in which caſe ſhe continually changes both latitude and longitude. See NAVIGATION.

OBLIQUUS, in anatomy, a name given to ſeveral muſcles, particularly in the head, eyes, and abdomen. See ANATOMY, *Table of the Muſcles*.

OBLONG, in general, denotes a figure that is longer than broad: ſuch is a parallelogram.

OBOLARIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is bifid; the corolla campanulated and quadrifid; the capſule unilocular, bivalved, and polyſpermous; the ſtamina riſing from the diviſions of the corolla.

OBOLUS, an ancient ſilver money of Athens, the ſixth part of a drachma; worth ſomewhat more than a penny-farthing ſterling.—The word comes from the Greek ὀβολὸς, or ὀβελὸς, "ſpit, or broach;" either becauſe it bore ſuch an impreſſion; or becauſe, according to Euſtathius, it was in form thereof. But thoſe now in the cabinets of the antiquaries are round.

OBOLUS, in medicine, is uſed for a weight of ten grains, or half a ſcruple.

OBOTH, an encampment of the Hebrews in the wilderneſs. From Punon they went to Oboth, and from Oboth to Je-abarim, (Numb. xxi. 10. xxxiii. 43). Ptolemy ſpeaks of a city called Oboda, or Eboda, in Arabia Petræa, which is the ſame as Oboth. Pliny and the geographer Stephanus mention it alſo; Stephanus makes it belong to the Nabathæans, and Pliny to the Helmodeans, a people of Arabia. It was at Oboth that they worſhipped the god Obodos, which Tertullian joins with Dufares, another god or king of this country.

OBRECHT (ULRIC), a learned German, born of a noble family at Straſburg in 1646, where he filled the chairs of civil law and hiſtory with great diſtinction. He was of the Proteſtant religion; but when Louis XIV. made himſelf maſter of Straſburg, and went there with his court, he was prevailed on to change; and accordingly abjured in 1684, and put his inſtrument into the hands of Boſſuet biſhop of Meaux. The next year the king nominated him to preſide in his name in the ſenate of Straſburg, with the title of prætor royal, in imitation of the ancient Romans; from which time Mr. Obrecht applied himſelf entirely to public affairs. He was the editor, tranſlator, and writer, of ſeveral learned works; and died in 1701.

OBREPTITIOUS, an appellation given to letters patent, or other inſtruments, obtained of a ſuperior by ſurpriſe, or by concealing from him the truth.

OBSCURE, ſomething that is dark and reflects little light in material objects, or that is not clear and intelligible in the objects of the intellect.

OBSECRATION, in rhetoric, a figure whereby the orator implores the aſſiſtance of God or man.

OBSEQUENS (JULIUS), a Latin writer, conjectured to have lived before the emperor Honorius's reign. He made a collection of the prodigies which Livy related in his hiſtory. There are ſeveral editions of thoſe remains. Lycoſthenes endeavoured to ſupply what was wanting in the original.

OBSEQUIES, the ſame with funeral ſolemnities. See FUNERAL.

OBSERVATION, among navigators, ſignifies the taking the ſun's or the ſtars' meridian altitude, in order thereby to find the latitude.

OBSERVATORY, a place deſtined for obſerving the heavenly bodies; being generally a building erected on ſome eminence, covered with a terrace for making aſtronomical obſervations. The more celebrated obſervatories are,

1. The *Greenwich* obſervatory, built in 1676, by order of Charles II. at the ſolicitation of Sir Jonas Moore and Sir Chriſtopher Wren; and furniſhed with the moſt accurate inſtruments; particularly a noble ſextant of ſeven feet radius, with teleſcopic ſights.

2. The *Paris* obſervatory, built by the order of Louis XIV. in the Fauxbourg St. Jacques. It is a very ſingular, but withal a very magnificent building, the deſign of Monſieur Perault: it is 80 feet high; and at top is a terrace. The difference in longitude between this and the Greenwich obſervatory is 2° 20′. In it is a cave or cellar, of 10 feet deſcent, for experiments that are to be made far from the ſun, &c. particularly ſuch as relate to congelations, refrigerations, indurations, conſervations, &c.

3. *Tycho Brahe's* obſervatory, which was in the little iſland Ween, or Scarlet Iſland, between the coaſts of Schonen and Zealand in the Baltic. It was erected and furniſhed with inſtruments at his own expence, and called by him *Uraniburg*. Here he ſpent twenty years in obſerving the ſtars; the reſult is his catalogue.

4. *Pekin* obſervatory. Father Le Compte deſcribes a very magnificent obſervatory, erected and furniſhed by the emperor of China, in his capital, at the interceſſion of ſome Jeſuit miſſionaries, principally Father Verbeiſt, whom he made his chief obſerver.—The inſtruments are exceedingly large; but the diviſion leſs accurate, and the contrivance in ſome reſpects leſs commodious, than that of the Europeans. The chief are, An armillary zodiacal ſphere of ſix feet diameter; an equinoctial ſphere of ſix feet diameter; an azimuthal horizon of ſix feet diameter; a large quadrant ſix feet radius; a ſextant eight feet radius; and a celeſtial globe ſix feet diameter.

Obſervatories, as they are very uſeful, and indeed abſolutely neceſſary for aſtronomers, ſo they have become far more common than they were. There is a very excellent one now at Oxford, built by the truſtees of Dr. Radcliffe, at the expence of nearly 30,000l. At Cambridge there is as yet no public obſervatory. Over the great gate of Trinity college, indeed, there is one which is called *Sir Iſaac Newton's*, becauſe this great philoſopher had uſed it; but it is gone to decay. It were well if the univerſity would repair and preſerve it in memory of that truly great man. In St. John's too, there is a ſmall one. The late ingenious Mr. Cotes had uſed to give lectures in Sir Iſaac Newton's on experimental philoſophy. There are ſeveral very good ones in the Scotch univerſities; and there is an excellent one lately erected at Dublin.

5. *Bramins* obſervatory at Banares. Of this Sir Robert Barker's account will be found under the article BANARES.

OBSIDIANUS LAPIS, in the natural hiſtory of the ancients,

the name of a ſtone which they have alſo deſcribed under the name of the *Chian marble*. It is a very ſmooth and hard marble, extremely difficult to cut, but capable of a fine poliſh; and was uſed among the ancient Greeks for the purpoſe of making reflecting mirrors. The later writers have ſuppoſed the name *obſidianus* to be derived from ſomebody called *Obſidius*, who was the inventor of this uſe of it; but it ſeems only a falſe ſpelling of the word *opſianus*, απο της οψεως, from ſeeing the images of things in it. See GALLINACEUS *Lapis*.

OBSIDIONALIS, an epithet applied by the Romans to a ſort of crown. See the article CROWN.

OBSTETRICS, or the OBSTETRIC ART, the ſame with MIDWIFERY.

OBSTRUCTION, in medicine, ſuch an obturation of the veſſels as prevents the circulation of the fluids, whether of the ſound and vital, or of the morbid and peccant kind, through them.

OBTURATOR, in anatomy. See ANATOMY, *Table of the Muſcles*.

OBY, or OB, a large and famous river of Aſiatic Ruſſia, which iſſues from the Altin lake (called by the Ruſſians *Teleſkoi-Oſero)*, in latitude 52 degrees, and longitude 103 degrees 30 minutes. Its name ſignifies *Great*; and accordingly in Ruſſia it is often ſtyled the *Great River*. The Calmucks and Tartars call it *Umar*. Its ſtream is very large and ſmooth, its current being uſually ſlow; and it is in general between two and three hundred fathoms broad; though in ſome places it is much wider. It affords plenty of fiſh, and is navigable almoſt to the lake from which it ſprings. After a long winding courſe through a vaſt tract of land, in which it forms ſeveral iſlands, it empties itſelf in latitude 67 degrees, and longitude 86 degrees, into a bay, which, extending near 400 miles farther, joins the Ice Sea in latitude 73. 30. and longitude 90. The ſprings from which this river riſes, are not very copious; but it receives in its courſe the waters of a great number of conſiderable ſtreams. Of theſe, the Tom and the Irtis are the moſt conſiderable: the Tom falls into it in lat. 58. and the Irtis in lat. 61. and lon. 86. The exact courſe of this river was unknown, till the country was ſurveyed by the Ruſſians; who have given us tolerable maps of it and of all Siberia. The Oby forms the boundary between Europe and Aſia, and its courſe is upwards of 2000 miles in length.

OCCIDENT, in geography, the weſtward quarter of the horizon; or that part of the horizon where the ecliptic, or the ſun therein, deſcends into the lower hemiſphere; in contradiſtinction to *orient*. Hence we uſe the word *occidental* for any thing belonging to the weſt; as occidental bezoar, occidental pearl, &c.

OCCIPITAL, in anatomy, a term applied to the parts of the occiput, or back part of the ſkull.

OCCULT, ſomething hidden, ſecret, or inviſible. The occult ſciences are magic, necromancy, cabbala, &c. Occult qualities, in philoſophy, were thoſe qualities of body or ſpirit which baffled the inveſtigation of philoſophers, and for which they were unable to give any reaſon: unwilling however to acknowledge their ignorance, they deceived themſelves and the vulgar by an empty title, calling what they did not know *occult*.

OCCULT, in geometry, is uſed for a line that is ſcarcely perceivable, drawn with the point of the compaſſes or a leaden pencil. Theſe lines are uſed in ſeveral operations, as the raiſing of plans, deſigns of building, pieces of perſpective, &c. They are to be effaced when the work is finiſhed.

OCCULTATION, in aſtronomy, the time a ſtar or planet is hid from our ſight, by the interpoſition of the body of the moon or ſome other planet.

OCCUPANCY, in law, is the taking poſſeſſion of thoſe things which before belonged to nobody. This is the true ground and foundation of all PROPERTY, or of holding thoſe things in ſeveralty, which by the law of nature, unqualified by that of ſociety, were common to all mankind. But, when once it was agreed that every thing capable of ownerſhip ſhould have an owner, natural reaſon ſuggeſted, that he who could firſt declare his intention of appropriating any thing to his own uſe, and, in conſequence of ſuch his intention, actually took it into poſſeſſion, ſhould thereby gain the abſolute property of it; according to that rule of the law of nations, recogniſed by the laws of Rome, *Quod nullius eſt, id ratione naturali occupanti conceditur*.

This right of occupancy, ſo far as it concerns real property, hath been confined by the laws of England within a very narrow compaſs; and was extended only to a ſingle inſtance; namely, where a man was tenant *pour autre vie*, or had an eſtate granted to himſelf only (without mentioning his heirs) for the life of another man, and died during the life of *ceſtuy que vie*, or him by whoſe life it was holden: in this caſe, he that could firſt enter on the land, might lawfully retain the poſſeſſion ſo long as *ceſtuy que vie* lived, by right of occupancy.

This ſeems to have been recurring to firſt principles, and calling in the law of nature to aſcertain the property of the land, when left without a legal owner. For it did not revert to the granter, who had parted with all his intereſt, ſo long as *ceſtuy que vie* lived: it did not eſcheat to the lord of the fee; for all eſcheats muſt be of the abſolute entire fee, and not of any particular eſtate carved out of it, much leſs of ſo minute a remnant as this: it did not belong to the grantee; for he was dead: it did not deſcend to his heirs; for there were no words of inheritance in the grant: nor could it veſt in his executors; for no executors could ſucceed to a freehold. Belonging therefore to nobody, like the *bæreditas jacens* of the Romans, the law left it open to be ſeized and appropriated by the firſt perſon that could enter upon it, during the life of *ceſtuy que vie*, under the name of an occupant. But there was no right of occupancy allowed, where the king had the reverſion of the lands: for the reverſioner hath an equal right with any other man to enter upon the vacant poſſeſſion; and where the king's title and a ſubject's interfere, the king's ſhall always be preferred. Againſt the king therefore there could be no prior occupant, becauſe *nullum tempus occurrit regi*. And, even in the caſe of a ſubject had the eſtate *pour autre vie* been granted to a man *and his heirs* during the life of *ceſtuy que vie*, there the heir might, and ſtill may, enter and hold poſſeſſion, and is called in law a *ſpecial occupant*; as having a ſpecial excluſive right, by the terms of the original grant, to enter upon and occupy this *bereditas jacens*, during the reſidue of the eſtate granted: though ſome have thought him ſo called with no very great propriety; and that ſuch eſtate is rather a deſcendible freehold. But the title of *common occupancy* is now reduced almoſt to nothing by two ſtatutes; the one, 29 Car. II. c. 3. which enacts, that where there is no ſpecial occupant, in whom the eſtate may veſt, the tenant *pour autre vie* may deviſe it by will, or it ſhall go to the executors, and be aſſets in their hands for payment of debts: the other that of 14 Geo. II. c. 20. which enacts, that it ſhall veſt not only in the executors, but, in caſe the tenant dies inteſtate, in the adminiſtrators alſo; and go in courſe of a diſtribution like a chattel intereſt.

By theſe two ſtatutes the title of *common occupancy* is utterly extinct and aboliſhed: though that of *ſpecial occupancy*, by the heir at law, continues to this day; ſuch heir being held to ſucceed to the anceſtor's eſtate, not by deſcent, for then he muſt take an eſtate of inheritance, but as an occupant, ſpecially marked out and appointed by the original grant. The doctrine of common occupancy may, however, be uſefully remembered on the following account, amongſt others: That, as by

the common law no occupancy could be of incorporeal hereditaments, as of rents, tithes, advowſons, commons, or the like, (becauſe, with reſpect to them, there could be no actual entry made, or corporal ſeiſin had; and therefore by the death of the grantee *pour autre vie* a grant of ſuch hereditaments was entirely determined): ſo now, it is apprehended, notwithſtanding thoſe ſtatutes, ſuch grant would be determined likewiſe; and the hereditaments could not be deviſeable, nor veſt in the executors, nor go in a courſe of diſtribution. For the ſtatutes muſt not be conſtrued ſo as to create any new eſtate, or to keep that alive which by the common law was determined, and thereby to defeat the granter's reverſion; but merely to diſpoſe of an intereſt in being, to which by law there was no owner, and which therefore was left open to the firſt occupant. When there is a reſidue left, the ſtatutes give it to the executors, &c. inſtead of the firſt occupant; but they will not create a reſidue on purpoſe to give it to the executors. They only mean to provide an appointed inſtead of a caſual, a certain inſtead of an uncertain, owner of lands which before were nobody's; and thereby to ſupply this *caſus omiſſus*. and render the diſpoſition of the law in all reſpects entirely uniform: this being the only inſtance wherein a title to a real eſtate could ever be acquired by occupancy.

For there can be no other caſe deviſed, wherein there is not ſome owner of the land appointed by the law. In the caſe of a ſole corporation, as a parſon of a church, when he dies or reſigns, though there be no *actual* owner of the land till a ſucceſſor be appointed, yet there is a *legal, potential*, ownerſhip, ſubſiſting in contemplation of law; and when the ſucceſſor is appointed, his appointment ſhall have a retroſpect and relation backwards, ſo as to entitle him to all the profits from the inſtant that the vacancy commenced. And, in all other inſtances, when the tenant dies inteſtate, and no other owner of the lands is to be found in the common courſe of deſcents, there the law veſts an ownerſhip in the king, or in the ſubordinate lord of the fee, by eſcheat.

So alſo, in ſome caſes, where the laws of other nations give a right by occupancy, as in lands newly created, by the riſing of an iſland in a river, or by the alluvion or dereliction of the ſea; in theſe inſtances, the law of England aſſigns them an immediate owner. For Bracton tells us, that if an iſland ariſe in the *middle* of a *river*, it belongs in common to thoſe who have lands on each ſide thereof; but if it be nearer to one bank than the other, it belongs only to him who is proprietor of the neareſt ſhore: which is agreeable to, and probably copied from, the civil law. Yet this ſeems only to be reaſonable, where the ſoil of the river is equally divided between the owners of the oppoſite ſhores: for if the whole ſoil is the freehold of any one man, as it muſt be whenever a ſeveral fiſhery is claimed, there it ſeems juſt (and ſo is the uſual practice) that the iſlets, or little iſlands, ariſing in any part of the river, ſhall be the property of him who owneth the piſcary and the ſoil. However, in caſe a new iſland riſe in the *ſea*, though the civil law gives it to the firſt occupant, yet our's gives it to the king. And as to lands gained from the ſea; either by *alluvion*, by the waſhing up of ſand and earth, ſo as in time to make *terra firma*; or by *dereliction*, as when the ſea ſhrinks back below the uſual water-mark; in theſe caſes the law is held to be, that if this gain be by little and little, by ſmall and imperceptible degrees, it ſhall go to the owner of the land adjoining. For *de minimis non curat lex:* and, beſides theſe owners being often loſers by the breaking in of the ſea, or at charges to keep it out, this poſſible gain is therefore a reciprocal conſideration for ſuch poſſible charge or loſs. But if the alluvion or dereliction be ſudden and conſiderable, in this caſe it belongs to the king: for, as the king is lord of the ſea, and ſo owner of the ſoil while it is covered with water, it is but reaſonable he ſhould have the ſoil when the water has left it dry. So that the quantity of ground gained, and the time during which it is gained, are what make it either the king's or the ſubjects' property. In the ſame manner, if a river, running between two lordſhips, by degrees gains upon the one, and thereby leaves the other dry; the owner who loſes his ground thus imperceptibly has no remedy: but if the courſe of the river be changed by a ſudden and violent flood, or other haſty means, and thereby a man loſes his ground, he ſhall have what the river has left in any other place as a recompenſe for this ſudden loſs. And this law of alluvions and derelictions, with regard to *rivers*, is nearly the ſame in the imperial law; from whence indeed thoſe our determinations ſeem to have been drawn and adopted: but we ourſelves, as iſlanders, have applied them to *marine* increaſes; and have given our ſovereign the prerogative he enjoys, as well upon the particular reaſons before-mentioned, as upon this other general ground of prerogative, which was formerly remarked, that whatever hath no other owner is veſted by law in the king. See PREROGATIVE.

OCCUPANT, in law, the perſon that firſt ſeizes or gets poſſeſſion of a thing.

OCCUPATION, in a legal ſenſe, is taken for uſe or tenure: as in deeds it is frequently ſaid, that ſuch lands are, or were lately, in the tenure or occupation of ſuch a perſon.—It is likewiſe uſed for a trade or myſtery.

OCCUPIERS *of* WALLING, a term uſed in the ſalt-works for the perſons who are the ſworn officers that allot in particular places what quantity of ſalt is to be made, that the markets may not be overſtocked, and ſee that all is carried fairly and equally between the lord and the tenant.

OCEAN, that huge maſs of ſalt waters which encompaſſes all parts of the globe, and by means of which, in the preſent improved ſtate of navigation, an eaſy intercourſe ſubſiſts between places the moſt diſtant. The ocean is diſtinguiſhed into three grand diviſions. 1. The *Atlantic* ocean, which divides Europe and Africa from America, which is generally about 3000 miles wide. 2. The *Pacific* ocean, or South-ſea, which divides America from Aſia, and is generally about 10,000 miles over. And, 3. The *Indian* ocean, which ſeparates the Eaſt Indies from Africa; which is 3000 miles over. The other ſeas, which are called *oceans*, are only parts or branches of theſe, and uſually receive their names from the countries they border upon. For the ſaltneſs, tides, &c. of the ocean, ſee the articles SEA, TIDES, &c.

OCEANIDES (fab. hiſt.), ſea-nymphs, daughters of Oceanus, from whom they received their name, and of the goddeſs Tethys or Thetis. They were 3000 according to Apollodorus, who mentions the names of ſeven of them; Aſia, Styx, Electra, Doris, Eurynome, Amphitrite, and Metis. Heſiod ſpeaks of the eldeſt of them, which he reckons 41, Pitho, Admete, Prynno, Ianthe, Rhodia, Hippo, Callirhoe, Urania, Clymene, Idyia, Paſithoe, Clythia, Zeuxo, Galuxaure, Plexaure, Perſeis, Pluto, Thoe, Polydora, Meloboſis, Dione, Cerceis, Xanthe, Acaſta, Ianira, Teleſtho, Europa, Menestho, Petrea, Eudora, Calypſo, Tyche, Ocyroe, Criſia, Amphiro, with thoſe mentioned by Apollodorus, except Amphitrite. Hyginus mentions 16 whoſe names are almoſt all different from thoſe of Apollodorus and Heſiod; which difference proceeds from the mutilation of the original text. The Oceanides, like the reſt of the inferior deities, were honoured with libations and ſacrifices. Prayers were offered to them, and they were entreated to protect ſailors from ſtorms and dangerous tempeſts. The Argonauts, before they proceeded to their expedition, made an offering of flour, honey, and oil, on the ſea-ſhore, to all the deities of the ſea, and ſacrificed bulls to them, and intreated their protection. When the ſacrifice was made on the ſea-ſhore, the blood of the victim was received in a veſſel; but when it was in-

open ſea, they permitted the blood to run down into the waters. When the ſea was calm, they generally offered a lamb or a young pig; but if it was agitated by the winds and rough, a black bull was deemed the moſt acceptable victim.

OCEANUS, in Pagan mythology, the ſon of Cœlus and Terra, the huſband of Thetis, and the father of the rivers and fountains, called *Oceanides*. The ancients called him the *Father of all things*, imagining that he was produced by Humidity, which, according to Thales, was the firſt principle from which every thing was produced. Homer repreſents Juno viſiting him at the remoteſt limits of the earth, and acknowledging him and Thetis as the parents of the gods. He was repreſented with a bull's head, as an emblem of the rage and bellowing of the ocean when agitated by a ſtorm. According to Homer, he was the father even of all the gods, and on that account he received frequent viſits from them. He is often, indeed almoſt always, repreſented as an old man with a long flowing beard, and ſitting upon the waves of the ſea. He often holds a pike in his hand, while ſhips under ſail appear at a diſtance, or a ſea-monſter ſtands near him. Oceanus preſided over every part of the ſea, and even the rivers were ſubjected to his power. The ancients were ſuperſtitious in their worſhip of him, and revered with great ſolemnity a deity to whoſe care they entruſted themſelves when going on any voyage.

OCEIA, a woman who preſided over the ſacred rites of Veſta for 57 years with the greateſt ſanctity. She died in the reign of Tiberius, and the daughter of Domitius ſucceeded her.

OCELLUS *the* LUCANIAN, an ancient Greek philoſopher of the ſchool of Pythagoras, who lived before Plato. His work περι τα Παντος, or "The Univerſe," is the only piece of his which is come down entire to us; and was written originally in the Doric dialect, but was tranſlated by another hand into the Attic. William Chriſtian, and after him Lewis Nogarola, tranſlated this work into Latin; and we have ſeveral editions of it, both in Greek and Latin.

OCELOT, the Mexican cat. See FELIS.

OCELOXOCHITL, or TYGER FLOWER, in botany: A large Mexican plant, compoſed of three pointed petals, red, but towards the middle of a mixed white and yellow, repreſenting in ſome degree the ſpots of that wild animal from which it takes its name. The plant has leaves alſo reſembling thoſe of the iris, and a bulbous root. See Pl. 1.

OCHINUS (BERNARDIN), a celebrated Italian, was born at Sienne in 1487, and firſt became a Cordelier: but he quickly returned into the world, applied himſelf to the ſtudy of phyſic, and acquired the eſteem of cardinal Julius de Medicis, afterwards pope Clement VII. At length, again changing his mind, he reſumed his monk's habit in a penitential mood; and not content with this, but aiming at higher perfection, he embraced in 1534 the reformed ſect of the Capuchins. He practiſed, with a moſt rigorous exactneſs, all the rules of the order; which, being then in its infancy, he contributed ſo much to improve and enlarge, that ſome writers have called him the founder of it. He was certainly made vicar-general of it, and became in the higheſt degree eminent for his pulpit eloquence. He delivered his ſermons with ſo much grace and politeneſs, and ſpoke ſo copiouſly, that he raviſhed his audience wherever he was: never indeed was a man more ſucceſsful or more applauded. His extraordinary merit procured him the favour of pope Paul III. who, it is ſaid, made him his father confeſſor and preacher. He was thus the darling both of prince and people; when, falling into the company of one John Valde a Spaniard, who had imbibed Luther's doctrine in Germany, he became a proſelyte. He was then at Naples, and began to preach in favour of Proteſtantiſm: which being obſerved, he was ſummoned to appear at Rome; and was in his way thither when he met at Florence Peter Martyr, with whom, it is probable, he had become acquainted at Naples. This friend perſuaded him not to put himſelf into the pope's power; and they both agreed to withdraw to ſome place of ſafety. Ochinus went firſt to Ferrara, where he diſguiſed himſelf in the dreſs of a ſoldier; and proceeding thence to Geneva, arrived there in 1542, and married a woman of Lucca. He did not, however, ſettle there, but went to Augſbourg, where he publiſhed ſome ſermons.

In 1547 he was invited, together with Peter Martyr, into England by Archbiſhop Cranmer, that he might have their joint aſſiſtance in carrying on the reformation. They arrived in December; and going to Lambeth, were kindly received by Cranmer. They were entertained there for ſome time; and Ochinus, as well as Martyr, was made a prebendary of Canterbury. He laboured heartily in the conduct of the reformation; and his dialogue upon the unjuſt uſurped primacy of the biſhop of Rome was tranſlated into Latin by Ponet biſhop of Winchester, and publiſhed in 1549. But upon the death of Edward VI. being forced as well as Martyr to leave England, they retired to Straſburg, where they arrived in 1553. From this city Ochinus went to Baſil, and was invited thence in 1555 to Zurich, to be miniſter of an Italian church which was gathering there. This church conſiſted of ſome refugees from Locarno, one of the four bailiwicks which the Switzers poſſeſs in Italy; they being hindered from the public exerciſe of the reformed religion by the oppoſition of the Popiſh cantons. Ochinus had no difficulty to ſubſcribe the articles of faith agreed upon by the church of Zurich, and met in that city with Bullinger, who proved a very good friend to him. He governed this Italian church till 1563, when he was baniſhed thence by the magiſtrates of the town for publiſhing ſome dialogues, wherein he defended the doctrine of polygamy. From Zurich he went to Baſil; but not being ſuffered to ſtay there, he fled in great diſtreſs into Moravia, where he fell in with the Socinians, and joined them. Staniſlaus Lubienietſki, the great patron of this ſect, gives the following account of his laſt days in his *Hiſt. Reformat. Polon.* Ochinus, ſays he, retired into Moravia, and into Poland, and even there he was not out of the reach of Calvin's letters. He returned into Moravia after king Sigiſmund's edict; who in 1564 puniſhed with baniſhment all thoſe that were called Tritheiſts, Atheiſts, &c. Some gentlemen endeavoured to keep him in Poland: but he anſwered, that men muſt obey the magiſtrates, and that he would obey them, even were he to die among the wolves in the woods. During his travels, he fell ſick of the plague at Pinckſow, and received there all poſſible offices of kindneſs from one of the brethren, named Philippovius. His daughter and two ſons, whom he carried along with him, died of the plague; but he had buried his wife before he had left Zurich. As for himſelf, he continued his journey to Moravia, and within three weeks died at Slakow, in 1564, aged 77.

His character is variouſly repreſented by different authors, as was to be expected; for men like him have all manner of things, good and bad, ſaid and written of them, by ſomebody or other. Bayle ſays, that the confeſſion he made publicly, on the change of his religion, is remarkable. He acknowledged, in a preface, that if he could have continued, without danger of his life, to preach the truth, after the manner he had preached it for ſome years, he would never have laid down the habit of his order; but as he did not find within himſelf that courage which is requiſite to undergo martyrdom, he took ſanctuary in a Proteſtant country. His writings are numerous, but not bulky.

OCHLOCRACY, that form of government wherein the populace have the chief adminiſtration of affairs.

OCHNA, in botany: a genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The

corolla is pentapetalous; the calyx pentaphyllous; the berries monoſpermous, and affixed to a large roundiſh receptacle.

OCHRE, in natural hiſtory, a genus of earths, ſlightly coherent, and compoſed of fine, ſmooth, ſoft, argillaceous particles, rough to the touch, and readily diffuſible in water. Ochres are of various colours, as red, blue, yellow, brown, green, &c.

OCHROMA, in botany: a genus of the pentandria order, belonging to the monadelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The corolla conſiſts of ſix petals, three of which are external, and the other three internal; the antheræ unite and form a ſpiral pillar round the ſtyle; the capſule is long, and has five loculaments, which contain a number of black round ſeeds. Of this there is only one ſpecies, *viz.* the ochroma lagopus, the down-tree or corkwood. This tree is frequent in Jamaica, is of ſpeedy growth, and riſes to about 25 or 30 feet. The flowers are large and yellow. The capſules are about five inches long, rounded, and covered with a thin ſkin; which when dry falls off in five longitudinal ſegments, and leaves the fruit greatly reſembling a hare's foot. The down is ſhort, ſoft, and ſilky: it is uſed ſometimes to ſtuff beds and pillows; but, like other vegetable downs, is apt to get into clots: an inſipid clear gum exudes from the tree when wounded. The bark is tough, and its fibres are in a reticulated form: it might be made into ropes. The dried wood is ſo very light and buoyant, as to be uſed by the fiſhermen in Jamaica for their nets inſtead of pieces of cork.

OCHUS, a king of Perſia, ſon of Artaxerxes. He was cruel and avaricious; and in order to ſtrengthen himſelf on his throne, he murdered all his brothers and ſiſters. His ſubjects revolted; but he reduced them to obedience, and added Egypt to his other dominions. Bagoas his favourite eunuch poiſoned him for the inſults he had offered to Apis the god of the Egyptians; and he gave his fleſh to be eaten by cats, and made handles for knives with his bones. It ſeems to be not a little remarkable, that all thoſe monſters who diſgraced humanity by their crimes, and ſunk themſelves below the level of brutes, have met with condign puniſhment; and this in general ſeems true, whether we refer to ancient or modern times.—A man of Cyzicus, who was killed by the Argonauts.—A prince of Perſia, who refuſed to viſit his native country for fear of giving all the women each a piece of gold.—A river of India or of Bactriana.—A king of Perſia: he exchanged this name for that of Darius Nothus.

OCKHAM, Occam, or Occhim (William of), was a celebrated ſcholaſtic divine in the 14th century, of the order of Cordeliers. He was a native of England, and diſciple to the famous Duns Scotus. He was head of the Nominaliſts; and acquired ſo much celebrity, as to be denominated the *Invincible Doctor*. At the requeſt of Michael de Ceſena general of his order, he became a party-man with Lewis of Raviere, who was an avowed enemy of the church of Rome; and he really wrote vigorouſly againſt pope John XXII. and his ſucceſſors. Trithemius informs us, that he uſed to ſay to Lewis, "My Lord, let your ſword defend me, and my pen ſhall be always ready to ſupport you." He treated Charles and Clement in a book he wrote againſt them with groſs ſcurrility.

This, however, was a bold, dangerous, and imprudent ſtep, and cannot well be defended on any proper principle. The effect of it, as might be expected, was an accuſation againſt him and Ceſena. They were charged with maintaining, that neither Chriſt nor his apoſtles had any poſſeſſions at all, either in common or as private property. This doctrine gave riſe to that pleaſant queſtion called the *bread of the Cordeliers*; and conſiſted in determining, whether the dominion of things conſumed in the uſe, ſuch as bread and wine, belonged to them, or only the ſimple uſe of them, without the dominion? Their rule not permitting them to have any thing as property, Pope Nicolas III. who had been of their order, deviſed a method to enrich them, without breaking their rule. To this end he made an ordinance, that they ſhould have only the uſufruct of the eſtates which ſhould be given to them, and that the ſoil and fund of all ſuch donations ſhould belong to the Roman church at large. By this means he gave them the poſſeſſion of an almoſt infinite number of eſtates, in the name of the church of Rome, but on this account, Pope Nicolas's bull was revoked by John XXII. who condemned the uſe without the dominion by his *Extravaganta ad Conditorem*. He alſo condemned, by another *Extravaganta cum inter*, the doctrine about the poſſeſſion of eſtates by Chriſt and his apoſtles. Ockham and Ceſena were alſo excommunicated, becauſe they had departed from Avignon without the pope's licence, and had written againſt him. Ockham, however, was abſolved, as is ſaid, from this cenſure before he died, which was about the year 1347.

We have ſeveral pieces of his, which are written with conſiderable wit and ſubtilty. The reformed church ſometimes makes uſe of his reaſoning againſt the church of Rome. Melchior Goldaſt printed, in his treatiſe upon monarchy, 413 queſtions of Ockham. His works are mentioned by many authors.

OCKLEY (Simon), a learned orientaliſt, was born at Exeter in 1678 and educated at Queen's college, Cambridge, where he diſtinguiſhed himſelf by his intenſe application to literature. At the uſual time he took the degrees in arts, and that of bachelor in divinity; but marrying very young, was precluded from a fellowſhip in his college, and this occaſioned his being afterwards involved in many difficulties. In 1705 he was preſented to the vicarage of Swaveſey in Cambridgeſhire; and in 1711 he was choſen Arabic profeſſor of the univerſity. He was perfect maſter of the Arabic and other oriental tongues: the learned Reland ſaid of him, "Vir, ſi quis alius, harum literarum peritus." Afterwards, however, he had the misfortune to be confined for ſome time in Cambridge caſtle for debt. The above preferments, notwithſtanding, he enjoyed till his death, which happened on the 9th of Auguſt 1720. He wrote, 1. *Introductio ad Linguas Orientales*. 2. The hiſtory of the preſent Jews throughout the world; tranſlated from the Italian of Leo Modena, a Venetian rabbi. 3. The improvement of human reaſon, exhibited in the life of Hai Ebn Yokdhan, tranſlated from the Arabic. 4. An account of South-weſt Barbary, containing what is moſt remarkable in the kingdoms of Fez and Morocco; written by a perſon who had been a ſlave there a conſiderable time, and tranſlated from his manuſcript. 5. The hiſtory of the Saracens, collected from the moſt authentic Arabic authors, in 2 vols. 8vo. He was not only well ſkilled in the learned languages, but alſo in the modern, as French, Spaniſh, Italian, &c.

OCRA, a viſcous vegetable ſubſtance well known in the Weſt Indies, where it is uſed to thicken ſoup, and for other purpoſes.

OCRISIA (fab. hiſt.), the wife of Corniculus, was one of the attendants of Tanaquil the wife of Tarquinius Priſcus. As ſhe was throwing into the flames for offerings ſome of the meats that were ſerved on the table of Tarquin, ſhe ſuddenly ſaw, as is reported, in the fire what Ovid calls *obſcœni forma virilis*. She informed the queen of it; and when by her command ſhe had approached near it, ſhe conceived a ſon who was named Servius Tullius, and was educated in the king's family. He afterwards ſucceeded to the vacant throne. Some ſuppoſe that Vulcan had aſſumed that form which was preſented to the eyes of Ocriſia, and that this god was the father of the ſixth king of Rome.

OCTAETERIS, a cycle or term of eight years, in the Grecian chronology, at the concluſion of which three entire lunar

months were added. This cycle was in uſe till Meton's invention of the golden number or cycle of 19 years.

OCTAGON, or Octogon, in geometry, is a figure of eight ſides and angles; and this, when all the ſides and angles are equal, is called a *regular octagon*, or one that may be inſcribed in a circle.

Octagon, in fortification, denotes a place that has eight baſtions. See Fortification.

OCTAHEDRON, or Octaedron, in geometry, one of the five regular bodies, conſiſting of eight equal and equilateral triangles.

OCTANDRIA (ὀκτω "eight," and ἀνηρ a "man, or huſband,") the eighth claſs in Linnæus's ſexual ſyſtem; conſiſting of plants with hermaphrodite flowers, which are furniſhed with eight ſtamina, or male organs of generation. See Botany.

OCTANT, or Octile, in aſtronomy, that aſpect of two planets, wherein they are diſtant an eighth part of a circle, or 45° from each other.

OCTAPLA, in matters of ſacred literature, denotes a polyglot bible conſiſting of eight columns, and as many different verſions of the ſacred text; viz. the original Hebrew both in Hebrew and Greek characters, Greek verſions, &c.

OCTATEUCH, an appellation given to the eight firſt books of the Old Teſtament.

OCTAVE, in muſic. See Interval.

OCTAVIA, daughter of Caius Octavius and ſiſter to Auguſtus Cæſar. See the following article. She was one of the moſt illuſtrious ladies of ancient Rome; her virtues and her beauty were equally conſpicuous. Prideaux ſays ſhe was much handſomer than Cleopatra. She married Claudius Marcellus, and after his death M. Antony. Her marriage with Antony was a political match, to reconcile her brother and him together. Antony proved for ſome time attentive to her; but when he had ſeen Cleopatra, he neglected and deſpiſed her; but when ſhe attempted to withdraw him from this illegal amour by going to meet him at Athens, ſhe was rebuked and totally baniſhed from his preſence. This affront was highly reſented by her brother; and though Octavia endeavoured to pacify him by palliating Antony's behaviour, yet he reſolved to revenge her cauſe by arms. After the battle of Actium and the death of Antony, Octavia, forgetful of her own injuries, took into her houſe all the children of her huſband, and treated them with extraordinary tenderneſs. Marcellus, her ſon by her firſt huſband, was married to a niece of Auguſtus, and openly intended as a ſucceſſor to his uncle. His ſudden death plunged all the family into the greateſt grief. Virgil, whom Auguſtus patronized, undertook of himſelf to pay a melancholy tribute to the memory of a young man whom Rome had looked upon as her future father and patron. He was deſired to repeat his compoſition in the preſence of the emperor and his ſiſter. Octavia burſt into tears even when the poet began; but when he mentioned *Tu Marcellus eris*, ſhe ſwooned away. This tender and pathetic encomium upon the merit and the virtues of young Marcellus ſhe liberally rewarded, and Virgil received 10,000 ſeſterces, according to ſome 78l. 2s. 6d. for every one of the verſes. Octavia had two daughters by Antony, Antonia Major and Antonia Minor. The elder married L. Domitius Ahenobarbus, by whom ſhe had Cn. Domitius, who was the father of the Emperor Nero by Agrippina the daughter of Germanicus. Antonia Minor, who was as virtuous and as beautiful as her mother, married Druſus the ſon of Tiberius, by whom ſhe had Germanicus, and Claudius who reigned before Nero. The death of Marcellus conſtantly preyed upon the mind of Octavia, who died of grief or melancholy, about 11 years before the Chriſtian era. Her brother paid great regard to her memory, and pronounced her funeral oration himſelf. The Roman people alſo ſhowed their regard for her virtues, by wiſhing to pay her divine honours.—A daughter of the Emperor Claudius by Meſſalina. She was betrothed to Silanus; but, by the intrigues of Agrippina, ſhe was married to the Emperor Nero in the 16th year of her age. She was ſoon after divorced under pretence of barrenneſs; and the emperor married Poppæa, who exerciſed her enmity upon Octavia by procuring her to be baniſhed into Campania. She was afterwards recalled by the people; but Poppæa, who was determined on her ruin, cauſed her again to be baniſhed to an iſland, where ſhe was ordered to kill herſelf by opening her veins. Her head was cut off and carried to Poppæa.

OCTAVIANUS, or Octavius Cæsar, was nephew of Julius Cæſar the dictator, being the ſon of Accia his ſiſter by Octavius a ſenator, and afterwards became the ſecond emperor of Rome. He was born in the year of the city 691, during the conſulſhip of Cicero. His uncle Julius Cæſar adopted him, and left him the greateſt part of his fortune. When he was but 20 years of age, he was raiſed to the conſulſhip. His youth and inexperience were ridiculed by his enemies; notwithſtanding which obſtacle, his prudence and valour raiſed his conſequence. He made war againſt his opponents on pretence of avenging the aſſaſſination of his uncle. He engaged in five civil wars with great ſucceſs, viz. The wars of Mutina, Peruſia, Philippi, Sicily, and Actium: the firſt and laſt of which were againſt M. Antony; the ſecond againſt L. Antony brother of the triumvir; the third was againſt Brutus and Caſſius; and the fourth againſt Sext. Pompey, ſon of Pompey the Great. He united his forces with Antony's at the battle of Philippi; and had he not been ſupported by the activity and bravery of his colleague, he would doubtleſs have been totally ruined in that engagement. In his triumvirate with Antony and Lepidus, he obtained the weſtern parts of the Roman empire; and, like his other colleagues, more firmly to eſtabliſh his power, he proſcribed his enemies and cut them off. The triumvirate laſted for 10 years. He had given his ſiſter Octavia in marriage to Antony, to make their alliance more laſting; but when Cleopatra had charmed this unfortunate man, Octavia was repudiated. Auguſtus immediately took up arms to avenge the wrongs of his ſiſter; but perhaps more eagerly to remove a man whoſe power and exiſtence kept him in continual fear and conſtant dependence. Both parties met at Actium to decide the fate of Rome. Antony was ſupported by all the power of the Eaſt, and Auguſtus by Italy. Cleopatra fled from the battle with 60 ſhips, and her flight ruined the intereſt of Antony, who followed her into Egypt. The conqueror ſoon after went into Egypt likewiſe, beſieged Alexandria, and honoured with a magnificent funeral his unfortunate colleague and the celebrated queen; whom the fear of being led in the victor's triumph at Rome had driven to commit ſuicide. After he had eſtabliſhed peace all over the world, he ſhut the gates of the temple of Janus, A. U. C. 753. He was twice determined to lay down the ſupreme power; immediately after the victory obtained over Antony, and on account of his ill health; but his two faithful friends Mecænas and Agrippa diſſuaded him, and contended, that if he did he would leave it to be the prey of the moſt powerful, and expoſe himſelf to the greateſt dangers. He died at Nola in the 76th year of his age, after he had held the ſovereign power for 57 years.—He was an active emperor, and conſulted the good of the Romans with the greateſt anxiety and care. He viſited all the provinces except Africa and Sardinia, and his conſummate prudence and experience occaſioned many ſalutary laws. He is, however, accuſed of licentiouſneſs and adultery; but the goodneſs of his heart, the fidelity of his friendſhip, and the many good qualities which the poets whom he patronized have perhaps truly celebrated, made ſome, though in the eye of ſtrict religion and true morality but little, amends for his natural foibles. He was ambitious of being

eſteemed handſome; and as he was publicly reported to be the ſon of Apollo according to his mother's declaration, he wiſhed his flatterers to repreſent him with the figure and attributes of that god. Like Apollo, his eyes were clear, and he affected to have it thought that they poſſeſſed ſome divine irradiation, and was well pleaſed if when he fixed his eyes upon any body, they held down their eyes as if overcome by the glaring brightneſs of the ſun. He diſtinguiſhed himſelf by his learning; he was a complete maſter of the Greek language, and wrote ſome tragedies, beſides memoirs of his life and other works, which are now loſt. He married four times; but he was unhappy in all theſe connections; and his only daughter Julia diſgraced herſelf and her father by the debauchery and licentiouſneſs of her manners. He recommended at his death his adopted ſon Tiberius as his ſucceſſor. He left his fortune partly to him and to Druſus, and made donations to the army and Roman people. The title of Auguſtus was conferred upon him by the ſenate after the battle of Actium and the final deſtruction of the Roman republic. The title continued afterwards, being given to his ſucceſſors in the empire. Virgil is ſaid to have written his Æneid at the deſire of Auguſtus, whom he repreſents under the amiable and perfect character of Æneas.—The name of Octavius was very common at Rome; it was the name of a variety of men of very conſiderable rank.

OCTOBER, in chronology, the eighth month of Romulus's year, which the name implies; but tenth in the kalendar of Numa, Julius Cæſar, &c. The ſenate gave this month the name *Fauſtinus*, in compliment to Fauſtina, the wife of the Emperor Antoninus; Commodus would have it called *Invictus*; and Domitian named it *Domitianus*; but in ſpite of all theſe attempts it ſtill retains its original name. This month was ſacred to Mars, and under his protection.

October *Equus*, a horſe annually ſacrificed to Mars in the month of October, either becauſe the horſe is a warlike animal, or to puniſh him for the taking of Troy. A race was run with chariots drawn by two horſes, previous to the ſacrifices, and he that ran quickeſt was adjudged to be the victim.

OCTOSTYLE, in the ancient architecture, is the face of an edifice adorned with eight columns.

OCULUS, the EYE, in anatomy. See ANATOMY.

Oculus *Beli*, in natural hiſtory, one of the ſemipellucid gems, of a greyiſh white colour, variegated with yellow and with a black central nucleus: it is of a roundiſh form, and its variegations very beautifully repreſent the pupil and iris of the eye; whence the name.

Oculus *Mundi*, or *Lapis Mutabilis*. See HYDROPHANES.

Oculus *Cati*. See ASTERIA.

OCYMOPHYLLON, in botany: a name given by Buxbaum to a new genus of plants, the characters of which are theſe: The flower is of the ſtamineous kind, having no petals; this ſtands upon the embryo fruit, which afterwards becomes an oblong quadrangular ſeed-veſſel, divided into four cells, and containing roundiſh and very ſmall ſeeds; its leaves are like thoſe of the common ocymum or baſil, whence its name; and its place of growth is in damp marſhes. Boccone has deſcribed it under the improper name of *glaux*, calling it the *great, green-flowered, marſh-glaux*.

OCYMUM, ſee BASIL.

OCZAKOW, or OCZAKOFF, a town of Turkey in Europe, and capital of a Sangiack of the ſame name, inhabited by Tartars. During a late war, here was a Turkiſh garriſon of 20,000 men. However, it was taken by the Ruſſians in 1737, and all thoſe that reſiſted were put to the ſword. The Ruſſians themſelves loſt 18,000 men in the aſſault. The Turks returned the ſame year with 70,000 men to retake it; but were obliged to retire, after the loſs of 20,000. In 1738, the Ruſſians withdrew their garriſon, and demoliſhed the fortifications. It is ſeated on the river Bog, to the weſt of the Nieper, or rather where they both unite and fall into the Black Sea. It is 42 miles ſouth weſt of Bialagrod, and 190 north by eaſt of Conſtantinople. It has been lately a ſubject of great conteſt between the Ruſſians and Turks. The affair is freſh in our readers' memories; but the following more particular account of the place will not, we truſt, be unacceptable to our readers—It is called by the Turks *Dzain Crimenda*, is ſeated at the mouth of the Nieper into the Black Sea, 120 miles from Bender, to the ſouth-eaſt. The river is here above a mile broad. Hither the Turkiſh galleys retire which guard the mouth of the river, to prevent the Coſſacks from pirating upon the Black Sea. Here is no port, but good anchorage. It is defended by a caſtle, ſurrounded with walls 25 feet high; thoſe of the town are much lower. There are about 2000 people at Oczakow. Below the caſtle are two towns or ſuburbs, ſituated on the declivity of a hill, which on the other ſide has nothing but precipices. To the ſouth of theſe towns is another ſmall caſtle, where is ſome artillery to prevent veſſels from coming up the river. Here is alſo a tower, in which are always ſome Turks upon the watch to diſcover from afar any of the Coſſacks at ſea, and give notice of them to the galleys by a ſignal. The city is inhabited by Tartars, though garriſoned by Turks. E. lon. 30. 50. N. lat. 46. 50.

ODA, in the Turkiſh ſeraglio, ſignifies a claſs, order, or chamber. The grand ſignior's pages are divided into five claſſes or chambers. The firſt, which is the loweſt in dignity, is called the *great oda*, from the greater number of perſons that compoſe it; theſe are the juniors, who are taught to read, write, and ſpeak the languages. The ſecond is called the *little oda*, where from the age of 14 or 15 years, till about 20, they are trained up to arms, and the ſtudy of all the polite learning the Turks are acquainted with. The third chamber, called *kilar oda*, conſiſts of 200 pages, which, beſides their other exerciſes, are under the command of the kilardgi-bachi, and ſerve in the pantry and fruitery. The fourth conſiſts only of 24, who are under the command of khazineda-bachi, and have charge of the treaſure in the grand ſignior's apartment, which they never enter with cloaths that have pockets. The fifth is called *kas oda* or *privy-chamber*; and is compoſed of only 40 pages, who attend in the prince's chamber. Every night eight of theſe pages keep guard in the grand ſignior's bed-chamber while he ſleeps: they take care that the light, which is conſtantly kept in the room, does not glare in his eyes, leſt it ſhould awake him: and if they find him diſturbed with troubleſome dreams, they cauſe him to be awaked by one of their agas.

Oda-*Bachi*, or *Oddabaſſi*, an officer in the Turkiſh ſoldiery, equivalent to a ſerjeant or corporal among us. The common ſoldiers and janizaries, called *oldachis*, after having ſerved a certain term of years, are always preferred and made biquelairs; and of biquelairs in time become odabachis, *i. e.* corporals of companies, or chiefs of certain diviſions, whoſe number is not fixed; being ſometimes ten, and ſometimes twenty. Their pay is ſix doubles *per* month; and they are diſtinguiſhed by a large felt, a foot broad and above a foot long, hanging on the back, with two long oſtrich-feathers.

ODE, in poetry, a ſong, or compoſition proper to be ſung. See POETRY.

ODED, a prophet of the Lord, who, being at Samaria when the Iſraelites of the ten tribes returned from the war, with their king Pekah, together with 200,000 of the people of Judah captives, he went out to meet them, and ſaid, "You have ſeen that the Lord God of your fathers was in wrath againſt Judah; he has therefore delivered them into your hands, and you have ſlain them inhumanly, ſo that your cruelty has aſcended up into heaven; and more than this, you would make ſlaves of the children of Judah, who are your brethren, and would add this

ſin to the many others you have committed: therefore, hear the council that I give you; ſend back theſe captives, leſt the Lord ſhould pour out his fury upon you." Oded having done ſpeaking, ſome of the chiefs of Samaria ſeconded him, and by their remonſtrances prevailed with the Iſraelites to ſet the captives at liberty (2 Chron. xxviii). See AHAZ. The enlargement of the captives being obtained, the principal men of Samaria took care of them, gave them cloaths and food and other neceſſary aſſiſtances. After which they furniſhed them with horſes, becauſe the greateſt part of them were ſo tired and exhauſted that they were not able to walk. Thus they conducted them to Jericho, which was in the confines of the land of Judah. This is all that is come to our knowledge concerning the prophet Oded.

ODENSEE, the capital of the iſle of Funen, a place of ſuch high antiquity, that ſome Daniſh writers derive its foundation and name from Oden, the god and hero of the Gothic nations. "Its name certainly occurs (ſays Mr. Coxe) in the earlieſt ages of the Daniſh hiſtory; and it was a town of great note long before Copenhagen exiſted. Odenſee ſtands upon a ſmall river, not navigable, and about two miles from the bay of Stegeſtrand. Many of the houſes are ancient, bearing dates about the middle of the 16th century; but part is newly built: it contains about 5200 inhabitants, who carry on ſome commerce, exporting chiefly grain and leather; the latter is much eſteemed, and its goodneſs is ſuppoſed to ariſe from a certain property in the river water, in which it is ſoaked for tanning. The Daniſh cavalry are ſupplied from thence with the greateſt part of their leathern accoutrements.

"Odenſee is the ſeat of a biſhop, which was founded by Harald Blaatand in 980, and is the richeſt in Denmark next to Copenhagen. It has a ſchool, endowed by the celebrated Margaret of Valdemar, in which a certain number of ſcholars, from 6 to 16 years of age, are inſtructed gratis: they live and board in the town, and each receives a yearly penſion; other ſcholarſhips have been alſo founded by private perſons. The whole number amounted to 70. There is alſo a gymnaſium, inſtituted by Chriſtian IV. for the admiſſion of ſtudents at the age of 16. This ſeminary was ſtill further improved by the liberality of Holberg the Daniſh hiſtorian, who protected letters with the ſame zeal with which he cultivated them. It is now greatly fallen from its former flouriſhing ſtate, containing, when I paſſed through the town, only eight ſtudents. The cathedral is a large old brick building, which has nothing remarkable except ſome coſtly monuments of a private Daniſh family. The church which formerly belonged to the convent of Recolets, contains the ſepulchre of John king of Denmark, and of his ſon Chriſtian II." E. lon. 10. 27. N. lat. 55. 28.

ODENATUS, a celebrated prince of Palmyra. He very early inured himſelf to bear fatigues, and by hunting leopards and wild beaſts accuſtomed himſelf to the labours of a military life. He was a faithful friend to the Romans; and when Aurelian had been taken priſoner by Sapor king of Perſia, Odenatus warmly intereſted himſelf in his cauſe, and ſolicited his releaſe, by writing to the conqueror, and by ſending him preſents. The king of Perſia was offended at this liberty of Odenatus, he tore the letter, and ordered the preſents that were offered to be thrown into a river; and in order to puniſh Odenatus, who had the impudence, as he called it, to pay homage to ſo great a monarch as himſelf, he commanded him to appear before him, on pain of being devoted to inſtant deſtruction with all his family, if he dared to refuſe. Odenatus deſpiſed this haughty ſummons of Sapor, and oppoſed force by force. He obtained ſome conſiderable advantages over the troops of the Perſian king and took his wife priſoner, with a great and rich booty. Theſe ſervices were obſerved with gratitude by the Romans; and Gallienus, the then emperor, named Odenatus as his colleague on the throne, and gave the title of *Auguſtus* to his children and to his wife the celebrated Zenobia. Odenatus, inveſted with new power, reſolved to ſignaliſe himſelf more conſpicuouſly by conquering the barbarians of the North: but his exulting was of ſhort duration; he periſhed by the dagger of one of his own relations, whom he had ſlightly offended at a domeſtic entertainment. He died at Emeſſa about the 267th year of the Chriſtian era. Zenobia ſucceeded to his titles and honours.

ODER, a river of Germany, which has its ſource near a town of the ſame name in Sileſia, and on the confines of Moravia. It runs north through that province, and then into the Marche of Brandenburg and Pomerania, where it forms a large lake, afterwards falling into the Baltic Sea by three mouths; between which lie the iſlands Uſedom and Wollin. It paſſes by ſeveral towns; as Ratibor, Oppelen, Breſlau, Glogau, and Croſſen, in Sileſia; Francfort, Lebus, and Cuſtrin, in Brandenburg; and Gartz, Stetin, Cammin, Wollin, Uſedom, and Wolgaſt in Pomerania.

ODEUM, in Grecian antiquity, a muſic-theatre, built by Pericles; the inſide of which was filled with ſeats and ranges of pillars, and on the outſide the roof deſcended ſhelving downwards from a point in the centre, with many bendings, in imitation of the king of Perſia's pavilion. Here the muſical prizes were contended for; and here alſo, according to Ariſtophanes, was a tribunal.

ODIN (ſee FREA), in mythology, called alſo in the dialect of the Anglo-Saxons *Woden* or *Wodin*, a name given by the ancient Scythians to their ſupreme god, and aſſumed, about 70 years before the Chriſtian era, by Sigge, a Scythian prince, who conquered the northern nations, made great changes in their government, manners, and religion, enjoyed great honours, and had even divine honours paid him. According to the account given of this conqueror by Snorro, the ancient hiſtorian of Norway, and his commentator Torfæus, Odin was a Scythian, who withdrew himſelf, with many others in his train, by flight, from the vengeance of the Romans under the conduct of Pompey: and having officiated as prieſt in his own country, he aſſumed the direction of the religious worſhip, as well as the civil government, of the nations which he conquered. Having ſubdued Denmark, Sweden, and Norway, he retired to Sweden, where he died. There is nothing certain in this account; but it is probable, that the god, whoſe prophet or prieſt this Scythian pretended to be, was named *Odin*, and that the ignorance of ſucceeding ages confounded the Deity with his prieſt, compoſing out of the attributes of the one, and the hiſtory of the other, the character of the northern conqueror. He deluded the people by his enchantments and ſkill in magic: having cut off the head of one Mimer, who in his lifetime was in great reputation for wiſdom, he cauſed it to be embalmed, and perſuaded the Scandinavians that he had reſtored it to the uſe of ſpeech; and he cauſed it to pronounce whatever oracles he wanted. The Icelandic chronicles repreſent Odin as the moſt eloquent and perſuaſive of men; they aſcribe to him the introduction of the art of poetry among the Scandinavians, and likewiſe the invention of the Runic characters. He had alſo the addreſs to perſuade his followers, that he could run over the world in the twinkling of an eye; that he had the direction of the air and tempeſts; that he could transform himſelf into all ſorts of ſhapes, could raiſe the dead, could foretel things to come, deprive his enemies, by enchantment, of health and vigour, and diſcover all the treaſures concealed in the earth. They add, that by his tender and melodious airs he could make the plains and mountains open and expand with delight; and that the ghoſts, thus attracted, would leave their infernal caverns, and ſtand motionleſs about him. Nor was he leſs dreadful and furious in battle; changing himſelf into the ſhape of a bear, a wild

bull, or a lion, and amidſt ranks of enemies committing the moſt horrible devaſtation, without receiving any wound himſelf.

Dr. Henry gives this account of him: "Odin is believed to have been the name of the one true God among the firſt colonies who came from the eaſt and peopled Germany and Scandinavia, and among their poſterity for ſeveral ages. But at length a mighty conqueror, the leader of a new army of adventurers from the Eaſt, over-ran the north of Europe, erected a great empire, aſſumed the name of *Odin*, and claimed the honours which had been formerly paid to that deity. From thenceforward this deified mortal, under the name of *Odin* or *Wodin*, became the chief object of the idolatrous worſhip of the Saxons and Danes in this iſland, as well as of many other nations. Having been a mighty and ſucceſsful warrior, he was believed to be the god of war, who gave victory, and revived courage in the conflict. Having civilized, in ſome meaſure, the countries which he conquered, and introduced arts formerly unknown, he was alſo worſhipped as the god of arts and artiſts. In a word, to this Odin his deluded worſhippers impiouſly aſcribed all the attributes which belong only to the true God: to him they built magnificent temples, offered many ſacrifices, and conſecrated the fourth day of the week, which is ſtill called by his name in England and in all the other countries where he was formerly worſhipped. Notwithſtanding all this, the founders of all the kingdoms of the Anglo-Saxon heptarchy pretended to be deſcended from Wodin, and ſome of them at the diſtance of only a few generations."

Odin's *Fire*. We have this account of it in Gough's Cambden. "In Evie pariſh, in the Orkneys, near the ſea, are ſome rocks, which frequently in the night appear on fire; and the church of St. Michael there was often ſeen full of lights, called fires ſent by Odin to guard their tombs, but now ceaſed. This may be a meteor, or ſome inflammable matter on the cliffs, as at Charmouth Dorſet."

ODINUS, a celebrated hero of antiquity, who flouriſhed about 70 years before the Chriſtian era, in the northern parts of ancient Germany, or in the modern kingdom of Denmark. He was at the ſame time a prieſt, a ſoldier, a poet, a monarch, and a victor. He impoſed upon the credulity of his ſuperſtitious countrymen, and made them believe that he could raiſe the dead, and that he was acquainted with futurity. When he had extended his power, and increaſed his fame by conqueſt and by artifice, he determined to die in a different way from other men. He aſſembled his friends, and with the ſharp point of a lance he made in his body nine different wounds in the form of a circle; and when expiring he declared that he was going to Scythia, where he ſhould become an immortal god. He added, that he would prepare bliſs and felicity for thoſe of his countrymen who lived a virtuous life, who fought with bravery, and who died like heroes in the field of battle. Theſe injunctions had the wiſhed-for effect: his countrymen ſuperſtitiouſly believed him, and conſtantly recommended themſelves to his protection when they engaged in battle; and they entreated him to receive the ſouls of ſuch as fell in war.

De Odio *et Atia*. See *Falſe* Imprisonment. The writ *de odio et atia* was anciently uſed to be directed to the ſheriff, commanding him to inquire whether a priſoner charged with murder was committed upon juſt cauſe of ſuſpicion, or merely *propter odium et atiam*, for hatred and ill-will; and if upon the inquiſition due cauſe of ſuſpicion did not then appear, then there iſſued another writ for the ſheriff to admit him to bail. This writ, according to Bracton, ought not to be denied to any man: it being expreſsly ordered to be made out *gratis*, without any denial, by *magna charta*, c. 26. and ſtatute Weſtm. 2. 13 Edw. 1. c. 29. But the ſtatute of Glocester, 6 Edw. 1. c. 9. reſtrained it in the caſe of killing by miſadventure or ſelf-defence; and the ſtatute 28 Edw. III. c. 9. aboliſhed it in all caſes whatſoever: but as the ſtat. 42 Ed. III. c. 1. repealed all ſtatutes then in being, contrary to the great charter; Sir Edward Coke is of opinion that the writ *de odio et atia* was thereby revived. See Habeas *Corpus*.

ODO (St.), ſecond abbot of Clugni in France, was illuſtrious for learning and piety in the 10th century. The ſanctity of his life contributed greatly to enlarge the congregation of Clugni; and he was ſo eſteemed, that popes, biſhops, and ſecular princes, uſually choſe him the arbiter of their diſputes. He died about the year 942, and his works are printed in the Bibliotheque of Clugni.

Odo *Cantianus*, ſo called as being a native of Kent in England, was a Benedictine monk in the 12th century, in which order his learning and eloquence raiſed him to the dignity of prior and abbot. Archbiſhop Becket was his friend; and his panegyric was made by John of Saliſbury. He compoſed Commentaries on the Pentateuch, and the Second Book of Kings; Moral Reflections on the Pſalms; treatiſes intitled, *De onere Philiſtim*; *De moribus Eccleſiaſticis*; *De vitiis et virtutibus Animæ*, &c.

ODOACER, according to Ennodius, was meanly born, and only a private man in the guards of the Emperor Auguſtulus, when (A. D. 476, under the conſulſhip of Baſilicus and Armatus) the barbarians choſe him for their leader. The barbarians thought, as they often defended Italy, they had a right at leaſt to part of it: but upon demanding it they were refuſed, and the conſequence was a revolt. Odoacer is ſaid to have been a man of uncommon parts, capable alike of commanding an army or governing a ſtate. Having left his own country when he was very young, ſo ſerve in Italy, as he was of a ſtature remarkably tall, he was admitted among the emperor's guards, and continued in that ſtation till the above year; when, putting himſelf at the head of the barbarians in the Roman pay, who, though of different nations, had unanimouſly choſen him for their leader, he marched againſt Oreſtes, and his ſon Auguſtulus, who ſtill refuſed to ſhare any of the lands in Italy. The Romans were inferior both in numbers and valour, and were eaſily conquered: Oreſtes was ordered to be ſlain; but the emperor Auguſtulus was ſpared, and, though ſtripped of his dignity, was treated with humanity, and allowed a liberal ſum for his own ſupport and for that of his relations. Odoacer was proclaimed king of Italy; but aſſumed neither the purple nor any other mark of imperial conſequence. He was afterwards defeated and ſlain by Theodoric the Oſtrogoth. See Ostrogoth.

ODONTALGIA, the toothach, a well known and inconvenient diſeaſe, for which there is no radical cure but extraction. The application of laudanum or eſſential oils ſometimes alleviates the pain; and when that is occaſioned by expoſure of the nervous ſubſtance in conſequence of a hole in the tooth, filling the hole with gold leaf, or with lead, has proved a means of prevention.

ODONTOIDE, in anatomy, an appellation given to the proceſs of the ſecond vertebra of the neck, from its reſemblance to a tooth.

ODOROUS, or Odoriferous, appellations given to whatever ſmells ſtrongly, whether they be fetid or agreeable; but chiefly to things whoſe ſmell is briſk and pleaſant.

ODYSSEY, the name of an epic poem compoſed by Homer, which, when compared with the Iliad, exhibits its author as the ſetting ſun, whoſe grandeur remains without the heat of his meridian beams.

The poet's deſign in the Odyſſey was to paint the miſeries of a kingdom in the abſence of its ſupreme governor, and the evil conſequences reſulting from a diſregard of law and of that ſubordination without which ſociety cannot exiſt. With this view he ſets before his countrymen the adventures of a prince

who had been obliged to forſake his native country, and to head an army of his ſubjects in a foreign expedition; and he artfully contrives, without interrupting the narrative, to make the reader acquainted with the ſtate of the country in the abſence of its ſovereign. The chief, having glorioufly finiſhed the enterpriſe in which he was engaged, was returning with his army; but in ſpite of all his eagerneſs to be at home, he was detained on the way by tempeſts for ſeveral years, and caſt upon ſeveral countries differing from each other in manners and in government. In theſe dangers his companions, not ſtrictly obeying his orders, periſh through their own fault. In the mean time the grandees of his country abuſe the freedom which his abſence gave them; conſume his eſtate; conſpire to deſtroy his ſon; endeavour to compel his queen to accept one of them for her huſband; and indulge themſelves in every ſpecies of violence, from a perſuaſion that he would never return. In this they were diſappointed. He returns; and, diſcovering himſelf only to his ſon and ſome others who had maintained their allegiance, he is an eye-witneſs of the inſolence of his enemies, puniſhes them according to their deſerts, and reſtores to his iſland that tranquillity and repoſe to which it had been a ſtranger during the many years of his abſence.

Such is the fable of the Odyſſey, in which there is no opportunity of diſplaying that vigour and ſublimity which characteriſe the Iliad. "It deſcends (ſays Blair) from the dignity of gods and heroes, and warlike atchievements; but in recompence we have more pleaſing pictures of ancient manners. Inſtead of that ferocity which reigns in the other poem, this preſents us with the moſt amiable images of hoſpitality and humanity; entertains us with many a wonderful adventure; and inſtructs us by ſuch a conſtant vein of morality and virtue which runs through the poem," ſometimes in precepts, and always in the conduct of the hero, that we ſhould not wonder if Greece, which gave the appellation of *wiſe* to men who uttered ſingle ſentences of truth, had given to Homer the title of *the father of virtue*, for introducing into his work ſuch a number of moral maxims. As a poem, however, the Odyſſey has its faults. The laſt twelve books are tedious and languid; and we are diſappointed by the calm behaviour of Penelope upon the diſcovery of her long-loſt huſband.

OECONOMICS, the art of managing the affairs of a family or community: and hence the perſon who takes care of the revenues and other affairs of churches, monaſteries, and the like, is termed *œconomus*.

OECONOMY denotes the prudent conduct, or diſcreet and frugal management, whether of a man's own eſtate or that of another.

Animal Oeconomy comprehends the various operations of nature in the generation, nutrition, and preſervation of animals. See Generation, Nutrition, &c. The doctrine of the animal œconomy is nearly connected with phyſiology, which explains the ſeveral parts of the human body, their ſtructure, uſe, &c. See Anatomy and Medicine.

OECUMENICAL ſignifies the ſame with *general* or *univerſal*; as, œcumenical council, biſhop, &c.

OEDEMA, in medicine and ſurgery, a ſort of tumour of the ſoft parts without pain. It is attended with paleneſs and coldneſs of the ſkin, which yields little reſiſtance, and retains the print of the finger when preſſed with it, and accompanied with little or no pain. It obtains no certain ſituation in any particular part of the body, ſince the head, eye-lids, hands, and ſometimes part, ſometimes the whole body, is afflicted with it. When the laſt mentioned is the caſe, the patient is ſaid to be troubled with a cachexy, leucophlegmatia, or dropſy. But if any particular part is more ſubject to this diſorder than another, it is certainly the feet, which are at that time called *ſwelled* or *œdematous feet*.

OEDERA, in botany: A genus of the polygamia ſegregata order, belonging to the ſyngeneſia claſs of plants. The calyces are multiflorous; the corollets tubular, hermaphrodite, and one or two feminine ones ligulate; the receptacle is chaffy; the pappus with numerous chaff.

OEDIPUS, the unfortunate king of Thebes, whoſe hiſtory is partly fabulous, flouriſhed about 1266 B.C. It is ſaid he was given by his father to a ſhepherd, who was ordered to put him to death, in order to prevent the misfortunes with which he was threatened by an oracle. But the ſhepherd, being unwilling to kill him with his own hands, tied him by the feet to a tree, that he might be devoured by wild beaſts. The infant was however found in this ſituation by another ſhepherd named *Phorbas*, who carried him to Polybus king of Corinth; where the queen, having no children, educated him with as much care as if he had been her own ſon. When he was grown up, he was informed that he was not the ſon of Polybus: on which, by order of the oracle, he went to ſeek for his father in Phocis; but ſcarce was he arrived in that country, when he met his father on the road, and killed him without knowing him. A ſhort time after, having delivered the country from the monſter called the *Sphinx*, he married Jocaſta, without knowing that ſhe was his mother, and had four children by her; but afterwards, being informed of his inceſt, he quitted the throne, and, thinking himſelf unworthy of the light, put out his eyes. Eteocles and Polynices, who were celebrated amongſt the Greeks, were born of this inceſtuous marriage.

OEGWA, a town on the Gold Coaſt of Africa, ſtanding, according to Artus, on the brow of an eminence, raiſing itſelf by a gentle aſcent to a conſiderable height, and defended by rocks, againſt which the waves beat with the utmoſt violence, the noiſe of which is heard at a great diſtance. Barbot affirms, that Oegwa contains above 500 houſes, disjoined by narrow crooked ſtreets; and that from the ſea it has the appearance of an amphitheatre. Des Marchais reduces the number of houſes to 200, in the centre of which ſtands a large ſquare building, the repoſitory of their gold-duſt and other commodities. The houſes are built of earth and clay, but convenient, and well furniſhed with chairs, ſtools, mats, carpets, earthen pots, and even looking-glaſſes, which laſt they purchaſe from the Europeans. No part of the coaſt is better provided with all kinds of eatables, which are ſent in from the adjacent cantons, and ſold in public markets. Every thing is bought and ſold with gold-duſt, which is the ſtandard of all other commodities, and brought hither in great abundance from all quarters of Fetu, Abrambo, Aſſiento, and Mandingo. The gold is ſold by weight, and the quantity determined by nice ſcales, made in the country before it was frequented by the Europeans: a proof that thoſe negroes are not wholly ignorant of the more refined principles of mechanics. Next to gold, the chief commerce of the place conſiſts in the ſale of fiſh, of which they catch prodigious quantities on the coaſt. Although the natives are brave and warlike, yet in time of peace no people are more induſtrious, their whole time being employed in catching fiſh or cultivating the fruits of the earth. They are extremely expert in throwing the line, and fiſhing by the hook; nor is their intrepidity in combating the elements, and purſuing their employments in all kinds of weather, leſs aſtoniſhing. Every day in the week, except Wedneſday, which is facred to the Fetiche, they employ in their ſeveral occupations, and no ſeaſon of the year is exempted from fiſhing. Their canoes weather ſtorms which would endanger the largeſt ſhipping; and the negroes have the dexterity of making their advantage of thoſe ſeaſons which oblige others to diſcontinue their labours, by throwing their lines with the ſame ſucceſs in tempeſtuous as in calm weather.

OELAND, an iſland of Sweden, ſeated on the Baltic ſea, between the continent of Gothland and the Iſle of Gothland.

It lies between 56° and 57° of north latitude, and between 17° and 18° of east longitude. It is about 60 miles in length, and 15 in breadth; having a wholesome air, and a fertile soil, with rising hills, and several castles. It has no town of any great note.

OENANTHE, WATER (or HEMLOCK) DROPWORT: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The florets are difform; those of the disc sessile and barren; the fruit crowned with the calyx. There are five species; of which the most remarkable is the crocata, or hemlock dropwort, growing frequently on the banks of ditches, rivers, and lakes, in many parts of Britain. The root and leaves of this plant are a strong poison; several persons have perished by eating it through mistake, either for water-parsnips or for celery, which last it pretty much resembles in its leaves. So exceedingly deleterious is this plant, that Mr. Lightfoot tells us he has heard the late Mr. Christopher d'Ehret, the celebrated botanic painter, say, that while he was drawing it, the smell or effluvia only rendered him so giddy, that he was several times obliged to quit the room, and walk out in the fresh air to recover himself; but recollecting at last what might be the probable cause of his repeated illness, he opened the door and windows of the room, and the free air then enabled him to finish his work without any more returns of the giddiness. Mr. Lightfoot informs us, that he has given a spoonful of the juice of this plant to a dog, but without any other effect than that of making him very sick and stupid. In about an hour he recovered; and our author has seen a goat eat it with impunity. To such of the human species as have unfortunately eat any part of this plant, a vomit is the most approved remedy.

Lobel, Ray, and others, call this vegetable *œnanthe aquatica cicutæ facie*. It grows in great plenty all over Pembrokeshire, and is called by the inhabitants *five-fingered root*: it is much used by them in cataplasms for the felon or worst kind of whitlow. They eat some parts of it, but carefully avoid the roots or stalk. These indeed are of a most pernicious nature, and never fail to prove instantly fatal, unless a proper remedy is applied. The following instance, in addition to what has been said, of the effects of this plant on man, is given in the Gentleman's Magazine for July 1747.

Three French prisoners being in the fields near the town of Pembroke, dug up a large quantity of a plant with its roots (which they took to be wild celery) to eat with their bread and butter for dinner. After washing it, while yet in the fields, they all three ate, or rather only tasted, of the roots. As they were entering the town, one of them was seized with convulsions. The other two ran and sent a surgeon, who endeavoured first to bleed, and them vomit him; but in vain, and he died presently. Ignorant of the cause of their comrade's death, and of their own danger, they gave of these roots to eight other prisoners, who all ate some of them with their dinner. A few minutes after, the two who gathered the plants were seized in the same manner as the first; of which one died: the other was bled, and an emetic with great difficulty forced down, on account of his jaws being set. This operating he recovered; but was some time much affected with a dizziness in his head, though not sick, or in the least disordered in his stomach. The other eight, being bled and vomited immediately, were soon well.

It is of so much importance that this vegetable, its effects when eaten, and the means to be employed to prevent its being fatal, should be known, that we shall here introduce, from an Essay on Poisons by the late Dr. Houlston of Liverpool, the case of a boy killed by it:—

"The eldest son of the Rev. Mr. Kirkpatrick, about nine years old, rambling with several other children in the fields adjoining to the Leeds canal, near Liverpool, gathered, and gave to the others, a number of the roots of the hemlock dropwort, which he believed were what children call *earth-nuts*, and of which he ate a much greater quantity than the rest. As he was returning home he grew giddy; and, if he had not been prevented, would have reeled into the canal. His inability to direct his motions increased gradually, and he was soon after affected with stupor and convulsions. His mother, apprised of his situation, speedily came to him, and immediately, as she said, conceived the idea of his having eaten something, the effects of which were similar to the poison administered to Sir Theodosius Boughton, till which time no such thing had been apprehended. Some water out of the canal was given him to drink, and he vomited a considerable quantity of the root he had swallowed: he, however, grew worse, raved, became heavy, and convulsed, and was carried into a house adjoining. A surgeon in the neighbourhood was sent for; who, with a view to evacuate what he had taken, gave him a solution of emetic tartar, and a purgative glyster.

"He had swallowed at least twenty grains of the emetic tartar when I was sent for to him about eight in the evening. I found him quite in the epileptic state, with the pupil of the eye vastly dilated, total insensibility, and all the appearance of a person in the last degree of intoxication. Convinced, that unless the contents of the stomach could be expelled, no hope of his recovery remained, I gave, in solution, a scruple of white vitriol, most part of which was got down.

"The convulsions for some time past had been strong and frequent; they seemed to begin with an effort, as it were, to vomit, though after he got into the house he never vomited in the least. The head was drawn to the right side, and thrown back; general spasms succeeded, the eyes started prodigiously out from the sockets, and the tongue was thrust out and forcibly bitten. Some æther was sent for; and I poured a small quantity into the mouth, on the temples, &c. It was thought at times to relieve the fits, which interrupted the circulation so as to render the pulse imperceptible, and often to give reason to suppose it was irrecoverably stopped. In this manner, however, the scene was closed at last, rather placidly, about ten o'clock at night, after he had suffered thus above four hours. The respiration, though slow, continued tolerably easy almost to the last. The glyster operated a little before he died, and a very offensive stool followed.

"Notwithstanding the boy had thrown up a considerable quantity of the root, yet I had no doubt but that such a part of what he had eaten remained in the stomach, as would render every effort to save him ineffectual. The event unfortunately answered my expectation, and dissection confirmed the truth of the conjecture. There was found in the stomach above an handful of the root; and the surgeon noticed, very sensibly, the smell peculiar to it the moment he cut into the cellular membrane, though it was not twenty-four hours after death.

"Four of the other boys in company had partaken, though more sparingly, of the noxious repast; but on the first alarm vomits having been exhibited, they all escaped. One, however, was with difficulty made to vomit, though he took largely both emetic tartar and ipecacuanha; and he was affected with giddiness, drowsiness, and twitchings so much, that for some hours his recovery remained doubtful. He told me he had eat one root and an half; and more than two hours had elapsed before he was sensibly affected by it."

Dr. Houlston concludes this account with the following reflections:

"To render a poisonous vegetable in the stomach, which cannot be evacuated, inactive, is what we are yet unequal to:—to dilute it would probably be at least a vain attempt, if it did not (by the liquid acting as a menstruum) elicit, and render more active, the poisonous qualitity; and, unfortunately, to evacuate it after

it has remained long enough to produce, in a certain degree, its effects on the ſtomach, ſeems next to impoſſible. We ſhould, however, when there is the leaſt ground to ſuſpect any thing of this kind, immediately endeavour, by an active emetic, to evacuate the ſtomach whilſt there yet remains a poſſibility of doing it. On the early exhibition of a vomit in ſuch caſes depends its operation; and on that only, perhaps, the ſecurity of the patient."

This vegetable is ſo extremely like celery, and therefore, as in the above caſe, ſo apt to be miſtaken for it, that it cannot be enough guarded againſt by all who have a proper regard for themſelves. In the plate (ſee Pl. 2.), X is the ſhape of the root. *a*, The part cut from the ſtalk. *b*, A branch taken from the bottom of the ſtalk, where the leaves are largeſt. *c*, A top branch with the umbels of flowers. *d*, An anterior view of the flower in its natural ſize. *e*, A poſterior view of the ſame. *f*, The anterior appearance of the flower through a microſcope. *g*, The poſterior view of the ſame *h*, A view of the rudiments of the fruit after the decay of the flower. *i*, The ſame magnified. A *, The ſhape of a leaf of *celery*. B, A leaf of *parſley*. We have added to the figures of this dangerous plant theſe leaves of celery and parſley, which it ſo greatly reſembles, in order to ſhow our readers how careful they ought to be in caſe of an accident becauſe of this ſimilarity.

OENKJE, in botany, a ſpecies of iris. See IRIS.

OENOPTÆ, in Grecian antiquity, a kind of cenſors at Athens, who regulated entertainments, and took care that none drank too much, nor too little.

OENOS, in ornithology, the name uſed by authors for the ſtock-dove, or wood-pigeon, called alſo by ſome *vinago*, ſomewhat larger than the common pigeon, but of the ſame ſhape and general colour. Its neck is of a fine changeable hue, as differently oppoſed to the light; and its breaſt, ſhoulders, and wings, are of a fine purpliſh hue, or red wine colour, from whence it has its name *vinago*. Its legs are red, and feathered a little below the joint.

OENOTHERA, TREE-PRIMROSE: A genus of the monogynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quadrifid; the petals four; the capſule cylindric beneath; the ſeeds naked. There are ſeven ſpecies: the moſt remarkable of which are, 1. The *biennis*, or common biennial tree-primroſe. It hath a long, thick, deeply-ſtriking root; crowned with many large, oval, ſpear-ſhaped, plane ſpreading leaves; upright, thick, firm, rough, hairy ſtems, riſing three or four feet high; garniſhed with long, narrow, lanceolate, cloſe ſitting leaves, irregularly; and at all the axillas, from the middle upwards, large bright-yellow flowers. 2. *Octovalvis*, or octovalved, ſmooth, biennial tree-primroſe, hath upright, firm, ſomewhat hairy ſtems, riſing a yard high; oblong, ſpear-ſhaped, pointed, plane, ſmooth leaves; and at the axillas large bright-yellow flowers. 3. The *fruticoſa*, or ſhrubby, narrow-leaved, perennial tree primroſe, hath long thick roots; upright under-ſhrubby like red ſtems, two or three feet high; ſpear-ſhaped, lightly-indented leaves; and at the axillas pedunculated cluſters of yellow flowers, ſucceeded by pedicellated, acute-angled capſules. 4. The *pumila*, or low perennial tree-primroſe, hath fibrous roots, crowned with many oval, ſpear-ſhaped, cloſe-ſitting leaves; ſlender herbaceous ſtems from 10 to 12 inches long; garniſhed with ſpear-ſhaped, blunt, ſmooth leaves, having very ſhort foot-ſtalks; and at the axillas ſmalliſh bright-yellow flowers, ſucceeded by acute angled capſules.

All theſe plants flower very profuſely in June and July, coming out almoſt half the length of the ſtalks from the axillas; and as the ſtalk advances in ſtature new flowers are produced, ſucceeding thoſe below; in which order the plants continue flowering from about midſummer till October: each flower is moderately large and conſpicuous, conſiſting of four plane petals, which with the calyx form a very long tube below, and ſpreading above, generally expand moſt towards the evening; and are ſucceeded by plenty of ſeed in autumn for propagation.

Theſe plants are exotics from America; but are all very hardy, proſper in any common ſoil and ſituation, and have been long in the Engliſh gardens, eſpecially the three firſt ſorts; but the œnothera biennis is the moſt commonly known. The firſt and ſecond ſpecies are biennial, and the third and fourth are perennial in root. They are proper to be employed as plants of ornament for embelliſhig the pleaſure-garden; they may be placed anywhere, and will effect a very agreeable variety three or four months with their plentiful blow of flowers. The biennial kinds muſt be raiſed annually from ſeed, for they totally periſh after they have flowered. But the perennials, once raiſed, continue for years by the root. The propagation of all the ſorts is by ſeed, and the perennial alſo by parting the roots.

OENOTRIA, an ancient name Italy; ſo called from the *Oenotrii* (Virgil); inhabiting between Pæſtum and Tarentum, (Ovid.) Originally Arcadians (Dionyſius Halicarnaſſæus), who came under the conduct of Oenotrus ſon of Lycaon, 17 generations before the war of Troy, or 459 years, at 27 years each generation, and gave name to the people. Cato derives the name from *Oenotrus*, king of the Sabines and Etruſcans; but Varro from *Oenotrus*, king of the Latins; and Servius from the Greek name for wine, for which Italy was famous; of which opinion is Strabo.

OENOTRIDES (Strabo, Pliny), two ſmall iſlands in the Tuſcan ſea, over-againſt Velia, a town of Lucania, called *Pontia* and *Iſcia*; now *Penza* and *Iſchia*, on the coaſt of the Principato Cito Citra, or to the weſt of Naples. So called from the *Oenotri*, an ancient people of Italy.

OESEL, an iſland of the Baltic ſea, at the entrance of the gulph of Livonia. It is about 70 miles in length, and 50 in breadth, and contains 10 pariſhes. It is defended by the fortreſſes of Arenſburg and Sonneburg. It lies between 22° and 24° of eaſt longitude, and between 58° and 59° of north latitude.

OESOPHAGUS, in anatomy, the GULA, or *Gullet*, is a membranaceous canal, reaching from the fauces to the ſtomach, and conveying into it the food taken in at the mouth. See ANATOMY.

OESTRUS, in zoology, a genus of inſects belonging to the order of diptera. It has no mouth; but three punctures, without trunk or beak: Antennæ taper, proceeding from a lenticular joint. See Pl. 2. There are five ſpecies. 1. *Bovis*, *the breeze* or *gad-fly*. Thorax yellow, with a black tranſverſe line between the wings: abdomen tawny, with fine black tranſverſe lines; laſt ſegment black: wings white, with a brown tranſverſe line, and three brown ſpots. Size of the large blue fly. Depoſits its eggs under the ſkin on the backs of oxen, where the maggots are nouriſhed the whole winter till the month of June; and plague the cattle ſo all the ſummer, that they are obliged to fly for refuge into the water, and dare not quit it the whole day. 2. *The hæmorrhoidalis*. Body long, black, covered with tawny hair; middle of the thorax leſs hairy; wings immaculate; antennæ very ſhort: length half an inch. Depoſits its eggs in the rectum of horſes, and occaſions great torment. See BOTTS. 3. *Ovis*, *the grey fly*. Spotted with black; front pale-yellow; legs brownith; wings with ſhort black veins: length half an inch. Breeds in the frontal ſinus of ſheep; where the maggots, hatched from the eggs, lodge the whole winter, vellicating the internal membranes, and often bringing on death. 4. *The naſalis*. Body black; but the head, thorax, and abdomen, covered with pale-red hair, except the firſt ſegment of the latter, which is covered with white hair; the wings immaculate. Breeds in the fauces of horſes, entering

by their noſe. 5. *The tarandi.* Thorax yellow; with a black line between the wings, which are immaculate: abdomen tawny, laſt ſegment black. Infeſt the back of the rein-deer, ſo as greatly to retard the breed. The rein-deer of Lapland are obliged every year to fly to the alpine mountains, to eſcape the purſuit of theſe inſects: yet a fourth part of their number periſh by them at two years old; the reſt are emaciated, and have their ſkins ſpoiled.—It is one of the moſt curious genera of inſects. They are diſtinguiſhed into ſeveral ſpecies, by reaſon of the different places wherein they depoſite their eggs. Some, inſtructed by nature that their eggs cannot be hatched but under ſkins of living creatures, ſuch as bulls, cows, rein-deer, ſtags, and camels, fix upon them at the inſtant of laying their eggs. From the hinder part of their body iſſues a whimble of wonderful ſtructure. It is a ſcaly cylinder, compoſed of four tubes, which draw out like the pieces of a ſpying-glaſs; the laſt is armed with three hooks, and is the gimblet with which the œſtri bore through the tough hides of horned cattle. The animal ſeems to experience no pain from the puncture, unleſs the inſect, plunging too deep, attacks ſome nervous fibre; in which caſe, the beaſt runs about, and becomes furious. The eggs being hatched, the grub feeds on the matter of the wound. The place of its abode forms upon the body of the quadrupeds a bunch ſometimes above an inch high. When full grown, the larva breaks through the tumor, and ſlides down to the ground; for doing which it takes the cool of the morning, that it may neither be over-powered by the heat of the day, nor chilled by the cold of the night: it then digs itſelf a burrow, into which it retires. Its ſkin grows hard, and turns to a very ſolid ſhell. There it is transformed to a chryſalis, and afterwards to a winged inſect. Nature has provided for every exigence: the ſhell wherein the œſtrus is incloſed, is of ſo ſtrong a texture that it could not make its way out, if at one of the ends there were not a ſmall valve, faſtened only by a very ſlight filament. The firſt puſh the œſtrus makes, the door gives way and the priſon opens. The inſect wings its way to woods and places frequented by cattle.

'OETA (anc geog.), a mountain of Theſſaly, extending from Thermopylæ weſtward to the Sinus Ambracius, and in ſome meaſure cutting at right angles the mountainous country ſtretching out between Parnaſſus to the ſouth, and Pindus to the north. At Thermopylæ it is very rough and high, riſing and ending in ſharp and ſteep rocks, affording a narrow paſſage between it and the ſea from Theſſaly to Locris (Strabo), with two paths over it; the one above Trachis, very ſteep and high; the other through the country of the Ænianes, much eaſier and readier for travellers; by this it was that Leonidas was attacked in rear by the Perſians (Pauſanias). Here Hercules laid himſelf on the funeral pile (Silius Italicus, Ovid); the ſpot thence called *Pyra* (Livy), who ſays, that the extreme mountains to the eaſt are called *Oeta*; and hence the poets allege, that day, night, ſun, and ſtars, aroſe from Oeta (Seneca, Statius, Silius Italicus, Catullus, Virgil's *Culex*)—circumſtances which ſhow the height of this mountain.

OETING, a town of Germany, in Upper Bavaria, under the juriſdiction of Burkhauſen. It is divided into the upper and the lower town, and ſeated on the river Inn, eight miles weſt of Burkhauſen. E. lon. 12. 47. N. lat. 48. 0. There is a great reſort of pilgrims to the old chapel.

OETING, or *Oetingen*, a town of Germany, in the circle of Suabia, and capital of a county of the ſame name, ſeated on the river Wirnitz. E. lon. 10. 45. N. lat. 48. 52.

OETING, a county of Germany, in the circle of Suabia, bounded on the north and eaſt by Franconia; on the ſouth by the duchy of Neuburg; and on the weſt by that of Wirtemberg. It is about 40 miles from eaſt to weſt, and 20 from north to ſouth.

OFFA's-DYKE, an entrenchment caſt up by Offa, a Saxon king, to defend England againſt the incurſions of the Welch. It runs through Herefordſhire, Shropſhire, Montgomeryſhire, Denbighſhire, and Flintſhire.

OFFANTO, a river of Italy, in the kingdom of Naples. It riſes in the Apennine mountains, in the Farther Principato; and paſſing by Conza, and Monte Verde, it afterwards ſeparates the Capitanata from the Baſilicata and the Terra-di-Bari, and then it falls into the gulf of Venice, near Salpe.

OFFENCE, in law, an act committed againſt the law, or omitted where the law requires it.

OFFERINGS. The Hebrews had ſeveral kinds of offerings, which they preſented at the temple. Some were free-will offerings, and others were of obligation. The firſt fruits, the tenths, the ſin-offerings, were of obligation; the peace-offerings, vows, offerings of wine, oil, bread, ſalt, and other things, which were made to the temple or to the miniſters of the Lord, were offerings of devotion. The Hebrews called all offerings in general *corban*. But the offerings of bread, ſalt, fruits, and liquors, as wine and oil, which were preſented to the temple, they called *mincha*. The ſacrifices are not properly offerings, and are not commonly included under that name. See CORBAN and SACRIFICE.

The offerings of grain, meal, bread, cakes, fruits, wine, ſalt, and oil, were common in the temple. Sometimes theſe offerings were alone, and ſometimes they accompanied the ſacrifices. Honey was never offered with the ſacrifices; but it might be offered alone in the quality of firſt fruits. Now theſe were the rules that were obſerved in the preſenting of thoſe offerings, called in Hebrew *mincha*, or *kerlon mincha*; in the Septuagint, *offerings of ſacrifice*; and the ſame by St. Jerom, *oblationem ſacrificii*; but by our tranſlators, *meat-offerings*. (Lev. ii. 1, &c.) There were five ſorts of theſe offerings: 1. Fine flour or meal. 2. Cakes of ſeveral ſorts, baked in an oven. 3. Cakes baked upon a plate. 4. Another ſort of cakes, baked upon a gridiron, or plate with holes in it. 5. The firſt-fruits of the new corn, which were offered either pure and without mixture, or roaſted or parched in the ear, or out of the ear.

The cakes were kneaded with oil-olive, or fried with oil in a pan, or only dipped in oil after they were baked. The bread offered to be preſented upon the altar, was to be without leaven; for leaven was never offered upon the altar, nor with the ſacrifices. But they might make preſents of common bread to the prieſts and miniſters of the temple. See CAKE, &c.

The offerings now mentioned were appointed on account of the poorer ſort, who could not go to the charge of ſacrificing animals. And even thoſe that offered living victims were not excuſed from giving meal, wine and ſalt, which was to go along with the greater ſacrifices. And alſo thoſe that offered only oblations of bread or of meal, offered alſo oil, incenſe, ſalt, and wine, which were in a manner the ſeaſoning of it. The prieſt in waiting received the offerings from the hand of him that offered them; laid a part of them upon the altar, and reſerved the reſt for his own ſubſiſtence: that was his right as a miniſter of the Lord. Nothing was burnt quite up but the incenſe, of which the prieſt kept back nothing for his own ſhare.

When an Iſraelite offered a loaf to the prieſt, or a whole cake, the prieſt broke the loaf or the cake into two parts, ſetting that part aſide that he reſerved to himſelf, and broke the other into crumbs; poured oil upon it, ſalt, wine, and incenſe: and ſpread the whole upon the fire of the altar. If theſe offerings were accompanied by an animal for a ſacrifice, it was all thrown upon the victim, to be conſumed along with it.

If theſe offerings were the ears of new corn, either of wheat or barley, theſe ears were parched at the fire or in the flame, and rubbed in the hand, and then offered to the prieſt in a veſſel; over which he put oil, incenſe, wine, and ſalt, and then burnt it upon the altar, firſt having taken as much of it as of right belonged to himſelf.

The greateſt part of theſe offerings were voluntary, and of

pure devotion. But when an animal was offered in ſacrifice, they were not at liberty to omit theſe offerings. Every thing was to be ſupplied that was to accompany the ſacrifice, and which ſerved as a ſeaſoning to the victim. There are ſome caſes in which the law requires only offerings of corn, or bread: for example, when they offered the firſt-fruits of their harveſt, whether they were offered ſolemnly by the whole nation, or by the devotion of private perſons.

As to the quantity of meal, oil, wine, or ſalt, which was to go along with the ſacrifices, we cannot eaſily ſee that the law had determined it. Generally the prieſt threw an handful of meal or crumbs upon the fire of the altar, with wine, oil, and ſalt in proportion, and all the incenſe. All the reſt belonged to him, the quantity depended upon the liberality of the offerer. We obſerve in more places than one, that Moſes appoints an aſſaron, or the tenth part of an ephah of meal, for thoſe that had not wherewithal to offer the appointed ſin-offerings. (Lev. v. 11. xiv. 21.) In the ſolemn offerings of the firſt-fruits for the whole nation, they offered an entire ſheaf of corn, a lamb of a year old, two tenths or two aſſarons of fine meal mixed with oil, and a quarter of an hin of wine for the libation. (Lev. xxiii. 10, 11, 12, &c.)

In the ſacrifice of jealouſy (Numb. v. 15.), when a jealous huſband accuſed his wife of infidelity, the huſband offered the tenth part of a ſatum of barley-meal, without oil or incenſe, becauſe it was a ſacrifice of jealouſy, to diſcover whether his wife was guilty or not.

The offerings of the fruits of the earth, of bread, of wine, oil, and ſalt, are the moſt ancient of any that have come to our knowledge. Cain offered to the Lord of the fruits of the earth, the firſt-fruits of his labour (Gen. iv. 3, 4.) Abel offered the firſtlings of his flocks, and of their fat. The heathen have nothing more ancient in their religion, than theſe ſorts of offerings made to their gods. They offered clean wheat, flour, and bread.

OFFICE, a particular charge or truſt, or a dignity attended with a public function. See HONOUR.—The word is primarily uſed in ſpeaking of the offices of judicature and policy; as the office of ſecretary of ſtate, the office of a ſheriff, of a juſtice of peace, &c.

OFFICE alſo ſignifies a place or apartment appointed for officers to attend in, in order to diſcharge their reſpective duties and employments; as the ſecretary's office, ordnance-office, exciſe-office, ſignet-office, paper-office, pipe-office, ſix-clerks office, &c.

OFFICE, in architecture, denotes all the apartments appointed for the neceſſary occaſions of a palace or great houſe; as kitchen, pantries, confectionaries, &c.

OFFICE, in the canon-law, is uſed for a benefice that has no juriſdiction annexed to it.

Duty upon OFFICES *and Penſions*, a branch of the king's extraordinary perpetual revenue, conſiſting in a payment of 1s. in the pound (over and above all other duties) out of all ſalaries, fees, and perquiſites, of offices and penſions payable by the crown. This highly-popular taxation was impoſed by ſtat. 31 Geo. II. c. 22. and is under the direction of the commiſſioners of the land-tax.

OFFICER, a perſon poſſeſſed of a poſt or office. See the preceding article. The great officers of the crown, or ſtate, are, The lord high-ſteward, the lord high-chancellor, the lord high-treaſurer, the lord-preſident of the council, the lord privy-ſeal, the lord-chamberlain, the lord high-conſtable, and the earl-marſhal; each of which ſee under its proper article.

Non-commiſſioned OFFICERS, are ſerjeant-majors, quarter-maſter ſerjeants, ſerjeants, corporals, drum and fife-majors; who are nominated by their reſpective captains, and appointed by the commanding officers of regiments, and by them reduced without a court-martial.

Orderly non-commiſſioned OFFICERS, are thoſe who are orderly, or on duty for that week; who, on hearing the drum beat for orders, are to repair to the place appointed to receive them, and to take down in writing, in the orderly-book, what is dictated by the adjutant, or ſerjeant-major: they are then immediately to ſhow theſe orders to the officers of the company, and afterwards warn the men for duty.

Flag OFFICERS. See FLAG *Officers*, and ADMIRALS.

Commiſſion OFFICERS, are ſuch as are appointed by the king's commiſſion. Such are all from the general to the cornet and enſign incluſive. They are thus called in contradiſtinction to non-commiſſioned officers. See *Non-commiſſioned* OFFICERS.

General OFFICERS, are thoſe whoſe command is not limited to a ſingle company, troop, or regiment; but extends to a body of forces compoſed of ſeveral regiments: ſuch are the general, lieutenant-general, major-general, and brigadier.

OFFICERS *of the Houſehold*. See the article HOUSEHOLD.

Staff OFFICERS, are ſuch as, in the king's preſence, bear a white ſtaff or wand; and at other times, on their going abroad, have it carried before them by a footman bare-headed: ſuch are the lord-ſteward, lord-chamberlain, lord treaſurer, &c. The white ſtaff is taken for a commiſſion; and, at the king's death, each of theſe officers breaks his ſtaff over the hearſe made for the king's body, and by this means lays down his commiſſion, and diſcharges all his inferior officers.

Subaltern OFFICERS, are all who adminiſter juſtice in the name of ſubjects; as thoſe who act under the earl marſhal, admiral, &c. In the army, the ſubaltern officers are the lieutenants, cornets, enſigns, ſerjeants, and corporals.

OFFICIAL, in the canon law, an eccleſiaſtical judge, appointed by a biſhop, chapter, abbot, &c. with charge of the ſpiritual juriſdiction of the dioceſe.

OFFICIAL is alſo a deputy appointed by an archdeacon as his aſſiſtant, who ſits as judge in the archdeacon's court.

OFFICINAL, in pharmacy, an appellation given to ſuch medicines, whether ſimple or compound, as are required to be conſtantly kept in the apothecaries ſhops. The *officinal ſimples* are appointed, among us, by the college of phyſicians; and the manner of making the compoſitions directed in their diſpenſatory. See PHARMACY.

OFFING, or OFFIN, in the ſea-language, that part of the ſea, a good diſtance from ſhore, where there is deep water, and no need of a pilot to conduct the ſhip: thus, if a ſhip from ſhore be ſeen ſailing out to ſeaward, they ſay, *ſhe ſtands for the offing*; and if a ſhip, having the ſhore near her, have another a good way without her, or towards the ſea, they ſay, *that ſhip is in the offing*.

OFF-SETS, in gardening, are the young ſhoots that ſpring from the roots of plants; which being carefully ſeparated, and planted in a proper ſoil, ſerve to propagate the ſpecies.

OFF-SETS, in ſurveying, are perpendiculars let fall, and meaſuring from the ſtationary lines to the hedge, fence, or extremity of an incloſure.

OGEE, or O. G. in architecture, a moulding conſiſting of two members, the one concave and the other convex; or of a round and hollow, like an S. See ARCHITECTURE.

OGHAMS, a particular kind of ſteganography, or writing in cypher practiſed by the Iriſh; of which there were three kinds: The firſt was compoſed of certain lines and marks, which derived their power from their ſituation and poſition, as they ſtand in relation to one principal line, over or under which they are placed, or through which they are drawn: the principal line is horizontal, and ſerveth for a rule or guide, whoſe upper part is called the left, and the under ſide the right; above, under, and through which line, the characters or marks are drawn, which ſtand in the place of vowels, conſonants, diphthongs, and triphthongs. Some authors have doubted the exiſtence of this ſpecies of writing in cypher, called *Ogham*, among the Iriſh;

but theſe doubts are perhaps ill-founded; for ſeveral MSS. in this character ſtill exiſt, from which Mr. Aſtle has given a plate of them.

OGILBY (John), an eminent writer, was born in or near Edinburgh, about the 17th of November 1600. His father having ſpent his eſtate, and being priſoner in the King's Bench for debt, could contribute but little to his education: however, he obtained ſome knowledge in the Latin grammar, and afterwards ſo much money as to procure his father's diſcharge from priſon, and to bind himſelf an apprentice to a dancing-maſter in London; when, by his dexterity in his profeſſion, and his complaiſant behaviour to his maſter's ſcholars, he obtained money to buy out the remainder of his time, and to ſet up for himſelf. But being afterwards appointed to dance in the duke of Buckingham's great maſk, he by a falſe ſtep ſtrained a vein in the inſide of his leg, which occaſioned his being ever after ſomewhat lame. When Thomas earl of Strafford was made lord lieutenant of Ireland, he was entertained as a dancing-maſter in his family, and made one of the earl's troop of guards; at which time he compoſed a humorous piece called *The Character of a Trooper*. He was ſoon after appointed maſter of the revels in Ireland, and built a theatre at Dublin. About the time of the concluſion of the war in England, he left Ireland, and, being ſhipwrecked, came to London in a neceſſitous condition; but ſoon after walked to Cambridge, where, being aſſiſted by ſeveral ſcholars, he became ſo complete a maſter of the Latin tongue, that in 1649 he publiſhed a tranſlation of Virgil. He ſoon after learned Greek; and in 1660 publiſhed, in folio, a tranſlation of Homer's Iliad, with Annotations. About two years after he went to Ireland, where he was made maſter of the revels by patent. He then built another theatre in Dublin, which coſt him about 1000l. He publiſhed at London, in folio, a tranſlation of Homer's Odyſſey, with Annotations; and afterwards wrote two heroic poems, intitled the *Epheſian Matron*, and the *Roman Slave*. He next compoſed the Carolics, an epic poem, in 12 books, in honour of king Charles I. but this was entirely loſt in the fire of London; when Mr. Ogilby's houſe in White Friars was burnt down, and his whole fortune, except to the value of five pounds, deſtroyed. He, however, ſoon procured his houſe to be rebuilt, ſet up a printing-office within it, was appointed his majeſty's coſmographer and geographic printer, and printed ſeveral great works, tranſlated or collected by himſelf and his aſſiſtants, particularly his Atlas. He died in 1676.

OGIVE, in architecture, an arch or branch of a Gothic vault; which, inſtead of being circular, paſſes diagonally from one angle to another, and forms a croſs with the other arches. The middle, where the ogives croſs each other, is called the *key*; being cut in form of a roſe, or a *cul de lampe*. The members or mouldings of the ogives are called *nerves*, *branches*, or *reins*; and the arches which ſeparate the ogives, *double arches*.

OGYGES, king of the Thebans, or, according to others, of Ogygia and Actæ, afterwards called *Bœotia* and *Attica*. He is recorded to have been the firſt founder of Thebes and Eleuſin. The famous deluge happened in his time, in which ſome ſay he periſhed with all his ſubjects, 1796 B. C.

OGYGIA (Homer), the iſland of Calypſo; placed by Pliny in the Sinus Scylaceus, in the Ionian Sea, oppoſite to the promontory Lacinium; by Mela in the ſtrait of Sicily, calling it *Ææe*; which others place at the promontory Circeium, and call it the iſland of *Circe*.

Ogygia, the ancient name of Thebes in Bœotia: ſo called from Ogyges, an ancient king, under whom happened a great deluge, 1020 years before the firſt Olympiad.

OHIO, a river of North America, called by the French the *Beautiful River*, has its ſource between the Allegany mountains and the lake Erie; and running ſouth-weſt through a moſt delightful country, and alſo receiving many ſmaller rivers in its paſſage, at length falls into the Miſſiſſippi, in about 37 degrees of latitude. The French had ſeveral forts on and near it; but the whole country through which it flows was ceded by the peace of 1763 to the Britiſh.

OHETEROA, one of the South Sea iſlands lately diſcovered, is ſituated in W. lon. 150. 47. S. lat. 22. 27. It is neither fertile nor populous; nor has it an harbour or anchorage fit for ſhipping, and the diſpoſition of the people is hoſtile to ſuch as viſit them.

OIL, in natural hiſtory, an unctuous inflammable ſubſtance, drawn from ſeveral natural bodies, as animal and vegetable ſubſtances. Animal oils are their fats, which are originally vegetable oils: all animal ſubſtances yield them, together with their volatile ſalts, in diſtillation. Vegetable oils are obtained by expreſſion, infuſion, and diſtillation. The oils by expreſſion are obtained from the ſeed, leaves, fruit, and bark of plants: thus, the ſeed of muſtard, and of the ſun-flower, almonds, nuts, beech-maſt, &c. afford a copious oil by expreſſion; and the leaves of roſemary, mint, rue, wormwood, thyme, ſage, &c. the berries of juniper, olives, Indian cloves, nutmeg, mace, &c. the barks of cinnamon, ſaſſafras, and clove, yield a conſiderable proportion of eſſential oil by diſtillation.

The method of procuring oils by expreſſion is very ſimple: thus, if either ſweet or bitter almonds, that are freſh, be pounded in a mortar, the oil may be forced out with a preſs, not heated: and in the ſame manner ſhould the oil be preſſed from linſeed and muſtard. The avoiding the uſe of heat, in preparing theſe oils intended for internal medicinal uſe, is of great importance, as heat gives them a very prejudicial rancidneſs.

This method holds of all thoſe vegetable matters that contain a copious oil, in a looſe manner, or in certain cavities or receptacles; the ſides whereof being broken, or ſqueezed, makes them let go the oil they contain: and thus the zeſt or oil of lemon-peel, orange-peel, citron-peel, &c. may be readily obtained by preſſure, without the uſe of fire. But how far this method of obtaining oils may be applied to advantage, ſeems not hitherto conſidered. It has been commonly applied to olives, almonds, linſeed, rape-ſeed, beech-maſt, ben-nuts, walnuts, bay-berries, mace, nutmeg, &c. but not, that we know of, to juniper-berries, caſhew-nuts, Indian cloves, pine-apples, and many other ſubſtances that might be enumerated, both of foreign and domeſtic growth. It has, however, been of late ſucceſsfully applied to muſtard-ſeed, ſo as to extract a curious gold-coloured oil, leaving a cake behind, fit for making the common table-muſtard.

Certain dry matters, as well as moiſt ones, may be made to afford oils by expreſſion, by grinding them into a meal, which being ſuſpended to receive the vapour of boiling water, will thus be moiſtened ſo as to afford an oil in the ſame manner as almonds; and thus an oil may be procured from linſeed, hemp-ſeed, lettuce-ſeed, white poppy ſeed, &c.

As to the treatment of oils obtained by expreſſion, they ſhould be ſuffered to depurate themſelves by ſtanding in a moderately cool place, to ſeparate from their water, and depoſite their fæces; from both which they ought to be carefully freed. And if they are not thus rendered ſufficiently pure, they may be waſhed well with freſh water, then thoroughly ſeparated from it again by the ſeparating-glaſs, whereby they will be rendered bright and clear.

The next claſs of oils are thoſe made by infuſion, or decoction, wherein the virtues of ſome herb or flower are drawn out in the oil; as the oil's of roſes, chamomile, hypericum, alder, &c. However, theſe require to be differently treated: thus, for the ſcented flowers, particularly roſes, inſolation does beſt; becauſe much boiling would exhale their more fragrant parts: but oils impregnated with green herbs, as thoſe of chamomile and alder, require long boiling, before they receive the green colour deſired.

And, in general, no oils will bear to be boiled any longer than there remains ſome aqueous humidity, without turning black. There are many compound oils prepared in the ſame manner, *viz.* by boiling and inſolation, and then ſtraining off the oil for uſe.

The ſame contrivance has likewiſe its uſe in making eſſences for the ſervice of the perfumer; not only where eſſential oils cannot be well obtained in ſufficient quantities, but alſo where they are too dear. The eſſential oil of jeſſamine-flowers, honey-ſuckles, ſweet-briar, damaſk-roſes, lilies of the valley, &c. are either extremely dear, or ſcarcely obtainable by diſtillation; and, in ſome of them, the odorous matter is ſo ſubtile, as almoſt to be loſt in the operation. But if theſe flowers be barely infuſed in fine oil of nuts, or oil of ben, drawn without heat, and kept in a cool place, their ſubtile odorous matter will thus paſs into the oil, and richly impregnate it with their flavour. And theſe eſſences may be rendered ſtill more perfect by ſtraining off the oil at firſt put on, and letting it ſtand again, without heat, upon freſh flowers; repeating the operation twice or thrice.

Oils or fats may likewiſe be obtained, by boiling and expreſſion, from certain animal ſubſtances; for the membranes which contain the fat, being chopped ſmall, and ſet in a pan over the fire, become fit for the canvas bag, and, by preſſure, afford a large quantity of fat; as we ſee in the art of chandlery, which thus extracting the oily matter, leaves a cake behind, commonly called *graves*.

As to the eſſential oils of vegetables, they are obtained by diſtillation with an alembic and a large refrigeratory. Water muſt be added to the materials, in ſufficient quantity to prevent their burning; and they ſhould be macerated or digeſted in that water, a little time before diſtillation. The oil comes over with the water; and either ſwims on the top, or ſinks to the bottom, according as it is ſpecifically heavier or lighter than water. This proceſs is applicable to the diſtilling of the eſſential oils from flowers, leaves, barks, roots, woods, gums, and balſams, with a ſlight alteration of circumſtances, as by longer digeſtion, briſker diſtillation, &c. according to the tenacity and hardneſs of the ſubject, the ponderoſity of the oil, &c.

Eſſential oils may be divided into two claſſes, according to their different ſpecific gravities; ſome floating upon water, and others readily ſinking to the bottom. Thus, the eſſential oils of cloves, cinnamon, and ſaſſafras, readily ſink, whereas thoſe of lavender, marjoram, mint, &c. ſwim, in water: the lighteſt of theſe eſſential oils is, perhaps, that of citron-peel, which even floats in ſpirit of wine; and the heavieſt ſeems to be oil of ſaſſafras.

For obtaining the full quantity of the more ponderous oils from cinnamon, cloves, ſaſſafras, &c. it is proper to reduce the ſubjects to powder: to digeſt this powder for ſome days in a warm place, with thrice its quantity of ſoft river-water, made very ſaline by the addition of ſea-ſalt, or ſharp with oil of vitriol; to uſe the ſtrained decoction, or liquor left behind in the ſtill, inſtead of common water, for freſh digeſtion; to uſe for the ſame purpoſe the water of the ſecond running, after being cleared of its oil; not to diſtil too large a quantity of theſe ſubjects at once; to leave a conſiderable part of the ſtill, or about one fourth, empty; to uſe a briſk fire, or a ſtrong boiling heat, at the firſt, but to ſlacken it afterwards; to have a low ſtill-head, with a proper internal ledge and current leading to the noſe of the worm; and, finally, to cohobate the water, or pour back the liquor of the ſecond running upon the matter in the ſtill, repeating this once or twice. The directions here laid down for obtaining the ponderous oils to advantage, are eaſily transferred to the obtaining of the lighter; ſo that we need not dwell particularly upon them.

Many of the eſſential oils being dear, it is a very common practice to adulterate or debaſe them ſeveral ways, ſo as to render them cheaper both to the ſeller and the buyer. Theſe ſeveral ways ſeem reducible to three general kinds, each of which has its proper method of detection, viz. 1. With expreſſed oils. 2. With alcohol. And, 3. With cheaper eſſential oils. If an eſſential oil be adulterated with an expreſſed oil, it is eaſy to diſcover the fraud, by adding a little ſpirit of wine to a few drops of the ſuſpected eſſential oil, and ſhaking them together; for the ſpirit will diſſolve all the oil that is eſſential, or procured by diſtillation, and leave all the expreſſed oil that was mixed with it, untouched. If an eſſential oil be adulterated with alcohol, or rectified ſpirit of wine, it may be done in any proportion, up to that of an equal quantity, without being eaſily diſcoverable either by the ſmell or taſte: the way to diſcover this fraud, is to put a few drops of the oil into a glaſs of fair water; and if the oil be adulterated with ſpirit, the water will immediately turn milky; and, by continuing to ſhake the glaſs, the whole quantity of ſpirit will be abſorbed by the water, and leave the oil pure at top. Finally, if an eſſential oil be adulterated by a cheaper eſſential oil, this is commonly done very artfully: the method is to put fir-wood, turpentine, or oil of turpentine, into the ſtill, along with the herbs to be diſtilled for their oil, ſuch as roſemary, lavender, origanum, &c. and by this means the oil of turpentine diſtilled from theſe ingredients comes over in great quantity, and intimately blended with the oil of the genuine ingredient. The oils thus adulterated always diſcover themſelves in time, by their own flavour being overpowered by the turpentine-ſmell: but the ready way to detect the fraud, is to drench a piece of rag, or paper, in the oil, and hold it before the fire; for thus the grateful flavour of the plant will fly off, and leave the naked turpentine-ſcent behind.

The virtues of oils, being the ſame with thoſe of the ſubſtances from whence they are obtained, may be learned under their ſeveral articles, to which we refer.

We have this account of different oils in the iſland of Madagaſcar in the Univerſal Hiſtory. "Oils are of different ſorts; the moſt common are thoſe of menach-tanhetanhe, menach ſignifying oil, menachil, menach-chouivau, menach-mafoutra, menach-vourave, menach-apocapoue, menach-vintang, and menach-arame. Menach-tanhetanhe is drawn from a particular plant, called, in the language of the country, *tanhetanhe*, and known in Europe by the name of *palma Chriſti*, or *ricinus*. Menachil is an oil from the ſeed of ſeſame, which they call *voancaze*; a great quantity whereof is made in the valley of Amboule. Menach-chouivau is drawn from a fruit of the ſize of an almond, extremely good in liquors or meats. Menach-mafoutra is drawn from nuts, the fruit of the tree which produces dragon's blood. Menach-vourave is drawn from a fruit named *fontſi*. Menach-apocapoue is ſqueezed from the fruit apocapoue, extremely poiſonous. Menach-vintang is an oil from large acorns, or maſt. Menach-arame is drawn from nuts, the fruit of the tree from which the gum tacamahaca is produced."

Rock OIL. See PETROLEUM.

Eſſential OIL *of Roſes*. See ROSES.

Method of Purifying Rancid OILS. Under CHEMISTRY, p. 453, we have noticed this ſubject generally, and in this part of our work we ſhall preſent the reader with the ſpecification of Mr. Collier's patent "for a chemical proceſs for freeing fiſh-oils from their impurities in point of ſmell, taſte, and colour; and improved ſtrainers for oils and other liquids; with other inſtruments for aſcertaining their qualities, and aſſiſting their burning.

"The machines are illuſtrated by the drawings hereunto annexed (ſee Pl. 18), together with their reſpective references. The chemical proceſs is performed as follows; to wit: I put a quantity of any ſpecies of fiſh-oil, or mixture of different ſorts of fiſh-oil, into any convenient veſſel, which I heat to the

temperature of one hundred and ten or one hundred and twenty degrees of Fahrenheit's ſcale; I then add, of cauſtic mineral alkali (of the ſpecific gravity commonly deſcribed as 1, 25, or one and twenty-five hundreths, or of ſuch ſtrength that a phial containing one thouſand grains of diſtilled water will contain one thouſand two hundred and fifty grains of theſe leys) a quantity equal to four parts to the one hundred, by weight, of the quantity of the oil. I then ſtir or agitate the mixture, and leave it to ſtand a ſufficient time for the ſalts and ſediment to ſubſide. It is then drawn off into another veſſel, containing a ſufficient quantity of freſh burnt charcoal, finely powdered, or of any other ſubſtance poſſeſſing antiſeptic properties, in a powdered or divided ſtate, with an addition of a ſmall proportion of diluted ſulphuric acid, ſufficient only to decompoſe the ſmall quantity of ſaponaceous matter ſtill ſuſpended in the oil, which will appear by the oil becoming clear at the ſurface. The contents of this veſſel are alſo agitated, and the coal, ſaline and aqueous particles left to ſubſide; after which, the oil is paſſed through proper ſtrainers, hereinafter deſcribed, and is thereby rendered perfectly tranſparent and fit for uſe. The principle of my improved ſtrainers or filtering machines, by which, as far as reſpects them, I deem myſelf entitled to the excluſive privilege ſecured by the ſaid patent, conſiſts in the means applied to combine hydroſtatic preſſure (which encreaſes as the perpendicular height of the fluid) with the mode of filtering *per aſcenſum*, thereby procuring the new and peculiar advantage, that the fluid and its ſediment take oppoſite directions, and alſo, in whatever is new in the conſtruction of my machines herein deſcribed. It cannot but be ſeen, that a paſſage for the air, more free from objection than any hitherto adopted, is here contrived in thoſe deſigned for domeſtic purpoſes, Fig. 1.; and alſo, that the eaſy means of emptying their ſediment facilitates the operation, and renders their uſe perfectly ſatisfactory to the moſt minute obſerver. A great advantage attending this invention is, that the dimenſions of the chamber in which the ſediment is received may be varied, while the filtering ſurface remains the ſame. To adapt theſe machines not only to the purpoſes of families, workhouſes, hoſpitals, public charities, the navy, or the merchant ſervice, but alſo, to all the purpoſes of oil-men, of diſtillers, of the laboratory, the brewery, &c. chambers of various capacities muſt be provided for the ſediment and precipitated matter. With reſpect to the oil trade, the ſpace required is very great, eſpecially for ſpermaceti or Brazil bottoms. In the various proceſſes of the laboratory, no limits can be fixed, but all dimenſions will be occaſionally required. In diſtilleries and breweries, they may be ſmaller in proportion; and in thoſe deſigned for water, and for domeſtic uſe, a very ſmall chamber will be ſufficient. When water is to be ſweetened, or freed from any putrid or noxious particles it may, from whatever cauſe, contain, it paſſes, in its way to the filtering chamber, through an iron box, or cylinder, letters L M N O, in Fig. 1, containing charcoal finely powdered, or any other antiſeptic ſubſtance inſoluble in water; which charcoal, or other ſubſtance, is forced cloſely into the box by any mechanical power; after which, the water is made to paſs through it by the hydroſtatic preſſure, through a tube of any ſufficient height. This box has two apertures, to receive and deliver the fluid, and theſe are opened or cloſed by cocks or ſcrews, at P and Q, or any other method uſed for ſuch purpoſes; and, being affixed to the machine by other ſcrews, or ſcrews and collars, may be eaſily detached from the ſame. Thus, whenever the charcoal begins to loſe its antiſeptic properties, the box is removed, and heated till it is red-hot, by which means, the foreign matter eſcapes through the ſmall apertures; after which, the box is left to cool, and the charcoal becomes ſweet, pure, and equally fit for uſe as at firſt, though the proceſs be ever ſo often repeated.

"Fig. 2. is a machine or contrivance for ſtraining oil from the bottoms, in the manner deſcribed in the references.

"I further claim, by virtue of this patent, the excluſive privileges ariſing from the invention of filtering-machines, in the form or forms of ſtills, in which charcoal may be repeatedly burned, after any fluid ſubſtances have paſſed through it, either for the purpoſe of freeing them from putrid or noxious particles, or of diſcharging their colouring matter; which filtering-ſtills are ſo contrived, that the fluid may paſs through in any quantity, without diſplacing the charcoal, as in Fig. 3. The part of the fluid remaining interſperſed among the charcoal, may be driven over by a proper degree of heat, and be employed for many inferior purpoſes of the arts and manufactures. Laſtly, the heat may be raiſed, ſo as to purify the charcoal, as has been before deſcribed in the machines for filtering water, or other fluids, for domeſtic purpoſes. The fine of the ſtills is ſo conſtructed, that water may be employed to cool them, without the loſs of time requiſite for their gradually parting with their heat to the ſurrounding atmoſphere, ſo as to be fit for a ſubſequent operation.

"My inſtruments for aſcertaining the comparative qualities of oils, depend in part on the principle of their ſpecific gravities; ſpermaceti oil, contraſted with other fiſh oils, being as 875 to 920. For this purpoſe, I uſe a glaſs-veſſel, of any convenient ſhape, furniſhed with a bubble, alſo of glaſs, and a thermometer. If the oil is pure, this bubble ſinks, when the mercury riſes to a certain ſtandard, by the application of the hand, or of any other heat, to the veſſel containing the oil. If the ſpermaceti oil is impure, the bubble will ſtill float, though it is of the temperature required, and the degree of impure or foreign matter will be ſhewn, by the ſcale of the thermometer at which the bubble ſinks. To determine what tendency oils uſed for burning have to congeal in cold weather, I put equal quantities of nitre and ſal-ammoniac, finely powdered and mixed, into a phial of thin glaſs, or any other convenient veſſel, containing rather more than ſufficient water to diſſolve them; or I put any other freezing mixture into ſuch veſſel: I then immerſe a thermometer therein, and let a ſingle drop of the oil under experiment fall on the outſide of the veſſel, where it immediately congeals. As the cold, produced by the mixture, gradually ceaſes, it is eaſy to obſerve, by the thermometer, at what point of temperature the oil becomes fluid, and runs down the ſides of the glaſs.

Explanation of the Figures. "Fig. 1. A, the ciſtern into which the water, or other fluid to be filtered, is put. B B B, a tube opening into the bottom of the ciſtern A, and bent along the bottom of the machine, conveying the fluid into CC, the filtering chamber, which is covered with leather bound down round its circular rim, and through which leather the water is percolated. D D, the baſon, riſing above the level of the chamber, and receiving the filtered liquor. E, the ſpout by which it runs off, into a pitcher or other veſſel. F, another ſpout, furniſhed with a cock, to draw off the foul water from the chamber, when neceſſary. GGGG, the air-tube, which begins above the level of the chamber, is covered with a button, which ſaves the leather from being cut, and has a ſmall lateral aperture for the air to be carried off. This pipe paſſes along the bottom, and up the ſide, and, riſing above the level of the water in the ciſtern, is there cloſed, except a ſmall lateral aperture, through which the air eſcapes. H, a guard or rim, with croſs bars, put over the leather, to keep it from being forced up by the water. It is faſtened down by means of two notches, on oppoſite ſides of the guard, by which it locks into two ſtaples riveted into the bottom of the baſon. I, the lid,

ſliding down to cover the water from duſt, and ſuſpended at pleaſure by means of K, K, two ſprings on each tube, for that purpoſe. LMNO, a cylindrical box, containing charcoal, which is connected with the above, by means of the tube P, and a continuation of the tube B. LM, the water-tube B continued below the charcoal apparatus, ſo that the fluid may paſs through the ſame into the cylinder at Q, from whence it enters the chamber at P, ſo as to be filtered through the leather, as before deſcribed. R, R, collars, which may be unſcrewed at pleaſure, ſo as to detach the charcoal apparatus, when the charcoal requires to be purified by heat. S, S, two cocks, to direct the fluid through the charcoal cylinder, or immediately into the filtering-chamber.

"Fig. 2. A, a tube or ciſtern, containing the oil to be filtered, and ſupplying a tube of ſufficient height for the hydroſtatic preſſure to operate. B B, a main tube, of wood, tin, leather, or cloth, to which any number of bags C, C, C, C, of the ſize and ſhape of corn-ſacks, or any convenient ſize and ſhape, may be connected; theſe are bound to ſtraight double iron bars D, D, D, D, furniſhed with a hinge at one end, and a ſcrew at the other, by opening which the bags may be emptied. E E, a trough underneath, made to receive the filtered oil.

"Fig. 3. A, a funnel, caſk, or ciſtern, into which the fluid is put, which paſſes down B, a tube fitted into the ſame, through which it enters C, an iron ſtill, full of finely-powdered and ſifted charcoal, through the head of which the fluid paſſes into any receiver. D, a fire-place, of any conſtruction, to drive over the fluid remaining interſperſed among the charcoal, and alſo to purify the charcoal by an increaſe of temperature, when required. E, a cock to let water into the flues, to cool the apparatus for a ſubſequent operation."

OINTMENT, in pharmacy. See UNGUENT.

OKEHAM, the capital of Rutlandſhire, in England, ſeated in a rich and pleaſant valley, called the *vale of Catmus*. It is pretty well built, has a good church, a free-ſchool, and an hoſpital. W. lon. 0. 45. N. lat. 52. 40.

OKINGHAM, OCKINGHAM, or *Wokingham*, a large town of Berkſhire, in England, noted for the manufacture of ſilk-ſtockings. W. lon. 0. 50. N. lat. 51. 26.

OLAUS MAGNUS. See MAGNUS.

OKRA. See HIBISCUS.

OLAX, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is entire; the corolla funnel-ſhaped and trifid; the nectarium tetraphyllous.

OLD AGE. See LONGEVITY. Many methods have been propoſed for lengthening life, and rendering old age comfortable. Cornaro's Treatiſe on this ſubject is known to every body, and needs not be quoted. To ſome of our readers the following ſet of reſolutions will perhaps be new, and may certainly be uſeful.

The old men ſhould reſolve, except the reaſons for a change be invincible, to live and to die in the public profeſſion of the religion in which they were born and bred. To avoid all profane talk and intricate debates on ſacred topics. To endeavour to get the better of the intruſions of indolence of mind and body, thoſe certain harbingers of enfeebling age. Rather to wear out, than to ruſt out. To riſe early, and as often as poſſible to go to bed before midnight. Not to nod in company, nor to indulge repoſe too frequently on the couch in the day. To waſte as little of life in ſleep as may be, for we ſhall have enough in the grave. Not to give up walking; nor to ride on horſeback to fatigue. Experience, and a late medical opinion, determine to ride five miles every day. Nothing contributes more to the preſervation of appetite, and the prolongation of life. Cheyne's direction to the valetudinary, "to make exerciſe a part of their religion," to be religiouſly obſerved. To continue the practice of reading, purſued for more than fifty years, in books on all ſubjects; for variety is the ſalt of the mind as well as of life. Other people's thoughts, like the beſt converſation of one's companions, are generally better and more agreeable than one's own. Frequently to think over the virtues of one's acquaintance, old and new. To admit every cheerful ray of ſun-ſhine on the imagination. To avoid retroſpection on a paſt friendſhip which had much of love in it; for memory often comes when ſhe is not invited. To try to think more of the living and leſs of the dead; for the dead belong to a world of their own. To live within one's income, be it large or little. Not to let paſſion of any ſort run away with the underſtanding. Not to encourage romantic hopes or fears. Not to drive away hope, the ſovereign balm of life, though he is the greateſt of all flatterers. Not to be under the dominion of ſuperſtition or enthuſiaſm. Not wilfully to undertake any thing for which the nerves of the mind or the body are not ſtrong enough. Not to run the race of competition, or to be in another's way. To avoid being joſtled too much in the ſtreet, being overcome by the noiſe of the carriages, and not to be carried even by curioſity itſelf into a large crowd. To ſtrive to embody that dignified ſentiment, "to write injuries in duſt, but kindneſſes in marble." Not to give the reins to conſtitutional impatience, for it is apt to hurry on the firſt expreſſions into the indecency of ſwearing. To recollect, that he who can keep his own temper may be maſter of another's. If one cannot be a ſtoic, in bearing and forbearing, on every trying occaſion, yet it may not be impoſſible to pull the check-ſtring againſt the moroſeneſs of ſpleen or the impetuoſity of peeviſhneſs. Anger is a ſhort madneſs. Not to fall in love, now on the precipice of threeſcore, nor expect to be fallen in love with. A connection between ſummer and winter is an improper one. Love, like fire, is a good ſervant, but a bad maſter. Love is death, when the animal ſpirits are gone. To contrive to have as few vacant hours upon one's hands as poſſible, that idleneſs, the mother of crimes and vices, may not pay its viſit. To be always doing of ſomething, and to have ſomething to do. To fill up one's time, and to have a good deal to fill up: for time is the materials that life is made of. If one is not able by ſituation, or through the neceſſity of raiſing the ſupplies within the year, or by habit (for virtue itſelf is but habit), to do much oſtentatious good, yet do as little harm as poſſible. To make the beſt and the moſt of every thing. Not to indulge too much in the luxury of the table, nor yet to underlive the conſtitution. The gout, rheumatiſm, and dropſy, in the language of the Spectator, ſeem to be hovering over the diſhes. Wine, the great purveyor of pleaſure, and the ſecond in rank among the ſenſes, offers his ſervice, when love takes his leave. It is natural to catch hold of every help, when the ſpirits begin to droop. Love and wine are good cordials, but are not proper for the beverage of common uſe. Reſolve not to go to bed on a full meal. A light ſupper and a good conſcience are the beſt receipts for a good night's reſt, and the parents of undiſturbing dreams. Not to be enervated by the flatulency of tea. Let the ſecond or third morning's thought be to conſider of the employment for the day; and one of the laſt at night to inquire what has been done in the courſe of it. Not to let one's tongue run at the expence of truth. Not to be too communicative nor unreſerved. A cloſe tongue, with an open countenance, are the ſafeſt paſſports through the journey of the world. To correct the error of too much talking, and reſtrain the narrativeneſs of the approaching climacteric. To take the good-natured ſide in converſation. However, not to praiſe every body, for that is to praiſe nobody. Not to be inquiſitive, and eager to know ſecrets, nor be thought to have a head full of other people's affairs. Not to make an enemy, nor to loſe a friend. To aim at the eſteem of the public, and to

leave a good name behind. Not to be ſingular in dreſs, in behaviour, in notions, or expreſſions of one's thoughts. Never to give bad advice, and to ſtrive not to ſet a bad example. Seldom to give advice till aſked, for it appears like giving ſomething that is ſuperfluous to one's ſelf. Not to like or diſlike too much at firſt ſight. Not to wonder, for all wonder is ignorance that poſſeſſion falls ſhort of expectation. The longing of twenty years may be diſappointed in the unanſwered gratification of a ſingle hour. Whilſt we are wiſhing, we ſee the beſt ſide; after we have taken poſſeſſion, the worſt. Reſolved to attend to the arguments on both ſides, and to hear every body againſt every body. The mind ought not to be made up but upon the beſt evidence. To be affectionate to relations, which is a kind of ſelf-love, in preference to all other acquaintance. But not to omit paying the commanding reſpect to merit, which is ſuperior to all the accidental chains of kindred. Not to debilitate the mind by new and future compoſitions. Like the ſpider, it may ſpin itſelf to death. The mind, like the field, muſt have its fallow ſeaſon. The leiſure of the pen has created honourable acquaintance, and pleaſed all it has wiſhed to pleaſe. To reſolve not to be too free of promiſes, for performances are ſometimes very difficult things. Not to be too much alone, nor to read, nor meditate, or talk too much on points that may awaken tender ſenſations, and be too pathetic for the ſoul. To enjoy the preſent, not to be made too unhappy by reflection on the paſt, nor to be oppreſſed by invincible gloom on the future. To give and receive comfort, thoſe neceſſary alms to a diſtreſſed mind. To be conſtantly thankful to Providence for the plenty hitherto poſſeſſed, which has preſerved one from the dependence on party, perſons, and opinions, and kept one out of debt. The appearance of a happy ſituation, and opportunities of taſting many worldly felicities (for content has ſeldom perverted itſelf into diſcontent), has induced many to conclude, that one muſt be pleaſed with one's lot in life; and it occaſions many to look with the eye of innocent envy. To reſolve more than ever to ſhun every public ſtation and reſponſibility of conduct. To be ſatisfied with being maſter of one's ſelf, one's habits, now a ſecond nature, and one's time. Determined not to ſolicit, unleſs trampled upon by fortune; to live and die in the harneſs of trade, or a profeſſion. To take care that pity (humanity is not here meant) does not find out one in the endurance of any calamity. When pity is within call, contempt is not far off. Not to wiſh to have a greater hold of life, nor to quit that hold. The poſſible tenure of exiſtence is of too ſhort poſſeſſion for the long night that is to ſucceed: therefore not a moment to be loſt. Not to loſe ſight, even for a ſingle day, of theſe good and proverbial doctors—diet—merryman—and quiet. Reſolved to remember and to recommend, towards tranquillity and longevity, the three oral maxims of Sir Hans Sloane—"Never to quarrel with one's ſelf—one's wife—or one's prince." Laſtly, not to put one's ſelf too much in the power of the elements, theſe great enemies to the human frame; namely, the ſun—the wind—the rain—and the night-air.

Old-*Man of the Mountain*. See Assassins.

OLDCASTLE (Sir John), called the *Good Lord Cobham*, was born in the reign of Edward III. and was the firſt author as well as the firſt martyr among the Engliſh nobility: he obtained his peerage by marrying the heireſs of that lord Cobham who with ſo much virtue and patriotiſm oppoſed the tyranny of Richard II. By his means the famous ſtatute againſt proviſors was revived, and guarded againſt by ſeverer penalties; he was one of the leaders of the reforming party: was at great expence in procuring and diſperſing copies of Wickliffe's writings among the people, as well as by maintaining a number of his diſciples as itinerant preachers. In the reign of Henry V. he was accuſed of hereſy; the growth of which was attributed to his influence. Being a domeſtic in the king's court, the king delayed his proſecution that he might reaſon with him himſelf; but not being able to reclaim him to the church of Rome, he in great diſpleaſure reſigned him to its cenſure. He was apprehended, and condemned for hereſy; but eſcaping from the Tower, lay concealed for four years in Wales, until the rumour of a pretended conſpiracy was raiſed againſt him, and a price ſet upon his head: he was at laſt ſeized, and executed in St. Giles's Fields; being hung alive in chains upon a gallows, and burned by a fire placed underneath. He wrote "Twelve Concluſions, addreſſed to the Parliament of England."

OLDENBURG (Henry), a learned German gentleman in the 17th century, was deſcended from the noble family of his name, who were earls of the county of Oldenburg, in the north part of Weſtphalia, for many generations. He was born in the duchy of Bremen in the Lower Saxony; and during the long Engliſh parliament in king Charles I.'s time, was appointed conſul for his countrymen, at London, after the uſurpation of Cromwell: but being diſcharged of that employ, he was made tutor to the lord Henry O'Bryan, an Iriſh nobleman, whom he attended to the univerſity of Oxford, where he was admitted to ſtudy in the Bodleian library in the beginning of the year 1656. He was afterwards tutor to William lord Cavendiſh, and was acquainted with Milton the poet. During his reſidence at Oxford, he became alſo acquainted with the members of that body there which gave birth to the royal ſociety; and upon the foundation of this latter, he was elected fellow; and when the ſociety found it neceſſary to have two ſecretaries, he was choſen aſſiſtant-ſecretary to Dr. Wilkins. He applied himſelf with extraordinary diligence to the buſineſs of his office, and began the publication of the Philoſophical Tranſactions with No. 1. in 1664. In order to diſcharge this taſk with greater credit to himſelf and the ſociety, he held a correſpondence with more than ſeventy learned perſons, and others, upon a vaſt variety of ſubjects, in different parts of the world. This fatigue would have been inſupportable, had he not, as he told Dr. Lifter, managed it ſo as to make one letter anſwer another; and that, to be always freſh, he never read a letter before he had pen, ink, and paper, ready to anſwer it forthwith; ſo that the multitude of his letters cloyed him not, nor ever lay upon his hands. Among others, he was a conſtant correſpondent of Mr. Robert Boyle, with whom he had a very intimate friendſhip; and he tranſlated ſeveral of that ingenious gentleman's works into Latin.

Mr. Oldenburg continued to publiſh the Tranſactions, as before, to No. xxxvi. June 25. 1677. After which the publication was diſcontinued till the January following, when it was again reſumed by his ſucceſſor in the ſecretary's office, Mr. Nehemiah Grew, who carried it on till the end of February 1678. Our author dying at his houſe at Charleton, near Greenwich in Kent, in the month of Auguſt that year, was interred there.

OLDENLANDIA, in botany: a genus of the tetrandria monogynia claſs. Its characters are theſe: The empalement of the flower is permanent, ſitting upon the germen; the flower has four oval petals, which ſpread open, and four ſtamina, terminated by ſmall ſummits; it hath a roundiſh germen, ſituated under the flower, crowned by an indented ſtigma; the germen afterwards turns to a globular capſule, with two cells filled with ſmall ſeeds. We have but one ſpecies of this plant in the Engliſh gardens; but Linnæus enumerates ſix.

OLDHAM (John), an eminent Engliſh poet in the 17th century, ſon of a nonconformiſt miniſter, was educated under his father, and then ſent to Edmund-hall in Oxford. He became uſher to the free-ſchool at Croydon in Surry; where he received a viſit from the earls of Rocheſter and Dorſet, Sir Charles Sedley, and other perſons of diſtinction, merely upon the reputation of ſome verſes of his which they had ſeen in manuſcript. He was tutor to ſeveral gentlemen's ſons ſucceſſively; and having ſaved a ſmall ſum of money, came to London, and

became a perfect votary to the bottle, being an agreeable companion. He was quickly found out here by the noblemen who had viſited him at Croydon, who brought him acquainted with Mr. Dryden. He lived moſtly with the earl of Kingſton at Holme-Pierpoint in Nottinghamſhire, where he died of the ſmallpox in 1683, in the 30th year of his age. His acquaintance with learned authors appears by his ſatires againſt the Jeſuits. in which there is as much learning as wit diſcovered. Mr. Dryden eſteemed him highly. His works are printed in 2 vols. 12mo. They chiefly conſiſt of ſatires, odes, tranſlations, paraphraſes of Horace and other authors, elegiac verſes, imitations, parodies, familiar epiſtles, &c.

OLD-HEAD, ſituated in the county of Cork, and province of Munſter, four miles ſouth of Kinſale, in the barony of Courcies, Ireland: it is a promontory, running far into the ſea, on which is a light-houſe for the convenience of ſhipping.—A mile from its extremity is an ancient caſtle of the lords of Kinſale, built from one ſide of the iſthmus to the other, which defended all the lands towards the head: this place was formerly called *Duncarma*, and was the old ſeat of the Iriſh kings. The iſthmus, by the working of the ſea, was quite penetrated through, ſo as to form a ſtupendous arch, under which boats might paſs from one bay to the other. Among the rocks of this coaſt there are aviaries of good hawks; alſo the ſea-eagle or oſprey build their neſts and breed in them.

OLDMIXON (John), was deſcended from an ancient family in Somerſetſhire: he was a violent party-writer and malevolent critic, who would ſcarcely have been remembered, if Pope, in reſentment of his abuſe, had not condemned him to immortality in his Dunciad. His party-writings procured him a place in the revenue at Liverpool, where he died at an advanced age in the year 1745. Beſides his fugitive temporary pieces, he wrote a Hiſtory of the Stuarts in folio; a Critical Hiſtory of England, 2 vols. 8vo; a volume of Poems, ſome dramatic pieces, &c.; none of them worthy of notice, his principal talent being that of falſifying hiſtory.

Old-wife, or *Wraſſe*. See Labrus.

Old-wife *Fiſh*. See Baliſtes.

Old-woman's island, a narrow ſlip of land, about two miles long, ſeparated from Bombay in the Eaſt Indies by an arm of the ſea, which, however, is paſſable at low water. It terminates at one extremity in a ſmall eminence, on which a look-out houſe is kept for veſſels. Near the middle are three tombs kept conſtantly white, as land-marks into the harbour. From the end of the iſland a dangerous ledge of rocks ſhoots forth, which are not very eaſily cleared. It produces only paſture for a few cattle.

OLEA, in botany, the *olive-tree*: A genus of the monogynia order, belonging to the diandria claſs of plants; and in the natural method ranking under the 44th order, *Sapiriæ*. The corolla is quadrifid, with the ſegments nearly ovate. The fruit is a monoſpermous plum.

There are three ſpecies of the olea. 1. The *Europea*, or common olive tree, riſes with upright ſolid ſtems, branching numerouſly on every ſide, 20 or 30 feet high; ſpear-ſhaped, ſtiff, oppoſite leaves, two or three inches long, and half an inch or more broad; and at the axillas ſmall cluſters of white flowers, ſucceeded by oval fruit. This ſpecies is the principal ſort cultivated for its fruit; the varieties of which are numerous, varying in ſize, colour, and quality. It is a native of the ſouthern warm parts of Europe, and is cultivated in great quantities in the ſouth of France, Italy, and Portugal, for the fruit to make the olive-oil, which is in ſo great repute, and is tranſported to all parts, to the great advantage of thoſe countries where the trees grow in the open ground: the green fruit is alſo in much eſteem for pickling, of which we may ſee plenty in the ſhops. 2. The *capenſis*, or Cape box-leaved olive, riſes with ſhrubby ſtems, branching numerouſly from the bottom, ſix or ſeven feet high; ſmall oval, thick, ſtiff, ſhining leaves; and at the axillas ſmall cluſters of whitiſh flowers; ſucceeded by ſmall fruit of inferior value. 3. *Olea odoratiſſima* (Indian name *cucfa*; Japaneſe name, *Skio Ran, it: Sju Ran*) is thus deſcribed by Thunberg, *bulbis fibroſis, foliis enſiformibus, ſeſſilibus, floribus pendulis*. (See Pl. 3.) The flower of the olea odoratiſſima is by ſome ſaid to give the fine flavour to the green tea; but Thunberg attributes the ſaid flavour to the *Camellia ſaſanqua*.

Olive-trees are eaſily propagated by ſhoots; which, when care has been taken to ingraft them properly, bear fruit in the ſpace of eight or ten years. Thoſe kinds of olive-trees which produce the pureſt oil, and bear the greateſt quantity of fruit, are ingrafted on the ſtocks of inferior kinds. Different names are aſſigned by the French to the different varieties of the olive-tree; and of theſe they reckon 19, whilſt in Florence are cultivated no fewer than 32. Olive ſhoots are ingrafted when in flower. If the operation has been delayed, and the tree bears fruit, it is thought ſufficient to take off a ring of bark, two fingers breadth in extent, above the higheſt graft. In that caſe the branches do not decay the firſt year; they afford nouriſhment to the fruit, and are not lopped off till the following ſpring. Olive-trees are commonly planted in the form of a quincunx, and in rows at a conſiderable diſtance from one another. Between the rows it is uſual to plant vines, or to ſow ſome kind of grain. It is obſerved, that olives, like many other fruit-trees, bear well only once in two years. The whole art of dreſſing theſe trees conſiſts in removing the ſuperfluous wood; for it is remarked, that trees loaded with too much wood produce neither ſo much fruit nor of ſo good a quality.

Their propagation in England is commonly by layers. The laying is performed on the young branches in ſpring. Give plenty of water all ſummer, and they will ſometimes be rooted and fit for potting off in autumn; but ſometimes they require two ſummers to be rooted effectually: when, however, they are properly rooted, take them off early in autumn, and put them ſeparately; give water, and place them in the ſhade till they have taken freſh root; and in October remove them into the green-houſe, &c. Thoſe you intend to plant in the open ground, as before ſuggeſted, ſhould be kept in pots, in order to have occaſional ſhelter of a garden-frame two or three years, till they have acquired ſome ſize, and are hardened to the full air; then tranſplant them into a warm border againſt a wall: mulch their roots in winter, and mat their tops in froſty weather.

Olives have an acrid, bitter, extremely diſagreeable taſte: pickled (as we receive them from abroad) they prove leſs diſagreeable. The Lucca olives, which are ſmaller than the others, have the weakeſt taſte; the Spaniſh, or larger, the ſtrongeſt; the Provence, which are of a middling ſize, are generally the moſt eſteemed.

When olives are intended for preſervation, they are gathered before they are ripe. The art of preparing them conſiſts in removing their bitterneſs, in preſerving them green, and in impregnating them with a brine of aromatiſed ſea ſalt, which gives them an agreeable taſte. For this purpoſe different methods are employed. Formerly they uſed a mixture of a pound of quick-lime, with ſix pounds of newly ſifted wood-aſhes; but of late, inſtead of the aſhes, they employ nothing but a ley. This, it is alleged, ſoftens the olives, makes them more agreeable to the taſte, and leſs hurtful to the conſtitution. In ſome parts of Provence, after the olives have lain ſome time in the brine, they remove them, take out the kernel, and put a caper in its place. Theſe olives they preſerve in excellent oil; and when thus prepared, they ſtrongly ſtimulate the appetite in winter. Olives perfectly ripe are ſoft and of a dark-red colour. They are then

eaten without any preparation, excepting only a ſeaſoning of pepper, ſalt, and oil; for they are extremely tart, bitter, and corroſive.

The oil is undoubtedly that part of the produce of olive-trees which is of greateſt value. The quality of it depends on the nature of the ſoil where the trees grow, on the kind of olive from which it is expreſſed, on the care which is taken in the gathering and preſſing of the fruit, and likewiſe on the ſeparation of the part to be extracted. Unripe olives give an intolerable bitterneſs to the oil; when they are over ripe, the oil has an unguinous taſte: it is therefore of importance to chooſe the true point of maturity. When the ſituation is favourable, thoſe ſpecies of olives are cultivated which yield fine oils; otherwiſe, they cultivate ſuch ſpecies of trees as bear a great quantity of fruit, and they extract oil from it, for the uſe of ſoaperies, and for lamps.

They gather the olives about the months of November or December. It is beſt to put them as ſoon as poſſible into baſkets, or into bags made of wool or hair, and to preſs them immediately, in order to extract a fine oil. Thoſe who make oil only for ſoaperies, let them remain in heaps for ſome time in their ſtorehouſes; when afterwards preſſed, they yield a much greater quantity of oil. Thoſe even who extract oil to be uſed in food, ſometimes allow them to ferment in heaps, that they may have more oil; but this is extremely hurtful to the quality of the oil, and is the reaſon why fine oil is ſo very rare. M. Duhamel recommends not to mix ſound olives with thoſe in which a fermentation has already begun, and ſtill leſs with ſuch as are putrified: in both caſes, the oil which is extracted is of a bad quality, and unfit for preſervation. In order to have the oil in its purity, we muſt allow it to depoſit its ſediment, and then pour it off into another veſſel. The oil extracted from the pulp only of olives is the moſt perfect which can be obtained, and will keep for ſeveral years; but that which is extracted from the kernel only, or from the nut, or from the whole olive ground in the common way in public mills, has always more or fewer defects, loſes its limpidity in a certain time, and is very apt to become rancid. Care muſt be taken likewiſe to keep the oil in proper veſſels well ſhut. After all, in the courſe of time, olive-oil loſes its qualities, becomes diſagreeable to the taſte and ſmell, diminiſhes in fluidity, and at length thickens conſiderably. The refuſe of the firſt preſſing, when ſqueezed a ſecond time, yields an oil, but thicker and leſs pure than the former. What remains after the ſecond preſſing, when mixed with a little water and placed in a pan over the fire, produces by preſſure a third oil, but of a very inferior quality. What remains after all the oil is expreſſed, is termed *grignon*, and is of no farther uſe but as fuel. The ſediment, or *fæces*, of new oil, we name after the ancients *amurca*: it is an excellent remedy in rheumatic affections. In Paris the wax uſed for ſhoes is commonly made of the dregs of defecated oil and ſmoke-black.

Oil of olives is an ingredient in the compoſition of a great many balſams, ointments, plaſters, mollifying and relaxing liniments. It is of an emollient and ſolvent nature; mitigates gripes of the colic, and the pains accompanying dyſentery: and is ſuppoſed a good remedy when one has chanced to ſwallow corroſive poiſons; but it by no means prevents the fatal accidents which enſue from the bite of a ſnake, as has been pretended. It is an effectual cure, however, for the bite of a viper, and, as M. Bourgeois tells us, for the ſting of waſps, bees, and other inſects. A bandage ſoaked in the oil is immediately applied to the ſting, and a cure is obtained without any inflammation or ſwelling. Olive-oil is of no uſe in painting, becauſe it never dries completely. The beſt ſoap is made of it, mixed with Alicant ſalt-wort and quicklime.

Great drought, as well as much rain, is extremely injurious to the crop of olives. This fruit is much expoſed to the attacks of a worm peculiar to itſelf, and which injures it ſo much, that after the olives are gathered the produce of the oil extracted from them is diminiſhed one half. The wood of the olive-tree is beautifully veined, and has a pretty agreeable ſmell: it is in great eſteem with cabinet-makers, on account of the fine poliſh which it aſſumes. It is of a reſinous nature, and conſequently excellent for burning. As the laurel-branch is the ſymbol of glory, ſo the olive-branch covered with leaves has from the moſt ancient times been the emblem of concord, the ſymbol of friendſhip and peace. The leaves of olive-trees have an aſtringent quality. Many people uſe them in making gargles for inflammations of the throat.

Theſe plants in this country muſt be kept principally in pots for moving to the ſhelter of a green-houſe in winter; for they are too tender to proſper well in the open ground in this climate: though ſometimes they are planted againſt a warm ſouth wall, and ſheltered occaſionally from froſt in winter, by mulching the roots, and matting their tops; whereby they may be preſerved, and will ſometimes produce fruit for pickling: a very ſevere winter, however, often kills or greatly injures their young branches; therefore let the principal part be potted in rich earth, and placed among the green-houſe ſhrubs, and managed as others of that kind. Theſe trees are often ſent over from Italy to the Italian warehouſes in London, along with orange-trees, &c. where pretty large plants may be purchaſed reaſonably, which ſhould be managed as directed for orange-trees that are imported from the ſame country. See CITRUS.

OLEAGINOUS, ſomething that partakes of the nature of oil, or out of which oil may be expreſſed.

OLEANDER, or ROSE BAY, *nerium*: A genus of the pentandria monogynia claſs. Its characters are theſe: the empalement of the flower is permanent, and cut into five acute ſegments; the flower has one funnel-ſhaped petal, cut into five broad obtuſe ſegments, which are oblique; it hath a nectarium, terminating the tube, which is torn into hairy ſegments; it hath five ſhort awl-ſhaped ſtamina within the tube; it hath an oblong germen, which is bifid, with ſcarce any ſtyle, crowned by ſingle ſtigmas; the germen afterwards turns to two long, taper, acute-pointed pods, filled with oblong ſeeds lying over each other like the ſcales of a fiſh, and crowned with down. There are four ſpecies.

Theſe plants are generally propagated by layers in this country; for although they will take root from cuttings, yet that being an uncertain method, the other is generally preferred; and as the plants are very apt to produce ſuckers or ſhoots from their roots, theſe are beſt adapted for laying; for the old branches will not put out roots: when theſe are laid down, they ſhould be ſlit at a joint, in the ſame manner as is practiſed in laying of carnations. There are few plants which are equal to them either to the ſight or ſmell, for their ſcent is very like that of the flowers of the white thorn; and the bunches of flowers will be very large if the plants are ſtrong.

It is called *nerium* from *νηρος*, "humid," becauſe it grows in humid places. The plant itſelf has a force which is inſuperable; for its juice excites ſo great and violent an inflammation, as immediately to put a ſtop to deglutition; and if it be received into the ſtomach, that part is rendered incapable of retaining any thing; the pernicious drug exerting its force, and purging both upwards and downwards.

Nerium in qualities reſembles the *apocynum*. See APOCYNUM. But when handled and examined upon an empty ſtomach, in a cloſe chamber, it cauſes a numbneſs coming by degrees, with a pain in the head; which ſhows that ſomething poiſonous belongs even to the ſmell, though there is no danger if it be received in the open air, as may be found upon trial. Antidotes ſaid to be good againſt its poiſon are vinegar and all acids.

OLEARIUS (Adam), minister to the duke of Holstein, and secretary to the embassy sent in 1633 to the great duke of Muscovy and to the king of Persia. He spent six years in this employment; and, on his return, published a relation of his journeys, with maps and figures, at Slesvic, 1656, in folio. He wrote an *Abridgement of the Chronicles of Holstein from* 1448 *to* 1663; and was appointed librarian to the duke of Holstein, in which capacity he probably died. He has the character of an able mathematician, an adept of music, and a good orientalist, especially in the Persian language.

Olearius (Godfrey), son of Godfrey Olearius, D. D. superintendant of Halle in Saxony, was born there in 1639. He became professor of Greek at Leipsic; and showed his abilities in that language by 52 exercitations on the dominical epistles, and upon those parts of the epistles in the New Testament which are read in the public exercises, and which among the Lutherans are the subject of part of their sermons. He discharged the most important posts in the university, and among other dignities was ten times rector of it. His learning and industry were displayed in 106 theological disputations, 61 in philosophy, some programmas upon difficult points, several speeches and theological counsels; which make two thick volumes: beside his Moral Theology, his introduction to Theology, which treats of cases of conscience, and his *Hermeneutica Sacra*. He lived to a good old age, dying in 1713. His eldest son of his own name was a man of genius and learning, a professor in the same university, who published several works, but died young of a consumption before his father.

OLECRANON, in anatomy, the protuberance of the ulna, which prevents the joint of the elbow from being bent back beyond a certain length. See Anatomy.

OLENUS, a Greek poet, older than Orpheus, came from Xanthe, a city of Lycia. He composed several hymns, which were sung in the island of Delos upon festival days. Olenus is said to have been one of the founders of the oracle at Delphi; to have been the first who filled at that place the office of priest of Apollo; and to have given responses in verse: but the truth of these assertions is very doubtful.

OLERON, an island of France, on the coast of Aunis and Saintonge, about five miles from the continent. It is 12 miles in length, and five in breadth; and is very fertile, containing about 12,000 inhabitants, who are excellent seamen. It is defended by a castle, which is well fortified; and there is a lighthouse placed there for the direction of ships. It is 14 miles south-east of Rochelle. W. lon. 1. 26. N. lat. 46. 10.

Sea-Laws of Oleron, certain laws relative to maritime affairs, made in the time of Richard I. when he was at the island of Oleron. These laws, being accounted the most excellent sea-laws in the world, are recorded in the black book of the admiralty. See *Selden's Mare Clausum*.

Oleum palmæ christi, commonly called *castor oil*, is extracted from the kernel of the fruit produced by the *Ricinus Americanus*. (See Ricinus.) This oil has been much used as a purgative in medicine. It acts gently on the bowels, with little or no irritation. By many physicians it has been deemed a sovereign remedy in bilious, calculous, and nephritic complaints; but its taste is extremely nauseous, and, when frequently used, it is apt to relax the tone of the bowels. It is recommended to be given in clysters; and Dr. Canvane of Bath affirms, that when children cannot be made to swallow any medicine, if the navel and hypochondria be rubbed with this oil, it will produce one or two physical stools. He adds, that given in small draughts, or by clyster, or by embrocation, it is an excellent and wonderful vermifuge.

OLFACTORY nerves. See Anatomy.

OLGA, queen of Igor the second monarch of Russia, who flourished about the year 880, having succeeded his father Ruric, who died in 878. Olga was born in Plescow, and was of the best family in that city. She bore him one son, called *Swetoslaw*. Igor being murdered by the Drewenses, or Drewliani, Olga revenged his death. She went afterwards, for what reason we know not, to Constantinople, where she was baptised, and received the name of *Helena*. The emperor John Zimisces was her god-father, and fell in love with her as we are told; but she, alleging their spiritual alliance, refused to marry him. Her example made some impression upon her subjects, a good number of whom became converts to Christianity; but none upon her son, who reigned for a long time after her death, which happened at Pereslaw, in the 80th year of her age, 14 years after her baptism. The Russians to this day rank her among their saints, and commemorate her festival on the 11th of July.

OLIBANUM, in pharmacy, a gummy resin, the product of the *juniperus lycia* (Lin.), brought from Turkey and the East Indies, usually in drops or tears like those of mastich, but larger; of a pale yellowish, and sometimes reddish colour; a moderately warm pungent taste, and a strong, not very agreeable smell. This drug has received many different appellations, according to its different appearances: the single tears are called simply *olibanum*, or *thus*; when two are joined together, they have been called *thus masculum*, and when very large, *thus fœminium*: sometimes four or five, about the bigness of filberds, are found adhering to a piece of the bark of the tree which they exuded from; these have been named *thus corticosum*: the finer powder which rubs off from the tears in the carriage, *mica thuris*; and the coarser powder, *manna thuris*. This drug is not however, in any of its states, what is now called *thus* or *frankincense* in the shops. See the article Thus. Olibanum consists of about equal parts of a gummy and resinous substance; the first soluble in water, the other in rectified spirit. With regard to its virtues, abundance have been attributed to it, particularly in disorders of the head and breast, in hæmoptoes, and in alvine and uterine fluxes: but its real effects in these cases are far from answering the promises of the recommenders. Riverius is said to have had large experience of the good effects of this drug in pleurisies, especially epidemic ones: he directs a scooped apple to be filled with a dram of olibanum, then covered and roasted under the ashes; this is to be taken for a dose, three ounces of carduus water after it, and the patient covered up warm in bed; in a short time, he says, either a plentiful sweat, or a gentle diarrhœa, ensues, which carry off the disease. Geoffroy informs us, that he has frequently made use of this medicine after venesection, with good success; but acknowledges that it has sometimes failed.

OLIGÆDRA, in natural history, the name of a genus of crystals composed of very few planes, as the name expresses. The word is compounded of ὀλιγος "a few," and εδρα "a plane." The bodies of this class are crystals of the imperfect kind; being composed of columns affixed irregularly to some solid body at one end, and the other terminated by a pyramid: but the column and pyramid being both pentangular, the whole consists only of ten planes, and not, as the common kind, of 12.

OLIGARCHY, a form of government wherein the administration of affairs is confined to a few hands.

OLIO, or Oglio, a savoury dish, or food, composed of a great variety of ingredients; chiefly found at Spanish tables. The forms of olios are various. To give a notion of the strange assemblage, we shall here add one from an approved author. Take rump of beef, neats tongues boiled and dried, and Bologna sausages; boil them together, and, after boiling two hours, add mutton, pork, venison, and bacon, cut in bits; as also turnips, carrots, onions, and cabbage, borage, endive, marigolds, sorrel, and spinach; then spices, as saf-

from, cloves, mace, nutmeg, &c. This done, in another pot put a turkey or goose, with capons, pheasants, wigeons, and ducks, partridges, teals, and stock-doves, snipes, quails, and larks, and boil them in water and salt. In a third vessel, prepare a sauce of white wine, strong broth, butter, bottoms of artichokes, and chesnuts, with cauliflowers, bread, marrow, yolks of eggs, mace, and saffron. Lastly, dish the olio, by first laying out the beef and veal, then the venison, mutton, tongues, and saufages, and the roots over all; then the largest fowls, then the smallest, and lastly pour on the sauce.

OLISIPO (Pliny, Antonine, Inscriptions); a town of Lusitania, situated on the north side of the frith of the Tagus; of such antiquity, that Solinus thought it was built by Ulysses; and Mela, probably to favour this opinion, writes, according to the common copies, *Ulyssipo*; both of them perhaps deceived by the similarity of sound. It was a municipium, with the surname *Felicitas Julia*, a privilege granted by the munificence of Augustus (Inscriptions, Pliny). Now Lisbon, capital of Portugal, situated on the north bank of the Tagus, distant about ten miles from its mouth. See Lisbon.

OLIVE, in botany. See Olea.

Olive-*Press*. In order to obtain the olive oil, the olives are first bruised in a rough trough, under a mill-stone, rolling perpendicularly over them; and when sufficiently mashed, put into the maye, or trough, *m*, plate 2, of an olive-press, where *aa* are the upright beams, or cheeks; *b*, the female, and *c*, the male screw *f*, the board on which the screw presses; *g*, a cubical piece of wood, called a *block*; *h*, the peel, a circular board, to be put under the block. By turning the screw, all the liquor is pressed out of the mashed olives, and is called *virgin-oil*; after which, hot water being poured upon the remainder in the press, a coarser oil is obtained. Olive-oil keeps only about a year, after which it degenerates.

Olive (Peter John), was born in France, and died in 1297, in the fiftieth year of his age. In his youth he wrote a book in praise of the Virgin Mary, which was condemned during the pontificate of Nicholas III. as containing some things too extravagant. He afterwards was frequently accused by the brothers of his order, whose resentment he had drawn upon himself by his severe reproofs of their luxury, and his endeavours to recall them to the poverty and rigour of their first institution. After his death his body was dug up, he was condemned as a heretic, and his writings were burnt, and remained prohibited till the time of Sixtus IV. who having ordered them to be examined, declared they contained nothing expressly contrary to the Catholic faith. The propositions condemned by John are mentioned by Emmericus, in his Directory of the Inquisition, under twenty-two heads. The chief of them are, "That the Pope was the mystical antichrist; that St. Francis was the angel in the Revelations said to have the mark of the living God, and that his rule was the true gospel; that the perfect state of the church began with St. Francis; and that Christ and his apostles had no property either in common or in particular, but only the usufruct of what they enjoyed."

OLIVER (Isaac), an excellent English painter, born in 1556, eminent both for history and portraits. Several fine miniatures of this master are to be seen in the collections of our nobility and gentry; some of them portraits of himself. As he was a very good designer, his drawings are finished to an extraordinary degree of perfection; many being copies after Parmegiano. Rubens and Vandyck painted James I. after a miniature of Oliver's, which is a sufficient testimony of his merit. He died in 1617.

Oliver (Peter), the son and disciple of Isaac Oliver, was born in 1601. He arrived at a degree of perfection in miniature portraits confessedly superior to his father, many of his cotemporaries, as he did not confine his subjects to a head only. In the collections of Charles I. and James II. there were 12 historical subjects painted by this Oliver; of which seven are still preserved in the closet of queen Caroline at Kensington; and a capital painting of his wife is in the possession of the duchess of Portland. He died in 1660.

OLIVET, or *Mount of* Olives (anc. geog.), was situated to the east of the city of Jerusalem, and parted from the city only by the brook Kidron, and by the valley of Jehoshaphat which stretches out from the north to the south. It was upon this mount that Solomon built temples to the gods of the Ammonites (1 Kings xi. 7.) and of the Moabites, out of complaisance to his wives, who were natives of these nations. Hence it is that the Mount of Olives is called the *mountain of corruption* (2 Kings xxiii. 13.). Josephus says, that this mountain is at the distance of five stadia, or furlongs, from Jerusalem, which make 625 geometrical paces, or the length of a Sabbath-day's journey, says St. Luke (Acts i. 12). The Mount of Olives had three summits, or was composed of three several mountains, ranged one after another from north to south. The middle summit is that from whence our Saviour ascended into heaven. It was upon that towards the south that Solomon built temples to his idols. The summit which is most to the north is distant two furlongs from the middlemost. This is the highest of the three, and is commonly called Galilee.

In the time of king Uzziah, the Mount of Olives was so shattered by an earthquake, that half of the earth that was on the western side fell down, and rolled four furlongs or 500 paces from thence, towards the mountain which was opposite to it on the east; so that the earth blocked up the highways, and covered the king's gardens.

Mr. Maundrell tells us, that he and his company going out of Jerusalem at St. Stephen's gate, and crossing the valley of Jehoshaphat, began immediately to ascend the mountain; that being got about two-thirds of the way up, they came to certain grottoes cut with intricate windings and caverns under ground, which were called the sepulchres of the prophets; that a little higher up were twelve arched vaults under ground, standing side by side, and built in memory of the apostles, who are said to have compiled their creed in this place; that sixty paces higher they came to the place where Christ is said to have uttered his prophecy concerning the final destruction of Jerusalem; and a little on the right hand, to another, where he is said to have dictated a second time the Lord's prayer to his disciples; that somewhat higher is the cave of a saint called *Pelagia*; a little above that a pillar, denoting the place where an angel gave the Blessed Virgin three days warning of her death: and at the top of all, the place of our Blessed Lord's ascension.

OLIVETAN (Robert), related to the famous Calvin, printed at Neufchatel in 1535, in folio, a version of the Bible into French, the first which had been translated from the original Hebrew and Greek. It is written in an uncouth and barbarous style, and is far from being faithful. The characters in which it is printed are Gothic, and the language of it is no less so. It is valued only because it is rare to be found. Calvin is thought to have had a very considerable share in this translation. Olivetan survived his publication but a short time; for he was poisoned at Rome the year after, of which his translation is alleged to have been the cause. Olivetan's Bible, revised by John Calvin and N. Malinger, was reprinted at Geneva, in 1540, in quarto. This edition is still rarer than the former. It is called the *Bible de l'Epée*, because the printer had a sword for his sign.

OLIVIER (Claude Matthieu), advocate of the parliament of Aix, was born at Marseilles in 1701, and appeared at the bar with eclat. He had a chief hand in the establishment of the academy of Marseilles, and was one of its original members. He possessed a quick and lively genius. A few hours retire-

ment from ſociety and from his pleaſures were frequently ſufficient to enable him to ſpeak and write, even on important cauſes; but his works commonly bore marks of haſte. Given to exceſs in every thing, he would employ a fortnight in ſtudying the Code and the Digeſt, or in ſtoring his mind with the beauties of Demoſthenes, Homer, Cicero, or Boſſuet; and then abandon himſelf for another fortnight, frequently a whole month, to a life of frivolity and diſſipation. He died in 1736, at the age of 35. He publiſhed, 1. *L'Hiſtoire de Phillippe roi de Macedoine, et pere d'Alexandre le Grand*, 2 vols. 12mo. No writer has ſo ably handled the hiſtory of the age of Philip, the intereſts of the different nations of Greece, and their manners and cuſtoms: but the conduct of the work is extremely defective. The digreſſions are too frequent, and often tedious. The ſtyle is in no reſpect ſuitable to a hiſtory. It is in general dry, unconnected, and like the ſtyle of a diſſertation. Sometimes, however, we find in it paſſages full of fire and beauty, and turns of expreſſion truly original. A diſeaſe of the brain, with which he was attacked, and under which he laboured ſeveral years, prevented him from putting his laſt hand to the work. 2. *Mémoire ſur les ſecours donnés aux Romains par les Marſeillois pendant la 2de Guerre Punique.* 3. *Mémoire ſur les ſecours donnés aux Romains par les Marſeillois durant la Guerre contre les Gaulois.*

OLMUTZ, a town in Germany, in Moravia, with a biſhop's ſee, and a famous univerſity. The public buildings are very handſome, particularly the Jeſuits college. It is a populous, trading, and very ſtrong place; and yet it was taken, with the whole garriſon, by the king of Pruſſia in 1741. In July 1758 he beſieged it again; and when he had almoſt taken the place he was obliged to raiſe the ſiege, to go and meet the Ruſſian army. It is ſeated on the river Morave. E. lon. 17. 35. N. lat. 49. 30.

OLOCENTROS, in natural hiſtory, a name given by the old Greeks to a ſmall animal of the ſpider kind, whoſe bite was accounted mortal. It is the ſame with the ſolipuga, ſo called from its ſtinging, or biting moſt violently, in places, or ſeaſons, where the ſun had the moſt power, as Africa, &c. The name *ſolifuga* was a corrupt way of writing that word; and this ſeems alſo a falſe way of writing the word *heliocentros*, which ſignifies the ſame as ſolipuga.

OLYMPIA (Maldachini Donna), a woman of a very uncommon character. She flouriſhed about the middle of the laſt century. She was ſiſter-in-law to Pope Innocent X. and had the addreſs to acquire an unlimited power over this vain, weak, and injudicious eccleſiaſtic. Her ſon Camillo was promoted to the cardinalate, under the title of Pamphilio; but falling in love with the Princeſs Roſſana, a beautiful young widow, he laid aſide his hat, and married. The crime, if it was one, was eſteemed by the Romans in general at leaſt venial. The pope, however, was diſpleaſed; and Olympia procured their baniſhment, being afraid leſt her daughter-in-law ſhould leſſen her authority in the *ſacred court*. This authority, equally unnatural and uncommon, reflected neither honour on her who held it, nor on the man who allowed her to hold it. Such elevated ſituations, however, whether they are the reward of merit, the effect of chance, or acquired by cunning, are ſeldom very ſecure. Olympia, who had procured the diſgrace of many who did not deſerve it, and who had herſelf long merited ſuch a fate, at length experienced both diſgrace and baniſhment. This was obtained by means of cardinal Panzirollo, a great favourite of the pope's. The immediate cauſe of it was this: The pope had determined, in order to leſſen his own trouble, to adopt a nephew, and to make him a *Cardinal Patron*, in order to give audience to ambaſſadors and miniſters, and in his abſence to preſide at the council. For this purpoſe, at the recommendation of his favourite, his holineſs made choice of Aſtalli, brother of the Marquis Aſtalli, who had married a niece of Olympia. Olympia indeed was ſlightly conſulted on the affair, and ſhowed no diſapprobation of the appointment. The pope, however, no ſooner got him fixed in his new office, than he ſhowed his own weakneſs by repenting of it. Olympia too was diſpleaſed, and by her ſolicitations procured the diſgrace of Aſtalli, before he had enjoyed either the honours or emoluments of his office. Panzirollo, however, ſoon managed matters ſo as to turn the ſcales: he prevailed on the pope again to countenance and honour Aſtalli; and, what was more, had influence ſufficient to perſuade him to diſgrace Olympia, and to baniſh her the court. She had indeed abuſed her authority in a moſt ſcandalous manner, and had gained ſuch an abſolute aſcendant over the pope, that in every thing his will had been ſubſervient to her dictates. Her avarice and ambition were unbounded: ſhe diſpoſed of all benefices, which were kept vacant till ſhe fully informed herſelf of their value: ſhe rated an office of 1000 crowns for three years, at one year's revenue, and if for life, at 12 years purchaſe, one half of which ſum ſhe required to be paid in advance: ſhe gave audience upon public affairs, enacted new laws, abrogated thoſe of former popes, and ſat in council with Innocent, with bundles of memorials in her hands. It was generally ſaid that they lived together in a criminal correſpondence, and that ſhe had charmed him by ſome ſecret incantation. In the Proteſtant countries the loves and intrigues of Innocent and Donna Olympia were repreſented upon the ſtage; and ſevere ſarcaſms were daily put into the hands of Paſquin at Rome: As ſhe had uſurped ſuch an abſolute authority, the new cardinal nephew ſaw the neceſſity of ruining her credit; he therefore ſeconded the endeavours of Panzirollo. He inſinuated to the pope, that his reputation had ſuffered greatly among the Catholics by her ſcandalous proceedings, and that his nuncios were treated with diſreſpect and contempt at the courts of the Emperor, France, and Spain. Upon theſe repreſentations, Innocent at length, but with great reluctance, baniſhed Olympia, and was reconciled to Prince Camillo and the Princeſs Roſſana; though ſome authors affirm that her baniſhment was no more than a political retreat, and that ſhe ſtill in private directed the affairs of the pope. A woman of Olympia's character, however, with ſuch unbounded ambition, ſuch an extravagant luſt for power, and ſuch an ambitious deſire of wealth, and who had once poſſeſſed ſo great an aſcendency over ſuch a man as Innocent, was not to be ſo eaſily put off. She was baniſhed in 1650; but in 1653 ſhe again aſſumed the ſupreme direction of affairs juſt as before her diſgrace. She again accompliſhed the diſgrace of Aſtalli, and procured the promotion of Azzolini to the office of ſecretary of the briefs. In 1654, his holineſs reſigned himſelf entirely into the hands of this aſſuming woman; who, obſerving his infirmities daily increaſing, redoubled her rapacity, diſpoſing of benefices to the higheſt bidders in all parts of Italy. She was again, however, in hazard of being diſplaced by a new favourite, *viz.* the Cardinal de Retz: and had not the pope's diſſolution prevented it, it would in all probability quickly have taken place. During his laſt illneſs he received nothing but from the hands of Donna Olympia, who was at great pains to prolong his life, watched continually at his bed-ſide, and prevented the ambaſſadors or others from diſturbing him with diſcourſes upon buſineſs. She is ſaid, during the laſt ten days of his life, when he continued without the uſe of reaſon, to have amaſſed about half a million of crowns. She did not find the ſucceeding pope (Alexander VII.) ſo eaſy to be played upon as his weak predeceſſor: a number of memorials were ſent in againſt her, and his holineſs was well diſpoſed to attend to them: he ordered her to retire from Rome, and at the ſame time began to examine witneſſes reſpecting her conduct. She was cut off, however, before the trial was finiſhed, by the plague, which, in 1636, afflicted Rome and its neigh-

bourhood. Her eſtate was not confiſcated as was generally expected; and the prince Pamphilio was allowed to ſucceed her. The pope only reſerved for his own relations about a million of crowns.

Olympia (anc. geog.), with the ſurname *Piſatis* (Strabo); ſo called from the territory of Piſa in Elis; deſcribed by Strabo, "as the temple of Jupiter Olympius, before which ſtands a grove of wild olive-trees, in which is the ſtadium, or foot-courſe, ſo called becauſe the eighth part of a mile; and by which the Alpheus, coming down from Arcadia, runs." Olympia, however, was famous, not merely for the temple of Jupiter, but alſo for a temple of Juno, 63 feet long, with columns round it of the Doric order; and a Metroum or temple of the mother of the gods, a large Doric edifice; with holy treaſuries. Theſe, and the porticoes, a gymnaſium, prytaneum, and many more buildings, chiefly in the incloſure, with the houſes of the prieſts and other inhabitants, made Olympia no inconſiderable place. The ſtadium was in the grove of wild olive-trees, before the great temple; and near it was the hippodrome or courſe for the races of horſes and chariots. The Alpheus flowed by from Arcadia with a copious and very pleaſant ſtream, which was received on the coaſt by the Sicilian ſea.

The temple of Jupiter was of the Doric order, 68 feet high to the pediment, 95 wide, and 230 long; the cell encompaſſed with columns. It was erected with the country-ſtone; the roof, not of earth baked, but of Pentelic marble; the ſlabs diſpoſed as tiles; the way to it up a winding ſtaircaſe. The two pediments were enriched with ſculpture; and one had over the centre a ſtatue of Victory gilded, and underneath a votive buckler of gold. At each corner was a gilded vaſe. Above the columns were fixed 21 gilded bucklers, offered at the concluſion of the Achæan war by the Roman general Mummius. The gates in the two fronts were of braſs, and over them were carved the labours of Hercules. Within the cell were double colonnades, between which was the approach to the image.

The Jupiter of Olympia was accounted alone ſufficient to immortalize its maker, Phidias. It was of ivory and gold, the head crowned with olive. In the right hand was a ſtatue of Victory; in the left a flowered ſceptre, compoſed of various metals, on which was an eagle. The ſandals were of gold, as alſo the veſtment, which was curiouſly emboſſed with lilies and animals. The throne was gold inlaid with ebony and ivory, and ſtudded with jewels, intermixed with paintings and exquiſite figures in relievo. The pillars between the feet contributed to its ſupport. Before it were walls, ſerving as a fence, decorated principally with the exploits of Hercules; the portion oppoſite to the door of a blue colour. It was the office of a family deſcended from Phidias, called *phædruntæ* or *the poliſhers*, to keep the work bright and clean. The veil or curtain was cloth rich with the purple dye of Phœnicia and with Aſſyrian embroidery, an offering of king Antiochus, and was let down from above by looſing the ſtrings. The image impreſſed on the ſpectator an opinion that it was higher and wider than it meaſured. Its magnitude was ſuch, that, though the temple was very large, the artiſt ſeemed to have erred in the proportions. The god, ſitting, nearly touched the cieling with his head; ſuggeſting an idea, that if he were to riſe up, he would deſtroy the roof. A part of the pavement before it was of black marble, incloſed in a rim of Parian or white, where they poured oil to preſerve the ivory.

The altar of Jupiter Olympius was of great antiquity, and compoſed of aſhes from the thighs of the victims, which were carried up and conſumed on the top with wood of the white poplar-tree. The aſhes alſo of the prytaneum, in which a perpetual fire was kept on a hearth, were removed annually on a fixed day, and ſpread on it, being firſt mingled with water from the Alpheus. The cement, it was affirmed, could be made with that fluid only; and therefore this river was much reſpected, and eſteemed the moſt friendly of any to the god. On each ſide of the altar were ſtone-ſteps. Its height was 22 feet. Girls and women, when allowed to be at Olympia, were ſuffered to aſcend the baſement, which was 125 feet in circumference. The people of Elis ſacrificed daily, and private perſons as often as they choſe.

Religion flouriſhed at Olympia, and many deities were worſhipped beſides Jupiter. Pauſanias has enumerated above 60 altars of various ſhapes and kinds. One of the unknown gods ſtood by the great altar. The people of Elis offered on all theſe monthly; laying on them boughs of olive; burning incenſe, and wheat mixed with honey; and pouring libations of ſuch liquors as the ritual preſcribed. At the latter ceremony ſometimes a form of prayer was uſed, and they ſung hymns compoſed in the Doric dialect.

Olympia was ſituated on an eminence, between two mountains called *Oſſa* and *Olympus*. Though its ancient ſplendor is gone, the place reminds the traveller of what it once was. It is in the Marca, being now a ſmall place called *Longinico*, 50 miles ſouth of Lepanto, in E. lon. 22. 0. N. lat. 37. 40.

OLYMPIAD, the ſpace of four years, whereby the Greeks reckoned time.—The firſt Olympiad fell, according to the accurate and learned computation of ſome of the moderns, exactly 776 years before the firſt year of Chriſt, or 775 before the year of his birth, in the year of the Julian period 3938, and 22 years before the building of the city of Rome. The games were exhibited at the time of the full moon next after the ſummer ſolſtice; therefore the Olympiads were of unequal length, becauſe the time of the full moon differs 11 days every year, and for that reaſon they ſometimes began the next day after the ſolſtice, and at other times four weeks after. The computation by Olympiads ceaſed, as ſome ſuppoſe, after the 364th, in the year 440 of the Chriſtian era. It was univerſally adopted not only by the Greeks, but by many of the neighbouring countries; though ſtill the Pythian games ſerved as an epoch to the people of Delphi and to the Bœotians; the Nemæan games to the Argives and Arcadians; and the Iſthmian to the Corinthians and the inhabitants of the Peloponneſian iſthmus. To the Olympiads hiſtory is much indebted. They have ſerved to fix the time of many momentous events: and indeed before this method of computing time was obſerved, every page of hiſtory is moſtly fabulous, and filled with obſcurity and contradiction, and no true chronological account can be properly eſtabliſhed and maintained with certainty.

OLYMPIAS, a celebrated woman, who was daughter of a king of Epirus, and who married Philip king of Macedonia, by whom ſhe had Alexander the Great. Her haughtineſs, and more probably her infidelity, obliged Philip to repudiate her, and to marry Cleopatra, the niece of King Attalus. Olympias was ſenſible of this injury, and Alexander ſhowed his diſapprobation of his father's meaſures, by retiring from the court to his mother. The murder of Philip, which ſoon followed this diſgrace, and which ſome have attributed to the intrigues of Olympias, was productive of the greateſt extravagances. The queen paid the greateſt honour to her huſband's murderer. She gathered his mangled limbs, placed a crown of gold on his head, and laid his aſhes near thoſe of Philip. The adminiſtration of Alexander, who had ſucceeded his father, was in ſome inſtances offenſive to Olympias; but when the ambition of her ſon was concerned, ſhe did not ſcruple to declare publicly that Alexander was not the ſon of Philip, but that he was the offſpring of an enormous ſerpent who had ſupernaturally introduced himſelf into her bed. When Alexander was dead, Olympias ſeized the government of Macedonia; and, to eſtabliſh her uſurpation, ſhe cruelly put to death Aridæus, with his wife Eurydice, as alſo Nicanor the brother of Caſſander, with 100

leading men of Macedon, who were inimical to her intereſt. Such barbarities did not long remain unpuniſhed: Caſſander beſieged her in Pydna, where ſhe had retired with the remains of her family, and ſhe was obliged to ſurrender after an obſtinate ſiege. The conqueror ordered her to be accuſed, and to be put to death. A body of 200 ſoldiers were ordered to put the bloody commands into execution, but the ſplendor and majeſty of the queen diſarmed their courage; and ſhe was at laſt maſſacred by thoſe whom ſhe had cruelly deprived of their children, about 316 years before the Chriſtian era.

OLYMPIC GAMES were ſolemn games among the ancient Greeks, ſo called from Olympian Jupiter, to whom they were dedicated; and by ſome ſaid to be firſt inſtituted by him, after his victory over the ſons of Titan; others aſcribe their inſtitution to Hercules, not the ſon of Alcmena, but one of much greater antiquity; others to Pelops; and others to Hercules the ſon of Alcmena. By whomſoever they were inſtituted, we know that, at a period rather early, they had fallen into diſuſe. The wars which prevailed among the Greeks, for a while, totally interrupted the religious ceremonies and exhibitions with which they had been accuſtomed to honour the common gods and heroes; but the Olympic games were reſtored on the following occaſion. Amidſt the calamities which afflicted or threatened Peloponneſus, Iphitus, a deſcendant of Oxylus, to whom the province of Eleia had fallen in the general partition of the peninſula, applied to the Delphic oracle. The prieſts of Apollo, ever diſpoſed to favour the views of kings and legiſlators, anſwered agreeably to his wiſh, that the feſtivals anciently celebrated at Olympia, on the Alpheus, muſt be renewed, and an armiſtice proclaimed for all the ſtates willing to partake of them, and deſirous to avert the vengeance of heaven. Fortified by this authority, and aſſiſted by the adviee of Lycurgus, Iphitus took meaſures, not only for reſtoring the Olympic ſolemnity, but for rendering it perpetual. The injunction of the oracle was ſpeedily diffuſed through the remoteſt parts of Greece by the numerous votaries who frequented the ſacred ſhrine. The armiſtice was proclaimed in Peloponneſus, and preparations were made in Eleia for exhibiting ſhows and performing ſacrifices. In the heroic ages, feats of bodily ſtrength and addreſs were deſtined to the honour of deceaſed warriors; hymns and ſacrifices were reſerved for the gods: but the flexible texture of Grecian ſuperſtition, eaſily confounding the expreſſions of reſpectful gratitude and pious veneration, enabled Iphitus to unite both in his new inſtitution.

The feſtival, which laſted five days, began and ended with a ſacrifice to Olympian Jove. The intermediate time was chiefly filled up by the gymnaſtic exerciſes, in which all freemen of Grecian extraction were invited to contend, provided they had been born in lawful wedlock, and had lived untainted by any infamous immoral ſtain. The preparation for this part of the entertainment was made in the gymnaſium of Elis, a ſpacious edifice, ſurrounded by a double range of pillars, with an open area in the middle. Adjoining were various apartments, containing baths, and other conveniences for the combatants. The neighbouring country was gradually adorned with porticoes, ſhady walks and groves, interſperſed with ſeats and benches; the whole originally deſtined to relieve the fatigues and anxiety of the candidates for Olympic fame; and frequented, in later times, by ſophiſts and philoſophers, who were fond to contemplate wiſdom, and communicate knowledge, in thoſe delightful retreats. The order of the athletic exerciſes, or combats, was eſtabliſhed by Lycurgus, and correſponded almoſt exactly to that deſcribed by Homer, in the 23d book of the Iliad, and eighth of the Odyſſey. Iphitus, we are told, appointed the other ceremonies and entertainments; ſettled the regular return of the feſtival at the end of every fourth year, in the month of July; and gave to the whole ſolemnity that form and arrangement, which it preſerved with little variation above a thouſand years; a period exceeding the duration of the moſt famous kingdoms and republics of antiquity. Among the benefactors of Olympia at a much later period, was reckoned Herod, who was afterwards king of Judæa. Seeing, on his way to Rome, the games neglected or dwindling into inſignificance from the poverty of the Eleans, he diſplayed vaſt munificence as preſident, and provided an ample revenue for their future ſupport and dignity.

The care and management of the Olympics belonged for the moſt part to the Eleans; who on that account enjoyed their poſſeſſions without moleſtation, or fear of war or violence. They appointed a certain number of judges, who were to take care that thoſe who offered themſelves as competitors ſhould perform their preparatory exerciſes; and theſe judges, during the ſolemnity, ſat naked, having before them a crown of victory, formed of wild olive, which was preſented to whomſoever they adjudged it. Thoſe who were conquerors were called *Olympionices*, and were loaded with honours by their countrymen. At theſe games women were not allowed to be preſent; and if any woman was found, during the ſolemnity, to have paſſed the river Alpheus, ſhe was to be thrown headlong from a rock. This, however, was ſometimes neglected; for we find not only women preſent at the celebration, but alſo ſome among the combatants, and ſome rewarded with the crown. The preparations for theſe feſtivals were great. No perſon was permitted to enter the liſts if he had not regularly exerciſed himſelf ten months before the celebration at the public gymnaſium of Elis. No unfair dealings were allowed; whoever attempted to bribe his adverſary was ſubjected to a ſevere fine; and even the father and relations were obliged to ſwear that they would have recourſe to no artifice which might decide the victory in favour of their friends. No criminals, nor ſuch as were connected with impious and guilty perſons, were ſuffered to preſent themſelves as combatants. The wreſtlers were appointed by lot. Some little balls ſuperſcribed with a letter were thrown into a ſilver urn, and ſuch as drew the ſame letter were obliged to contend one with the other. He who had an odd letter remained the laſt; and he often had the advantage, as he was to encounter the laſt who had obtained the ſuperiority over his adverſary. In theſe games were exhibited, running, leaping, wreſtling, boxing, and the throwing of the quoit, which was called altogether πενταθλον, or *quinquertium*. Beſides theſe, there were horſe and chariot races, and alſo contentions in poetry, eloquence, and the fine arts. The only reward that the conqueror obtained was a crown of olive. This, as ſome ſuppoſe, was in memory of the labours of Hercules, which were accompliſhed for the univerſal good of mankind, and for which the hero claimed no other reward but the conſciouſneſs of having been the friend of mankind. So ſmall and trifling a reward ſtimulated courage and virtue, and was the ſource of greater honours than the moſt unbounded treaſures. The ſtatues of the conquerors, called *Olympionicæ*, were erected at Olympia in the ſacred wood of Jupiter. Their return home was that of a warlike conqueror; they were drawn in a chariot by four horſes, and everywhere received with the greateſt acclamations. Their entrance into their native city was not through the gates; to make it more grand and more ſolemn a breach was made in the walls. Painters and poets were employed in celebrating their names; and indeed the victories ſeverally obtained at Olympia are the ſubjects of the moſt beautiful odes of Pindar. The combatants were naked. A ſcarf was originally tied round their waiſt; but when it had entangled one of the adverſaries, and been the cauſe that he loſt the victory, it was laid aſide, and no regard was paid to decency. The Olympic games were obſerved every fifth year, or, to ſpeak with greater exactneſs, after a revolution of four years, and in the firſt

month of the fifth year, and they continued for five ſucceſſive days. As they were the moſt ancient and moſt ſolemn of all the feſtivals of the Greeks, it will not appear wonderful that they drew ſo many people, not only inhabitants of Greece, but of the neighbouring iſlands and countries.

Such is the account of Grecian writers, who have, doubtleſs, often aſcribed to poſitive inſtitution many inventions and uſages naturally reſulting from the progreſſive manners of ſociety. When we come to examine the Elean games in their more improved ſtate, together with the innumerable imitations of them in other provinces of Greece, there will occur reaſons for believing, that many regulations, referred by an eaſy ſolution to the legiſlative wiſdom of Iphitus or Lycurgus, were introduced by time or accident, continued through cuſtom, improved by repeated trials, and confirmed by a ſenſe of their utility. Yet ſuch an inſtitution as the Olympiad, even in its leaſt perfect form, muſt have been attended with manifeſt advantages to ſociety. It is ſufficient barely to mention the ſuſpenſion of hoſtilities which took place, not only during the celebration of the feſtival, but a conſiderable time both before and after it. Conſidered as a religious ceremony, at which the whole Grecian name was invited, and even enjoined, to aſſiſt, it was well adapted to facilitate intercourſe, to promote knowledge, to ſoften prejudice, and to haſten the progreſs of civiliſation and humanity. Greece, and particularly Peloponneſus, was the centre from which the adventurous ſpirit of its inhabitants had diffuſed innumerable colonies through the ſurrounding nations. To theſe widely ſeparated communities, which, notwithſtanding their common origin, ſeemed to have loſt all connection and correſpondence, the Olympiad ſerved as a common bond of alliance and point of reunion. The celebrity of this feſtival continually attracted to it the characters moſt diſtinguiſhed for genius and enterpriſe, whoſe fame would have otherwiſe been unknown and loſt in the boundleſs extent of Grecian territory. The remote inhabitants, not only of European Greece, but of Aſia and Africa, being aſſembled to the worſhip of common gods, were formed to the ſenſe of a general intereſt, and excited to the purſuit of national honour and proſperity. Strangers of ſimilar diſpoſitions might confirm in Elis the ſacred and indiſſoluble ties of hoſpitality. If their communities were endangered by any barbarous power, they might here ſolicit aſſiſtance from their Grecian brethren. On other occaſions they might explain the benefits which, in peace or war, their reſpective countries were beſt qualified to communicate. And the Olympic feſtival might thus ſerve the purpoſe of reſident ambaſſadors, and other inſtitutions alike unknown to antiquity.

OLYMPUS, the name of ſeveral mountains.—One bounding Bithynia on the ſouth.—Another in the iſland of Cyprus, on whoſe top was a temple of Venus, which women were not permitted either to enter or to ſee (Strabo).—A third, Olympus of Galatia (Livy).—A fourth of Lycia, with a noble cognominal town, near the ſea-coaſt (Strabo, Cicero), extinct in Pliny's time, there remaining only a citadel: the town was deſtroyed by P. Servilius Iſauricus (Florus), having been the retreat of pirates. From this mountain there was an extenſive proſpect of Lycia, Pamphilia, and Piſidia (Strabo).—A fifth, Olympus of Myſia (Ptolemy); thence ſurnamed *Olympena*, anciently *Minor*; one of the higheſt mountains, and ſurnamed *Myſius* (Theophraſtus); ſituated on the Propontis, and thence extending more inland.—A ſixth, on the north of Theſſaly, or on the confines of Macedonia; famous for the fable of the giants (Virgil, Horace, Seneca); reckoned the higheſt in the whole world, and to exceed the flight of birds (Apulcius), which is the reaſon of its being called *heaven*, than which nothing is higher: the ſerenity and calmneſs which reign there are celebrated by Homer, Lucan, and Claudian.

OLYRA, in botany: A genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. The male calyx is a biflorous and ariſtated glume; the corolla a beardleſs glume; the female calyx is an uniflorous, patulous, and ovate glume; the ſtyle is bifid, and the ſeed cartilaginous.

OMAR (Ebn Al Khattab) ſucceſſor of Abu Becr.—The Mohammedan impoſture, like every other falſehood of its kind, copies after the truth as far as was thought convenient or proper; and miracles being the grand proof of revelation, it was to be expected that all pretences to that ſhould aſſume at leaſt the appearances of them. Few ſyſtems of faith are more abſurd than Mohammed's; yet, though he diſclaimed miracles, it was ſupported, as we are told by later writers, by a variety of them, which, however, unfortunately for the creed they were contrived to ſupport, are too trifling, abſurd, and contradictory, to deſerve the ſmalleſt attention.

They tell us, but upon grounds too vague and indeterminate to command belief, that Omar was miraculouſly converted to this faith; a man he is reported to have been, before this event, truly reſpectable, and in particular a violent oppoſer of the Arabian prophet. Mohammed, it ſeems, felt this oppoſition and regretted it; he therefore, with the fervour, and, as it happened, with the ſucceſs of a true prophet, according to his followers' account, prayed for the converſion of this his dangerous antagoniſt. Omar, it is ſaid, had no ſooner read the 20th chapter of the Koran than he was convinced: upon which he inſtantly repaired to Mohammed and his followers, and declared his converſion. It is ſaid, that at one time he intended to murder the prophet; and various cauſes are aſſigned for the prevention of this ſhocking piece of ſacrilege. After his wonderful converſion, the Mohammedan writers inform us that he was ſurnamed *Al Faruk*, or the "divider;" becauſe, ſay they, when a certain Moſlem was condemned by Mohammed for his iniquitous treatment of a Jew, and appealed afterwards from the ſentence of the prophet to Omar, he cut him in two with his ſcimitar, for not acquieſcing in the deciſion of ſo upright a judge: which circumſtance when Mohammed heard, he gave him the ſurname of *Al Faruk*, or the "divider;" becauſe, by this action, he had ſhown himſelf capable of perfectly diſtinguiſhing between truth and falſehood. Al Kodai affirms, that 39 of Omar's adherents followed his example the ſame day he profeſſed himſelf a votary of Mohammed. The converſion of Hamza and Omar Ebn Al Khattab happened in the year preceding the firſt flight of the Moſlems into Ethiopia, or the fourth year of Mohammed's miſſion, according to Abulfeda. He was unqueſtionably a great acquiſition to the prophet, and enabled him to carry on his ſchemes to far more purpoſe than he could poſſibly have done without him, or if he had continued his enemy. Omar at length found his ſervices in the cauſe he had undertaken ſufficiently honoured and amply rewarded; for on the death of Abu Beer, who had ſucceeded the impoſtor himſelf, he was promoted to the regal and pontifical dignity. The title firſt aſſigned him was the *khalif of the khalif of the apoſtle of God*; or in other words *the ſucceſſor of the ſucceſſor of Mohammed*: but the Arabs conſidering that this title, by the addition to be annexed to it at the acceſſion of every future khalif, would be too long, they, by univerſal conſent, ſaluted him *the emperor of the believers*. Which illuſtrious title, at this juncture conferred on Omar, deſcended afterwards to all the ſucceſſors of that prince. Our readers will not expect us to follow the khalif with minute exactneſs through the tranſactions of his reign. This would indeed ſwell our article beyond all proportion. We ſhall therefore confine ourſelves to ſome of the leading facts.

His arms appear to have been particularly ſucceſsful; the Perſians he conquered, and Jeruſalem ſubmitted to his power; nor does he appear to have been checked in a ſingle inſtance.

In conſequence, however, of his ſucceſs, an attempt was made to aſſaſſinate him. The fact is thus related: Wathek Ebn Moſafer, a reſolute young Arab, was procured by the king of Ghaſſan, and ſent to Medina for this very purpoſe. Some time after his arrival, obſerving Omar to fall aſleep under a tree on which he had placed himſelf ſo as not to be diſcovered by any perſon, he drew his dagger, and was upon the point of ſtabbing him, when, lifting up his eyes, he ſaw a lion walking round about him, and licking his feet. Nor did the lion ceaſe to guard the khalif till he awoke; but then inſtantly went away. This phenomenon ſtruck Wathek with a profound reverence for Omar, whom he now revered as the peculiar care of heaven. He therefore came down from the tree, on which the lion had forced him to remain, kiſſed the khalif's hand, confeſſed his crime, and embraced the Mohammedan religion; being ſo ſtrongly affected with the wonderful deliverance he had been an eye-witneſs of. His life, however, was at length ended by aſſaſſination; for about two years after the concluſion of the Nohawandian war, in which the Arabs probably ſtill farther extended their conqueſts, though no account of their military operations during that period has reached us, that is, in the 23d year of the Hegira, according to Abu Jaafar Al Tabari, the khalif Omar Ebn Al Khattab was aſſaſſinated by a Perſian ſlave; of which horrid fact the Arab writers have handed down the following particulars: Abu Lulua, a Perſian of the Magian ſect, whoſe name was *Firuz*, one of Al Mogheira Ebn Al Shaabah's ſlaves, was obliged by his maſter to pay daily two dirhems, in conformity to the Mohammedan cuſtom, for the free exerciſe of his religion. Firuz reſenting this treatment, complained of it to the khalif, and deſired that ſome part at leaſt of the tribute exacted of him might be remitted; but this favour being refuſed by Omar, the Perſian threatened his deſtruction; which he ſoon after effected, by ſtabbing him thrice in the belly with a dagger, whilſt he was in the moſque at Medina performing his morning devotions. The Arabs then preſent, perceiving that the villain had embrued his hands in the blood of their ſovereign, immediately ruſhed upon him; but he made ſo deſperate a defence, that he wounded 13 of the aſſailants, and ſeven of them mortally. At laſt, one of the khalif's attendants threw his veſt over him, and ſeized him; upon which he ſtabbed himſelf, and ſoon after expired. According to Theophanes, this Firuz was an apoſtate or renegade, and conſequently had before embraced the Mohammedan religion: but this aſſertion is by no means probable; becauſe, on his becoming a convert to Iſlamiſm, he muſt have been manumitted by his maſter, and on his relapſing into Magiſm he would have been put to death by the khalif's order: neither of which particulars is conſiſtent with what we find related by the Arab hiſtorians, and even by our Greek chronographer himſelf. Omar languiſhed three days, and then died, in the month of Dhu'lhajja, and the 23d year of the Hegira, which began in the year of our Lord 643. Authors are not agreed with regard to the duration of his khalifat. The Arab hiſtorians, whom we are inclined to follow, ſay that he reigned between 10 and 11 years. Theophanes affirms, that he was murdered in the 12th year of his khalifat, and Dionyſius Telmarenſis extends the length of his reign to 12 complete years. Only one of the wounds given him by Firuz was mortal, and that he received under his navel. At his death he was 63 years old; which, as we are told by an Arab author, was the age of Mohammed himſelf, Abu Becr, and Ayeſha, one of the prophet's wives, when they died. When Omar fell in the moſque, Abd'alrahman Ebn Awf, one of Mohammed's firſt converts, ſupplied his place during the remainder of the ſervice; and three days before his death, Sahib Ebn Tarſib, at his command, officiated for him. His body was interred in Ayeſha's apartment, near that of the prophet Mohammed. We are informed by Eutychius, that during his khalifat he performed the pilgrimage to Mecca nine times. His extenſive conqueſts made the Moſlem empire one of the moſt powerful and formidable monarchies in the world. His diſpoſition is repreſented to us, with evident partiality indeed, as one of the beſt poſſible, and his temperance has always been highly extolled.

OMBI, a city of ancient Egypt, afterwards called *Arſinoe* and *Crocodilopolis*, was the capital of one of the nomes into which that country was divided, and is remarkable, in the annals of idolatry, for the hatred of its inhabitants to the religion of their neighbours the citizens of Tentyra.

The genius of paganiſm was ſo complying with reſpect to the objects of religious worſhip, that although each nation, each city, and almoſt every family, had its own tutelar god, we know not a ſingle inſtance, out of Egypt, of one tribe of pagans perſecuting another for worſhipping gods different from theirs. The Jews and Chriſtians were indeed perſecuted by the Romans, not however for worſhipping the true God, but becauſe, together with him, they would not worſhip Jupiter, Juno, and all the rabble of heathen divinities.

The reaſon of the almoſt univerſal tolerance of idolaters to one another, and of the intolerance of all to the Jews and Chriſtians, is very obvious. Not a ſingle pagan, a very few philoſophers perhaps excepted, ever thought of paying his adoration to the Supreme and ſelf-exiſtent Being, but to inferior divinities, to whom it was ſuppoſed that the care of particular perſons, families, cities, and nations was conſigned by the God of the univerſe. The conſequence was, that, as no perſon denied the divinity of his neighbour's object of worſhip, an intercommunity of gods was every where admitted, and all joined occaſionally in adoring the gods of the various nations. By the Jews and Chriſtians this communion was rejected as in the higheſt degree impious; and it could not well be maintained between the citizens of Ombi and thoſe of Tentyra.

That brutes were worſhipped in Egypt is univerſally known (See POLYTHEISM): and Diodorus the Sicilian informs us, in a paſſage quoted by Euſebius, that "the cities and nomes of Egypt being at one time prone to rebellion, and to enter into conſpiracies againſt monarchical government, one of their moſt politic kings contrived to introduce into the neighbouring nomes the worſhip of different animals; ſo that while each reverenced the deity which itſelf held ſacred, and deſpiſed that which its neighbours had conſecrated, they could hardly be brought to join cordially in one common deſign to the diſturbance of the government."

In this diſtribution of gods he conferred upon Ombi the *crocodile*, and upon Tentyra the mortal enemy of that monſter, the *ichneumon*. The conſequence of which was, that while the Ombites worſhipped the crocodile, the Tentyrites took every opportunity of ſlaughtering him, inſomuch that, according to Strabo, the very voice of an inhabitant of Tentyra put the crocodile to flight. This, we confeſs, is a very improbable fact; but it is certain that the mutual hatred of thoſe cities, on account of their hoſtile gods, roſe to ſuch a height, that whenever the inhabitants of the one were engaged in the more ſolemn rites of their religion, thoſe of the other were ſure to embrace the opportunity of ſetting fire to their houſes, and rendering them every injury in their power to inflict. And what may, to a ſuperficial thinker, appear extraordinary, though it will excite no wonder in the breaſt of him who has ſtudied mankind, this animoſity continued between the inhabitants of the two cities long after the crocodile and ichneumon had loſt their divinity.

The conduct of the Egyptian monarch was admirably calculated for preventing the nation from combining againſt the government; and it extended its influence over the whole king-

dom. Diodorus informs us, that he aſſigned to each nome an animal to worſhip, which was hated, killed, and ſometimes fed upon by the inhabitants of the neighbouring nome: and we know upon higher authority than his, that the Iſraelites could not offer ſacrifices in Egypt, becauſe the bullock was deemed ſacred over the whole country.

OMBRE, a celebrated game at cards, borrowed from the Spaniards, and played by two, by three, or by five perſons, but generally by three. When three play at this game, nine cards are dealt to each party; the whole ombre pack being only 40; becauſe the eights, nines, and tens are thrown out of the pack. There are two ſorts of counters for ſtakes, the greater and the leſſer; the laſt having the ſame proportion to the other as a penny to a ſhilling: of the greater counters each man ſtakes one for the game; and one of the leſſer for paſſing for the hand, when eldeſt, and for every card taken in. As to the order and value of the cards, the ace of ſpades, called *ſpadillo*, is always the higheſt trump, in whatſoever ſuit the trump be; the *manille*, or black duce, is the ſecond; and the *baſto*, or ace of clubs, is always the third: the next in order is the king, the queen, the knave, the ſeven, the ſix, the five, four, and three. Of the black there are 11 trumps; of the red, 12. The leaſt ſmall cards of the red are always the beſt, and the moſt of the black; except the duce and red ſeven, both of which are called the *manilles*, and are always ſecond when the red is a trump. The red ace, when a trump, enters into the fourth place, and is called *punto*, otherwiſe it is only called an *ace*. The three principal cards are called *matadores*; which have this privilege, that they are not obliged to attend an inferior trump when it leads; but for want of a ſmall trump, the perſon may renounce trumps, and play any other card; and when theſe are all in the ſame hand, the others pay three of the greater counters a-piece; and with theſe three for a foundation, he may count as many matadores as he has cards in an uninterrupted ſeries of trumps; for all which the others are to pay one counter a-piece. He who hath the firſt hand is called *ombre*, and has his choice of playing the game, of naming the trump, and of taking in as many and as few cards as he pleaſes; and after him the ſecond, &c. But if he does not name the trump before he looks on the cards he has taken in, any other may prevent him, by naming what trump he pleaſes. He that has the firſt hand ſhould neither take in, nor play, unleſs he has at leaſt three ſure tricks in his hand: for, as he wins the game who wins moſt tricks, he that can win five of the nine has a ſure game; which is alſo the caſe if he wins four, and can ſo divide the tricks as that one perſon may win two, and the other three.

If a perſon plays without diſcarding or changing any cards, this is called *playing ſans prendre*; and if another wins more tricks than he, he is ſaid to *win codille*. The overſights in the courſe of the game are called *beaſts*. And if the ombre wins all the nine tricks, it is called *winning the vole*.

In ombre by five, which many, on account of its not requiring ſo cloſe an attention, prefer to that by three, only eight cards a-piece are dealt; and five tricks muſt be won, otherwiſe the ombre is beaſted. Here the perſon who undertakes the game, after naming the trump, calls a king to his aſſiſtance; upon which the perſon in whoſe hand the king is, without diſcovering himſelf, is to aſſiſt him as a partner, and to ſhare his fate. If, between both, they can make five tricks, the ombre wins two counters, and the auxiliary king only one; but when the counters are even, they divide them equally. If the ombre venture the game without calling in any king, this too is called *playing ſans prendre*; in which caſe the other four are all againſt him, and he muſt win five tricks alone, or be beaſted. The reſt is much the ſame as by three.

OMBRE *de ſoleil*, "Shadow of the ſun," in heraldry, is when the ſun is borne in armory, ſo as that the eyes, noſe, and mouth, which at other times are repreſented, do not appear; and the colouring is thin, ſo that the field can appear through it.

OMBRIA, the ancient name of a province of Italy, in the territory of the pope, now called *Spoletto* and *Perugia*.

OMBRO, or LOMBRO, a town of Italy in the duchy of Tuſcany, and territory of the Siennois, ſituated near the Tuſcan ſea, a little ſouth of the lake of Caſtiglione, 45 miles ſouth-weſt of Sienna.

OMBROMETER, a machine to meaſure the quantity of rain that falls. We have the deſcription and ſign of one in Phil. Tranſ. No. 473. p. 12. It conſiſts of a tin funnel, whoſe ſurface is an inch ſquare, with a flat board, and a glaſs tube ſet into the middle of it in a groove. The riſe of the water in the tube, whoſe capacity at different times muſt be meaſured and marked, ſhows the quantity of rain that has fallen.

OMELET, or AMLET, a kind of pancake or fricaſſee of eggs, with other ingredients, very uſual in Spain and France. It may be made as follows: The eggs being beaten, are to be ſeaſoned with ſalt and pepper, and then fried in butter made boiling hot; this done, gravy is to be poured on, and the whole ſtewed with chives and parſley ſhred ſmall: when one ſide is fried enough, it is to be turned on the other.

OMEN, is a word which, in its proper ſenſe, ſignifies a ſign or indication of ſome future event taken from the language of a perſon ſpeaking without any intent to propheſy. Hence Tully ſays, "Pythagorei non ſolum voces deorum obſervarunt, ſed etiam hominum, quæ vocent *omina*." "The Pythagoreans attend to the diſcourſe not only of gods, but alſo of men, which they call *omens*." This ſort of omen was ſuppoſed to depend much upon the will of the perſon concerned in the event; whence the phraſes *accepit omen, arripuit omen*. Such were the original *omens*; but they were afterwards derived from *things* as well as from words. Thus Paterculus, ſpeaking of the head of Sulpicius on the roſtrum, ſays, it was *velut omen imminentis proſcriptionis*, "the omen of an impending proſcription." Suetonius ſays of Auguſtus, that he believed implicitly in certain omens; and that, *ſi mane ſibi calceus perperam, ac ſiniſter pro dextero inducceretur, ut dirum*, "if his ſhoes were improperly put on in the morning, eſpecially if the left ſhoe was put upon his right foot, he held it for a bad omen." Omen was uſed in a ſtill larger ſenſe, to ſignify an *augury*; as in the following line of Tully: "Sic aquilæ clarum firmavit Jupiter *omen*." "Thus Jove confirmed the bright omen of the eagle." It was laſtly uſed, in the moſt generic ſenſe of all, for a portent or prodigy; as in the third book of the Æneid, where a myrtle torn up by Æneas dropped blood. Upon this appearance, ſays the hero,

——— Mihi frigidus horror
Membra quatit, gelidusque coit formidine ſanguis.

And the ſame thing being repeated upon his breaking a branch from another tree, he prayed to the gods to avert the *omen*.

Multa movens animo Nymphas venerabar agreſtes,
Gradivumque patrem, Geticis qui præſidet arvis,
Rite ſecundarent viſus, *omen*que levarent.

Theſe portentous or ſupernatural omens were either external or internal. Of the former ſort were thoſe ſhowers of blood ſo frequently occurring in the Roman hiſtory, which were much of the ſame nature with this adventure of Æneas, which he calls MONSTRA DEUM. Of the ſecond ſort were thoſe ſudden conſternations, which, ſeizing upon men without any viſible cauſe, were imputed to the agency of the god *Pan*, and hence called *panic fears*. But indeed there was hardly any thing, however trivial, from which the ancients did not draw omens. That it ſhould have been thought a direful omen when any thing befel

the temples, altars, or ſtatues of the GODS, need excite no wonder; but that the meeting of a eunuch, a negro, a bitch with whelps, or a ſnake lying in the road, ſhould have been looked upon as portending bad fortune, is a deplorable inſtance of human weakneſs, and of the pernicious influence of ſuperſtition on the mind.

It is more than probable that this practice of making ordinary events ominous of good or bad fortune took its riſe in Egypt, the parent country of almoſt every ſuperſtition of paganiſm; but wherever it may have ariſen, it ſpreads itſelf over the whole inhabited globe, and at this day prevails in a greater or leſs degree among the vulgar of all nations.

A ſuperſtitious regard to omens is too common among the vulgar in every country of Europe. With ſome it is a remnant of the many deceptions which the Druids impoſed upon their followers. That it is contrary to every principle of truth, all philoſophers will readily acknowledge; and whoever has ſtudied the writings of St. Paul muſt be convinced that it is inconſiſtent with the ſpirit of genuine Chriſtianity.

OMENTUM, or EPIPLOON, the *Caul*, in anatomy, a membranaceous part, uſually furniſhed with a large quantity of fat; being placed under the peritonæum, and immediately above the inteſtines. See ANATOMY.

OMER, in Jewiſh antiquity. See CORUS.

OMER (ST.), a fortified, large, and populous town of France, in the department of the Straits of Calais and late province of Artois. It was anciently a village, called Sithieu, and owes its preſent name and importance to a ſaint, who built a monaſtery here in the ſeventh century. The principal church, and that of St. Bertin, are magnificent, as is the late abbey of that ſaint. In 1677 it was taken by the French, and confirmed to them by the treaty of Nimeguen. About a league from St. Omer is a great moraſs, in which are ſome floating iſlands, that may be directed at pleaſure, nearly like a boat. They produce good paſture; and the trees that grow upon them are kept low, that the wind may not have too much power over them. St. Omer is ſeated on the Aa, on the ſide of a hill, eight miles north-weſt of Aire, and 135 north of Paris. E. lon. 2. 20. N. lat. 54. 45.

OMOA, a Spaniſh town and fortification on the ſouth ſide of the bay of Honduras, N. lat. 15. 50. W. lon. 89. 30. from London. It is the key to the bay; and ſuch is the depth of the water, that ſhips of any burden may ride in the harbour with ſafety. It is a place of the utmoſt importance to Spain, as the regiſter ſhips to and from Guatimala are ſent to it in the time of war. The town was firſt eſtabliſhed in 1751, under the command of Don Joſeph Antonio de Palmo. At that period the inhabitants were about 20 white men, 60 mulattoes and free negroes, and 200 ſlaves to the king of Spain; and the military force conſiſted of about 30 ſoldiers, beſides officers. The fort was originally compoſed of ſand confined in boarded coffers, and faced with half-burnt bricks. It was defended by 12 fine braſs 24-pounders mounted, four or five iron guns of different bores, and ſome field-pieces. The Spaniards, ſenſible of the importance of the place, afterwards fortified it at an incredible expence, the ſtone of which the walls are built having been raiſed from the ſea, and brought from the diſtance of 20 leagues.

OMOPHAGIA, an ancient Greek feſtival, in honour of Bacchus, ſurnamed *Omophages*, *i. e.* eater of raw fleſh. This feſtival was obſerved in the ſame manner with the other feſtivals of Bacchus, in which they counterfeited madneſs. What was peculiar to it, was, that the worſhippers uſed to eat the entrails of goats, raw and bloody, in imitation of the god, who was ſuppoſed to do the ſame thing.

OMPHACINE-OIL, a viſcous brown juice extracted from green olives. With this oil the ancient *Athletæ*, when going to wreſtle, anointed themſelves; and when that gymnaſtic exerciſe was over, they rolled themſelves in the ſand, which, mixing with the oil and ſweat on their bodies, conſtituted the *ſtrigmenta* ſo highly eſteemed in the cure of ſeveral diſeaſes. This precious medicine was carefully ſcraped off the body of the Athlet with a kind of inſtrument ſomething like a comb, which was called *ſtrigilis*; and ſuch was the demand for the ſcrapings, that they were a very lucrative article of trade.

OMPHALE (fab. hiſt.), a queen of Lydia, daughter of Jardanus. She married Tmolus, who at his death left her miſtreſs of his kingdom. Omphale had been informed of the great exploits of Hercules, and wiſhed to ſee ſo illuſtrious a hero. Her wiſh was ſoon gratified. After the murder of Eurytus, Hercules fell ſick, and was ordered to be ſold as a ſlave, that he might recover his health and the right uſe of his ſenſes. Mercury was commiſſioned to ſell him, and Omphale bought him, and reſtored him to liberty. The hero became enamoured of his miſtreſs, and the queen favoured his paſſion, and had a ſon by him, whom ſome call Agelaus, and others Lamon. From this ſon were deſcended Gyges and Cræſus; but this opinion is different from the account which makes theſe Lydian monarchs ſpring from Alcæus, a ſon of Hercules by one of the female ſervants of Omphale. Hercules is repreſented by the poets as ſo deſperately enamoured of the queen, that, to conciliate her eſteem, he ſpins by her ſide among her women, while ſhe covers herſelf with the lion's ſkin, and arms herſelf with the club of the hero, and often ſtrikes him with her ſandals for the uncouth manner with which he holds the diſtaff, &c. Their fondneſs was mutual. As they once travelled together, they came to a grotto on mount Tmolus, where the queen dreſſed herſelf in the habit of her lover, and obliged him to appear in a female garment. After they had ſupped, they both retired to reſt in different rooms, as a ſacrifice on the morrow to Bacchus required. In the night Faunus, or rather Pan, who was enamoured of Omphale, introduced himſelf into the cave. He went to the bed of the queen, but the lion's ſkin perſuaded him that it was the dreſs of Hercules; and therefore he repaired to the bed of Hercules, in hopes to find there the object of his affections. The female dreſs of Hercules deceived him, and he laid himſelf down by his ſide. The hero was awakened, and kicked the intruder into the middle of the cave. The noiſe awoke Omphale, and Faunus was diſcovered lying on the ground, greatly diſappointed and aſhamed.

OMPHALEA, in botany: A genus of the triandria order, belonging to the monœcia claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The male calyx is tetraphyllous; there is no corolla; the receptacle, into which the antheræ are ſunk, is ovate. The female calyx and corolla are as in the male; the ſtigma trifid; the capſule carnous and trilocular, with one ſeed.

OMPHALO-MESENTERIC, in anatomy. All fœtuſes are wrapped up in at leaſt two coats or membranes; moſt of them have a third, called *allantoides*, or *urinary*. Some, as the dog, cat, hare, &c. have a fourth, which has two blood-veſſels, viz. a vein and an artery, called *omphalo-meſenterics*, becauſe paſſing along the ſtring to the navel, and terminating in the meſentery.

OMRAH, a man of the firſt rank in the Mogul empire; a nobleman. It is the plural of the Arabic *ameer*.

ON, (anc. geog.), a city of Egypt ſacred to the Sun, and by the Greeks, on that account, called *Heliopolis*. (See HELIOPOLIS.) It was remarkable for the wiſdom and learning of its prieſthood, and for the ſpacious buildings in which they cultivated the ſtudies of philoſophy and aſtronomy. The prieſts of On were eſteemed more noble than all the other prieſts of Egypt. They were always privy counſellors and miniſters of

ſtate; and therefore, when Pharaoh reſolved to make Joſeph *prime* miniſter, he very wiſely gave him in marriage a daughter of the prieſt of *On*, thereby incorporating him into the moſt venerable caſt in Egypt. Biſhop Warburton thinks that the ſuperior nobility of the prieſts of *On* was chiefly owing to their high antiquity and great learning. That they were much given to the ſtudy of aſtronomy, we know from the teſtimony of Strabo; and indeed nothing is more probable than that they ſhould be attached to the ſtudy of that ſyſtem over which their god, the Sun, preſided, not only in his *moral* but alſo in his *natural* capacity. The learned prelate affirms, that "whether they received the doctrine from original tradition, or invented it at hazard (which laſt ſuppoſition he thinks more probable, though we are of a very different opinion), it is certain they taught that the Sun is in the centre of its ſyſtem, and that all the other bodies move round it in perpetual revolutions. This noble theory (he continues) came with the reſt of the Egyptian learning into Greece (being brought thither by Pythagoras, who received it from Œnnphis, a prieſt of *On*); and after having given the moſt diſtinguiſhed luſtre to his ſchool, it ſunk into obſcurity, and ſuffered a total eclipſe throughout a long ſucceſſion of learned and unlearned ages; till theſe times returned its ancient ſplendor, and immoveably fixed it on the unerring principles of ſcience."

If it be true, as ſome philoſophers allege, that Moſes appears from the firſt chapter of Geneſis to have been acquainted with the true ſolar ſyſtem, this account of the origin of that ſyſtem is extremely probable. As it is of no importance to the civil or religious conſtitution of a ſtate whether the ſyſtem of Ptolemy or that of Copernicus be admitted by the people, we cannot reaſonably ſuppoſe that the Jewiſh lawgiver was taught aſtronomy by a revelation from Heaven. But there can be no doubt of his knowing as much of that ſcience as the prieſts of *On*; for we know that he was inſtructed in all the wiſdom of the Egyptians; and therefore, if he held the Sun to be in the centre of the ſyſtem, it is morally certain that the ſame thing was held by that prieſthood.

ONANIA, or Onanism, terms lately framed to denote the crime of ſelf-pollution, mentioned in ſcripture to have been committed by Onan, and puniſhed in him with death.

This practice, however common, hath among all nations been reckoned a very great crime. In ſcripture, beſides the inſtance of Onan above-mentioned, we find ſelf-polluters termed *effeminate*, *unclean*, *filthy*, and *abominable*. Even the heathens, who had not the advantage of revelation, were of the ſame opinion, as appears from the following lines of Martial:

Hoc nihil eſſe putes! Scelus eſt, mihi crede; ſed ingens
Quantum vix animo concipis ipſe tuo.

You think 'tis nothing! 'Tis a crime, believe!
A crime ſo great you ſcarcely can conceive.

Dr. Tiſſot has publiſhed a treatiſe on the pernicious effects of this ſhameful practice, which appears to be no leſs baneful to the mind than to the body. He begins with obſerving, that, by the continual waſte of the human body, aliments are required for our ſupport. Theſe aliments, however, require certain preparations in the body itſelf; and when by any means we become ſo altered that theſe preparations cannot be effected, the beſt aliments then prove inſufficient for the ſupport of the body. Of all the cauſes by which this morbid alteration is brought on, none is more common than too copious evacuations; and of all evacuations, that of the ſemen is the moſt pernicious when carried to exceſs. It is alſo to be obſerved, that though exceſs in natural venery is productive of very dangerous diſorders, yet an equal evacuation by ſelf-pollution, which is an unnatural way, is productive of others ſtill more to be dreaded.

The conſequences enumerated by Dr. Tiſſot are as follow: —1. All the intellectual faculties are weakened; the memory fails; the ideas are confuſed, and the patient ſometimes even falls into a ſlight degree of inſanity. They are continually under a kind of inward reſtleſſneſs, and feel a conſtant anguiſh. They are ſubject to giddineſs; all the ſenſes, eſpecially thoſe of ſeeing and hearing, grow weaker and weaker, and they are ſubject to frightful dreams. 2. The ſtrength entirely fails, and the growth in young perſons is conſiderably checked. Some are afflicted with almoſt continual watching, and others doſe almoſt perpetually. Almoſt all of them become hypochondriac or hyſteric, and are afflicted with all the evils which attend theſe diſorders. Some have been known to ſpit calcareous matter; and others are afflicted with coughs, ſlow fevers, and conſumptions. 3. The patients are affected with the moſt acute pains in different parts of the body, as the head, breaſt, ſtomach, and inteſtines; while ſome complain of an obtuſe ſenſation of pain all over the body on the ſlighteſt impreſſion. 4. There are not only to be ſeen pimples on the face, which are one of the moſt common ſymptoms; but even blotches, or ſuppurative puſtules, appear on the face, noſe, breaſt, and thighs; and ſometimes fleſhy excreſcences ariſe on the forehead. 5. The organs of generation are alſo affected; and the ſemen is evacuated on the ſlighteſt irritation, even that of going to ſtool. Numbers are afflicted with an habitual gonorrhœa, which entirely deſtroys the vigour of the conſtitution, and the matter of it reſembles a fetid ſanies. Others are affected with painful priapiſms, dyſuries, ſtranguries, and heat of urine, with painful tumours in the teſticles, penis, bladder, and ſpermatic cord; and impotence in a greater or leſs degree is the never-failing conſequence of this deteſtable vice. 6. The functions of the inteſtines are ſometimes totally deſtroyed; and ſome patients complain of coſtiveneſs, others of diarrhœa, piles, and the running of a fetid matter from the ſundament.

With regard to the cure, the firſt ſtep is to leave off thoſe practices which have occaſioned the diſeaſe; which our author aſſerts is no eaſy matter; as, according to him, the ſoul itſelf becomes polluted, and can dwell on no other idea; or if ſhe does, the irritability of the parts of generation themſelves quickly recalls ideas of the ſame kind. This irritability is no doubt much more to be dreaded than any pollution the ſoul can have received; and by removing it, there will be no occaſion for exhortations to diſcontinue the practice. The principal means for diminiſhing this irritability are, in the firſt place, to avoid all ſtimulating, acrid, and ſpiced meats. A low diet, however, is improper, becauſe it would further reduce the body, already too much emaciated. The food ſhould therefore be nutritive, but plain, and ſhould conſiſt of fleſh rather roaſted than boiled, rich broths, &c. It is certain, however, that as theſe foods contribute to reſtore the ſtrength of the body, the ſtimulus on the organs of generation will be proportionably increaſed by the ſemen which is conſtantly ſecreted, and which will now be in larger quantity than even in healthy perſons, owing to the great evacuations of it which have preceded. Some part of the ſemen is gradually abſorbed by the lymphatics; in conſequence of which, the remainder becomes thick, acrid, and very ſtimulating. To remedy this, exerciſe is to be uſed, and that not only for pleaſure, but till it is attended with a very conſiderable degree of fatigue. The ſleep alſo muſt be no more than is barely ſufficient to repair the fatigues occaſioned by the exerciſe, or other employment; for an exceſs in ſleep is as bad as idleneſs or ſtimulating foods. Exceſs in wine or intoxicating liquors is alſo to be avoided; or rather ſuch liquors ought never to be taſted, unleſs as a medicine to reſtore the exhauſted ſpi-

rits: and to all this ought to be joined the Peruvian bark, which hath this admirable property, that, with little or no ſtimulus, it reſtores the tone of the ſyſtem, and invigorates the body in a manner incredible to thoſe who have not obſerved its effects. If theſe directions are followed, the patient may almoſt certainly expect a recovery, provided any degree of vital ſtrength remains; and thoſe who deſire a life of celibacy on a moral account, will find them much more effectual than all the vows of chaſtity they can make.

ONCA and ONCE. See FELIS.

ONEEHOURA and ONEEHOW, two ſmall iſlands of that cluſter which was diſcovered by captain Cook, and by him called the *Sandwich Iſlands*. (See SANDWICH ISLANDS.) *Oneehoura* is very ſmall, and its chief produce is yams. *Oneehow* is conſiderably larger, being about ten miles over. It is remarkable for the great quantity of excellent yams which it produces, and for a ſweet root called *tee* or *tea*, which is generally about the thickneſs of a man's wriſt, though ſometimes much larger. This root, which the natives commonly bake previous to their bringing it to market, is of a wet clammy nature, and with proper management makes excellent beer.

ONEGA, a river and lake of the Ruſſian empire, between Muſcovite Carelia, the territory of Cargapol, and Swediſh Carelia. It is 100 miles in length and 40 in breadth, having a communication with the lake Ladoga, and conſequently with Peterſburgh. The river has its ſource in Cargapol, and gives its name to a country full of woods.

ONEGLIA, a ſea-port town of Italy in the territory of Genoa, with the title of a principality; but it belongs to the king of Sardinia, as well as the province, which abounds in olive-trees, fruit and wine. It has often been taken and retaken in the wars of Italy; which is no wonder, as it is an open place. The French and Spaniards had poſſeſſion of it in 1744, but were driven out by the Piedmonteſe; however, they returned next winter, and again made themſelves maſters of it. E. lon. 7. 51. N. lat. 43. 58.

ONEIROCRITICA, the art of interpreting dreams; or a method of foretelling future events by means of dreams. See DREAM, DIVINATION, &c. The word is formed from the Greek ονειρος, "dream," and κριλικη, of κριστς, "judgment." Some call it *oneirocratica*; and derive it from ονειρος and κρατεω, "I poſſeſs, I command." It appears from ſeveral paſſages of ſcripture, that there was, under the Jewiſh diſpenſation, ſuch a thing as foretelling future events by dreams; but then there was a particular gift or revelation required for that purpoſe. Hence it has been inferred, that dreams are really ſignificative, and do forebode ſomething to come; and all that is wanting among us is the *oneirocritica*, or the art of knowing what: yet it is the opinion of many, that dreams are mere chimeras; bearing indeed ſome relation to what has paſſed, but none to what is to come.—As to the caſe of Joſeph, it was poſſible for God, who knew all things, to diſcover to him what was in the womb of fate; and to introduce that, he might take the occaſion of a dream.

ONEIROCRITICS, a title given to interpreters of dreams, or thoſe who judge of events from the circumſtances of dreams. There is no great regard to be had to thoſe Greek books called *oneirocritics*; nor do we know why the patriarch of Conſtantinople, and others, ſhould amuſe themſelves with writing on ſo pitiful a ſubject. Rigault has given us a collection of the Greek and Latin works of this kind; one attributed to Aſtrampſichus; another to Nicephorus, patriarch of Conſtantinople; to which are added the treatiſes of Artemidorus and Achmet. But the books themſelves are little elſe than reveries; a kind of waking dreams, to explain and account for ſleeping ones. The ſecret of oneirocriticiſm, according to them all, conſiſts in the relation ſuppoſed to be between the dream and the thing ſignified: but they are far from keeping to the relations of agreement and ſimilitude; and frequently have recourſe to others of diſſimilitude and contrariety. Concerning oneirocritics and oneirocritica, the unlearned reader will find much information in Warburton's Divine Legation of Moſes, and the books to which he refers.

ONESIÆ THERMÆ, were, according to Strabo, *excellent baths*, and *ſalutary waters*, at the foot of the Pyrenees in Aquitania. Near the river Aturus ſtands at this day the town Bagneres, famous for its waters, which appear to be the *Oneſiæ* of Strabo; ſituated in the county of Bigorre in Gaſcony, near the river Adour.

ONIÆ OPPIDUM and *Templum* (Joſephus); ſo called from Onias, the high prieſt of the Jews in Egypt; who built a temple in imitation of that at Jeruſalem, by permiſſion of the king of Egypt, on the ſpot where ſtood the temple of Diana Agreſtis in Leontopolis: it was encompaſſed with a brick-wall, and had a large tower like that at Jeruſalem (Joſephus): it was the metropolis of the Nomos Heliopolites (Ptolemy); becauſe in Strabo's time Heliopolis was fallen to decay.

ONGLEE, in heraldry, an appellation given to the talons or claws of beaſts or birds, when borne of a different colour from that of the body of the animal.

ONION, See ALLIUM, ſp. 5.—Onions, leeks, and garlic are all of the ſame genus; and in their recent ſtate are acrid, but harmleſs to the human body. When, by age or climate, this acrimony is too great, we do not uſe them as food. In Spain, the garlic being equally mild with the onion is uſed as common food. By the ordinary culinary preparation their acrimony is diſſipated, and a remarkably mild ſubſtance remains, promiſing much nutriment, which thoſe who can digeſt them raw will certainly obtain. Though ſometimes ſhunned as food, yet they are on that account uſed in medicine, uniting the two qualities of pectorals, viz. on the account of their acrimony, being in their recent ſtate expectorant; in their boiled ſtate, on account of their mucilage, demulcent, provided the quantity taken be ſufficient. Some of late, in this country, have found in leeks a ſomniferous quality; but this is not yet confirmed by a ſufficient number of experiments.—Beſides the three above mentioned, there are ſeveral others belonging to the ſame tribe, which we uſe as condiment; but only the leek and onion as diet. In its recent ſtate, the onion is the moſt acrid; in its boiled ſtate, the leek retains its acrimony moſt tenaciouſly. On account of this, and ſome difference of texture, the onion is more eaſily digeſted and more univerſally uſed than the leek; being more eaſily broke down, and more generally agreeable.

ONISCUS, in zoology, a genus of inſects belonging to the order of aptera. It has 14 legs, briſtly feelers, and an oval body. (See Pl. 3.) There are 15 ſpecies; of which the moſt remarkable are, 1. The *entomon*, or *ſea wood-louſe*, is white; eyes black; convex above, beneath flat, margin acute; antennæ 4: four hind pair of legs largeſt, hairy. Body of 10 ſegments. Length $1\frac{1}{2}$ line. Found on the coaſt. It accompanies the herring, and is an enemy well known to our fiſhermen; theſe inſects will frequently eat up a whole fiſh while it hangs in the net. 2. *Oniſcus aquaticus*, is of an aſhen-colour, and tolerably ſmooth. Its body is compoſed of ſeven articulations, excluſive of the head and tail; which laſt part is much larger than the other ſegments, round at the extremity, and from which iſſue two appendices, each divided into two threads. This inſect has that in common with ſome ſea-oniſci, but differs from them by the ſea ones having ten ſegments. This has ſeven legs on each ſide; the laſt of which gradually increaſe in length, and are conſtantly larger than the foremoſt. The antennæ have but three long articulations, the laſt of which is much longer than

the reſt. This inſect is found in pools, ſmall rivulets, and eſpecially in ſprings. 3. *Aſellus, millepes*, or *wood-louſe*, is oval; the tail obtuſe, with two undivided briſtles: various as to colour: length, 5 lines. Their uſe in medicine is well known. 4. *Oniſcus armadillo* is broad, very gloſſy, and ſmooth: its colour is black, with a ſmall portion of white on the edge of the ſegment, which colour often varies; but ſtill the inſect is gloſſy and ſmooth. Its body is compoſed of ten ſegments, beſides the head and tail. Of the ten ſegments, the firſt ſeven are broad, and the laſt three ſhort. The firſt of theſe three appears divided in the middle, which is broader than the reſt, into three more. Theſe laſt ſhort ſegments, with that of the tail, form the extremity of the animal's body, which is round, without any appendix, and conſtitutes the ſpecific character of this inſect. It has fourteen feet, ſeven on each ſide. This oniſcus, when touched, rolls itſelf up into a ball, bringing its head and tail together like the animal called *armadillo*, and neither antennæ nor feet are ſeen: it might be taken for a round, ſhining pearl. This oniſcus is found in woods.

ONKELOS, ſurnamed the *Proſelyte*, a famous rabbi of the firſt century, and the author of the Chaldee Targum on the Pentateuch. He flouriſhed in the time of Jeſus Chriſt, according to the Jewiſh writers; who all agree that he was, at leaſt in ſome part of his life, contemporary with Jonathan Ben Uzziel, author of the ſecond Targum upon the prophets. Dean Prideaux thinks he was the elder of the two, for ſeveral reaſons: the chief of which is the purity of the ſtyle in his Targum, therein coming neareſt to that part of Daniel and Ezra which is in Chaldee, and is the trueſt ſtandard of that language, and conſequently is the moſt ancient; ſince that language, as well as others, was in a conſtant flux, and continued deviating in every age from the original: nor does there ſeem to be any reaſon why Jonathan Ben Uzziel, when he undertook his Targum, ſhould paſs over the law, and begin with the prophets, but that he found Onkelos had done this work before him, and with a ſucceſs which he could not exceed.

Azaries, the author of a book entitled *Meor Enaim*, or the *Light of the eyes*, tells us, that Onkelos was a proſelyte in the time of Hillel and Samnai, and lived to ſee Jonathan Ben Uzziel one of the prime ſcholars of Hillel. Theſe three doctors flouriſhed 12 years before Chriſt, according to the chronology of Gauz; who adds, that Onkelos was contemporary with Gamaliel the elder, St. Paul's maſter, who was the grandſon of Hillel, who lived 28 years after Chriſt, and did not die till 18 years before the deſtruction of Jeruſalem. However, the ſame Gauz, by his calculation, places Onkelos 100 years after Chriſt; and to adjuſt his opinion with that of Azaries, extends the life of Onkelos to a great length. The Talmudiſts tell us that he aſſiſted at the funeral of Gamaliel, and was at a prodigious expence to make it moſt magnificent. Dean Prideaux obſerves, that the Targum of Onkelos is rather a verſion than a paraphraſe; ſince it renders the Hebrew text word for word, and for the moſt part accurately and exactly, and is by much the beſt of all this ſort: and therefore it has always been held in eſteem among the Jews, much above all the other Targums; and being ſet to the ſame muſical notes with the Hebrew text, it is thereby made capable of being read in the ſame tone with it in their public aſſemblies. From the excellency and accuracy of Onkelos's Targum, the dean alſo concludes him to have been a native Jew, ſince, without being bred up from his birth in the Jewiſh religion and learning, and long exerciſed in all the rites and doctrines thereof, and being alſo thoroughly ſkilled in both the Hebrew and Chaldee languages, as far as a native Jew could be, he can ſcarce be thought thoroughly adequate to that work which he performed; and that the repreſenting him as a proſelyte ſeems to have proceeded from the error of taking him to have been the ſame with Akilas, or Aquila, of Pontus, author of the Greek Targum or verſion of the prophets and Hagiographa, who was indeed a Jewiſh proſelyte.

ONKOTOMY, in ſurgery, the opening of a tumour or abſceſs. See SURGERY.

ONOCLEA, in botany: A genus of the natural order of filices, belonging to the cryptogamia claſs of plants. The ſpike is flat, and turned to each ſide, with quinquevalved fructifications.

ONOMANCIA, or rather ONOMANTIA, a branch of divination, which foretells the good or bad fortune of a man from the letters in his name. See the articles DIVINATION, and NAME.—From much the ſame principle the young Romans toaſted their miſtreſſes as often as there were letters in their names: Hence Martial ſays,

"*Nævia ſex cyathis, ſeptem Juſtina bibatur.*"

ONOMATOPOEIA, in grammar and rhetoric, a figure where words are formed to reſemble the ſound made by the things ſignified; as the buz of bees, the cackling of hens, &c. Reſemblances of this kind are often fancied when they are not real, though, no doubt, there are in every language ſome words of which the ſound is very like to that which thoſe words are employed to expreſs. Yet, to the mortification of grammarians and rhetoricians, conjunctions, which have been juſtly pronounced no parts of ſpeech, are the only ſounds uttered by men that are wholly natural, and theſe are fewer than is commonly ſuppoſed. See GRAMMAR and LANGUAGE.

ONONIS, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants. The calyx is quinquepartite, with the ſegments linear; the vexillum ſtriated; the legumen turgid and ſeſſile; the filaments coalited without a fiſſure.

ONOPORDUM, in botany: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is honey-combed; the ſcales of the calyx mucronated or pointed.

ONOSANDER, a Greek author and Platonic philoſopher, who wrote Commentaries on Plato's Politics, which are loſt: but his name is particularly famous for a treatiſe entitled Λογος Στρατηγικος, "Of the duty and virtues of the general of an army;" which has been tranſlated into Latin, Italian, Spaniſh, and French. The time when he lived is not preciſely known, but is imagined to be in the reign of the emperor Claudius.

ONOSMA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The corolla is campanulated, with the throat pervious: there are four ſeeds.

ONTARIO, a lake of North America, in the country of the Iroquois, 180 miles in length and 60 in breadth. There are many rivers that run into it; and from it the great river St. Laurence proceeds. It communicates with lake Erie by a river 33 miles in length, in which is the remarkable cataract of NIAGARA.

ONTOLOGY. See METAPHYSICS.

ONUPHRIUS (PANVINUS), a learned Italian of the order of hermits of St. Auguſtine, was born of a noble family at Verona, in 1529; and, being trained to literature, became ſo indefatigable in his ſtudies, that he ſpent whole days and nights in reading the ancients: which made Manutius ſtyle him *Helluo Antiquitatis*. His firſt performance was A Chronicle of Popes and Cardinals, which was printed without his knowledge at Venice in 1557; and ſome time after, more correctly by himſelf. He afterwards continued Platina's Lives of the Popes, from Sextus IV. to Pius V. and ſubjoined annotations to the lives Platina had written. He alſo wrote four pieces upon Roman Antiquities, which are printed in Grævius's Collection. He died in his 39th year, in 1568.

ONYCOMANCY, or, as ſome write it, ONYMANCY; a kind of divination by means of the nails of the fingers.—The word is formed from the Greek ονυξ "nail," and μαντεια "divination." The ancient practice was to rub the nails of a youth with oil and ſoot, or wax; and to hold up the nails thus ſmeared againſt the ſun.—Upon them were ſuppoſed to appear figures or characters, which ſhowed the thing required.

ONYX, in natural hiſtory, one of the ſemipellucid gems, with variouſly coloured zones, but none red; being compoſed of cryſtal, debaſed by a ſmall admixture of earth; and made up either of a number of flat plates, or of a ſeries of coats ſurrounding a central nucleus, and ſeparated from each other by veins of a different colour, reſembling zones or belts. We have four ſpecies of this gem. 1. A blueiſh-white one, with broad white zones. 2. A very pure onyx, with ſnow-white veins. 3. The jaſponyx, or horny-onyx with green zones. 4. The brown onyx, with blueiſh-white zones. The ancients attributed wonderful properties to the onyx, and imagined that if worn on the finger it acted as a cardiac; they have alſo recommended it as an aſtringent; but at preſent no regard is paid to it. The word in the Greek language ſignifies *nail*; the poets making this ſtone to have been formed by the Parcæ from a piece of Venus's nails, cut off by Cupid with one of his arrows.

OONALASHKA, one of the iſlands of the Northern Archipelago, viſited by captain Cook in his laſt voyage. The native inhabitants of this iſland are, to all appearances, a very peaceable people, having been much poliſhed by the Ruſſians, who now keep them in a ſtate of ſubjection. As the iſland furniſhes them with ſubſiſtence, ſo it does, in ſome meaſure, with clothing, which is chiefly compoſed of ſkins. The upper garment, which is made like a waggoner's frock, reaches down to the knees. Beſides this, they wear a waiſtcoat or two, a pair of breeches, a fur cap, and a pair of boots, the legs of which are formed of ſome kind of ſtrong gut; but the ſoles and upper-leathers are of Ruſſia leather. Fiſh and other ſea animals, birds, roots, berries, and even ſea-weed, compoſe their food. They dry quantities of fiſh during the ſummer, which they lay up in ſmall huts for their uſe in winter. They did not appear to be very deſirous of iron, nor to want any other inſtrument, except ſewing needles, their own being formed of bone. With theſe they ſew their canoes, and make their clothes, and alſo work very curious embroidery. They uſe, inſtead of thread, the fibres of plants, which they ſplit to the thickneſs required. All ſewing is performed by the females, who are ſhoe-makers, tailors, and boat-builders. They manufacture mats and baſkets of graſs, which are both ſtrong and beautiful. There is indeed a neatneſs and perfection in moſt of their works, that ſhows they are deficient neither in ingenuity nor perſeverance.

Though the climate is ſometimes ſevere, captain Cook did not obſerve a fire place in any of their habitations. They are lighted as well as heated by lamps; which, though ſimple, effectually anſwer the purpoſe for which they are intended. They conſiſt of a flat ſtone, hollowed on one ſide like a plate; in the hollow part they put the oil, mixed with ſome dry graſs, which ſerves for a wick. Both ſexes often warm themſelves over one of theſe lamps, by placing it between their legs, under their garments, and ſitting thus over it for ſeveral minutes. E. lon. 139. 29. N. lat. 53. 5.

OONELLA, OONEMAH, two iſlands of the ſame Archipelago with Conalaſhka; the former of which lies to the north-eaſt of that iſland, being ſeparated from it by a navigable ſtrait; the other is more to the weſtward, being in E. lon. 192. 30. and N. lat. 54. 30. The circumference of Oonella is about ſeven leagues, and the produce of both much the ſame with that of Oonalaſhka.

OORT (ADAM VAN), born at Antwerp in 1557, was the ſon of Lambert Van Oort, a painter of conſiderable reputation for perſpective and architecture. Adam was inſtructed in the art by his father, and afforded ſufficient proofs of his having an enlarged genius; ſo that he ſoon roſe into eſteem, not only as a painter of hiſtory, but as an able artiſt in landſcape and portrait. But the greateſt honour of Van Oort proceeded from his having been the firſt inſtructor of Rubens, whoſe works have eternized his maſter's memory along with his own.

Naturally he was of a rough and diſagreeable temper, which occaſioned him to loſe the love of his diſciples and his friends; and among the number, he totally forfeited the eſteem of Rubens, his beſt pupil. Jordaens was the only perſon who accommodated himſelf to the ſavage humour of his maſter; but it appears probable, that he only condeſcended to endure his moroſe behaviour, out of affection to the daughter of Van Oort, to whom Jordaens was afterwards married.

In his ſtyle of painting, however, he neglected nature, and was entirely a manneriſt; nor did he ſeem to have any regard to painting as a fine art, but merely as an art that might be the means of making him rich. In his beſt time, his compoſition was agreeable and his deſign correct; but in his latter time, his works had nothing to recommend them, except the freedom of handling, and the goodneſs of their colouring; yet, with all his defects, he was accounted a good painter. Rubens uſed to ſay, that Van Oort would have ſurpaſſed all his contemporaries, if he had ſeen Rome, and formed his taſte by ſtudying after the beſt models. He painted a great number of deſigns for the altars of churches in Flanders, which have much merit in ſeveral parts; and they are ſtill beheld with pleaſure by good judges.

OOST, a kiln for drying hops after they are picked from the ſtalks.

OOST (JACQUES VAN), a painter of hiſtory, landſcape, and architecture, was born at Bruges about the year 1600, and learned the art in his native city, though it is not aſcertained by what maſter he was inſtructed; but he travelled to Italy, to ſtudy after the works of the great maſters, and copied every thing that pleaſed his own taſte, or that he thought might contribute to his improvement. However, among all the famous artiſts, he attached himſelf particularly to the ſtyle of Annibal Caracci, and imitated him in ſuch a manner, as to ſurpriſe the moſt able connoiſſeurs at Rome.

He poſſeſſed many of the accompliſhments of a great painter. His touch and his colouring were good; he introduced but few figures in his deſigns, to avoid incumbering his ſubject; and he diſpoſed them with a great deal of ſkill and elegance, giving them ſuch draperies as were ſimple and natural. He deſigned in a good taſte; and though his ſtyle of compoſition reſembled that of Annibal, yet it was leſs charged than the deſigns of that maſter uſually are. In his carnations, his colouring was freſh and like nature; but he is not ſo commendable in the colour of his draperies, which is ſometimes ſo broken as to give the ſtuffs an appearance of hardneſs. He underſtood perſpective and architecture extremely well; and as he was not fond of painting landſcape (though occaſionally he painted it well), in the ſtead of it he ornamented his back grounds moſt frequently with buildings, columns, arches, and different pieces of architecture, which gave his compoſition a grand effect.

The moſt admired picture of Van Ooſt is in the church at Bruges which belonged to the Jeſuits: the ſubject of it is, a Deſcent from the Croſs; in which the deſign, the diſpoſition, the expreſſion, colour, and chiaro-ſcuro are worthy of the higheſt praiſes. He had a ſon of the ſame name, who acquired conſiderable fame in his profeſſion.

OPACITY, in philoſophy, a quality of bodies which renders them impervious to the rays of light.

OPAH, commonly called the *king fiſh*. See Plate 3, and ZEUS. The body is deep; the ſcales exceedingly minute: it has ſetaceous teeth on the tongue only, one long dorſal fin, and

a tail ſomewhat lunated. The genus of which this is a ſpecies is not numerous: this, however, is conſiderably the largeſt, and with reſpect to its colours the moſt ſplendid. It is conſidered by many as the moſt beautiful fiſh that is found on the coaſt of Europe. Mr. Pennant in his Britiſh Zoology gives the following account of this fiſh, which is exceedingly rare on the Britiſh coaſt: "We have only four inſtances (ſays he) of this fiſh being taken in our ſeas, each of them in the north, viz. twice off Scotland, once off Northumberland, and once in Filey-Bay, Yorkſhire. This laſt was caught about two years ago, and exhibited as a ſhow at Scarborough.

"It is of that genus which Linnæus diſtinguiſhes by the name of *Chætodon* from its briſtly teeth, and is ſaid to be very common on the coaſt of Guinea. (See CHÆTODON).

It is well deſcribed by an anonymous writer in the London Magazine for October 176-, which we ſhall borrow, as the account is confirmed to us by Mr. Travis, who had an opportunity of examining one of the ſame ſpecies.

"Newcaſtle, September 12. On Saturday laſt was thrown upon the ſands at Blyth, a very rare and beautiful fiſh, weighing between 70 and 80 pounds, ſhaped like the ſea-bream. The length was three feet and an half; the breadth from back to belly almoſt two feet; but the thickneſs from ſide to ſide not above ſix inches.

"The mouth ſmall for the ſize of the fiſh, forming a ſquare opening, and without any teeth in the jaws. The tongue thick, reſembling that of a man, but rough and thick ſet with beards or prickles, pointing backwards, ſo that any thing might eaſily paſs down, but could not eaſily return back; therefore theſe might ſerve inſtead of teeth to retain its prey. The eyes remarkably large, covered with a membrane, and ſhining with a glare of gold. The cover of the gills like the ſalmon.

"The body diminiſhes very ſmall to the tail, which is forked, and expands 12 inches: the gill fins are broad about eight inches long, and play horizontally: a little behind their inſertion the back fin takes its original, where it is about ſeven inches high, but ſlopes away very ſuddenly, running down very near the tail, and at its termination becomes a little broader: the belly fins are very ſtrong, and placed near the middle of the body: a narrow fin alſo runs from the anus to the tail.

"All the fins, and alſo the tail, are of a fine ſcarlet; but the colours and beauty of the reſt of the body, which is ſmooth, and covered with almoſt imperceptible ſcales, beggar all deſcription; the upper part being a kind of bright green, variegated with whitiſh ſpots, and enriched with a ſhining golden hue, much reſembling the ſplendour of the peacock's feathers: this by degrees vaniſhes in a bright ſilver; and near the belly the gold begins again to predominate in a lighter ground than on the back."

OPAL, in natural hiſtory, a ſpecies of the chroaſtaces genus of gems.—This ſpecies of precious ſtone is generally eſteemed the moſt beautiful of all the ſtony tribe, which appears to be owing to its changeable appearance when viewed by reflection.—The form of the opal is that of a pebble, like the agate, with which authors in general have claſſed it, from a ſuppoſed reſemblance, of which there appears no ſort of proof. On the contrary, Bergman's analyſis points it out to be of a very different nature from the genus of flints, of which the agate is a ſpecies; magneſia conſtituting a large part of its compoſition, and not entering at all into that of the agate, if we are to judge from the analyſis of the parent ſpecies or flint, there being none yet publiſhed of agate. The ſpecific gravity of the opal is likewiſe extremely different from that of the agate. Wallerius tells us that its ſpecific gravity is upwards of 1900. It loſes its colour and tranſparency in the fire, and in other reſpects is affected by it in the very ſame manner as quartz or flint would be. It may be melted with borax, but not without great difficulty. The ſpecies are,

1. The opal of *Nonnius*. This appears olive-coloured by reflection, and then opaque; but when held between the eye and the light, it is found to be tranſparent, and appears of a beautiful ruby colour. Boccede Boot, author of the *Complete Jeweller*, conſiders it as the moſt precious ſort of opal, and indeed the moſt wonderful of this kind of nature's works: he gives a lofty encomium upon it chiefly from Pliny, who called this opal *pæderos*. This ſpecies of opal is the *ſangenon* of India, and *nonnius* of the ancients and modern Europeans, from the Roman ſenator Nonnius, poſſeſſor of the famous opal of Rome, worth 20,000 ſeſterces, who preferred baniſhment to parting with it to Anthony. An opal anſwering exactly to Pliny's deſcription of the nonnius was diſcovered about 40 or 50 years ago in the ruins of Alexandria, and purchaſed for a trifle by the French conſul Lironcourt, from his dragoman Roboly. The duke de Nivernois, when ambaſſador in London in 1763, was in poſſeſſion of the very ſtone. The next in eſteem and value is the Iris opal, of a glaſſy white colour, but when looked through it appears of a flame colour, as the nonnius does of a ruby.

Wallerius indeed is of opinion that the opal found in Alexandria was not that of Nonnius mentioned by Pliny; and adds, that it was by many ſuppoſed to be only a counterfeit piece of glaſs or paſte. There is another of the ſame ſpecies in Sweden, which, by reflection appears of a browniſh colour, but by refraction is red with violet veins.

2. The *white* opal, having its ground of a white glaſs-like complexion, from whence green, yellow, blueiſh, and purple rays are thrown out; but when held againſt the light it appears of a reddiſh or rather flame-colour. Wallerius, in his Mineralogy, ſays, that this white opal anſwers the deſcription of it given by Pliny much better than the olive coloured one above deſcribed. There are two varieties of it: . The oriental opal, ſhowing many colours.—Engenſtroom informs us, that he had obtained a ſmall piece of pſeudo-agate from the Eaſt Indies, of a yellowiſh brown and pale blue or rather milk colour, with a ſhining brightneſs, exactly like that of the milky opals already mentioned; alſo ſome other ſpecimens near Turin in Piedmont, where they are called *baſtard agates*, a name which, in his opinion, is extremely proper for them, as they agree with the agates in almoſt every reſpect except hardneſs: this, however, has been controverted.—Sometimes the opal is ſurrounded with a white cruſt, like common flints in the ſtrata of chalk; which cruſt has likewiſe the ſame properties as the flint when this laſt mentioned ſubſtance has been previouſly freed from the adherent chalk; viz. 1. It does not diſſolve in nitrous acid. 2. It is not fuſible *per ſe*. 3. It melts pretty eaſily with borax, but without any effervеſcence, contrary to what is obſerved in calcareous ſubſtances; ſo that borax will diſſolve about three quarters of its own bulk of this ſubſtance, though with difficulty, eſpecially towards the end of the operation; but the glaſs becomes quite clear and colourleſs, inſtead of becoming white and opaque, as is the caſe with calcareous ſubſtances. This oriental ſtone is found in the iſland of Ceylon, where it is called the *elementary fire*. The Indians put as high a value on it as on the diamond. There is another kind of oriental opal much valued, generally called the *flaming opal*, becauſe it changes its colours, as if ſparks of fire eſcaped from it in parallel lines.

3. The *blueiſh and ſemitranſparent* opal is leſs valued by thoſe who are converſant in gems than the others, on account of its being ſuppoſed more eaſily imitable by art. M. Magellan, however, informs us, that not only this, but ſeveral other kinds of opals are eaſily imitable by art; ſeveral compoſitions of glaſs being met with which ſhow very different colours by reflection and by refraction. A curious ancient one of this kind was to be

ſeen in the royal abbey of St. Denis near Paris, which is green on the outſide, but ſhows a fine ruby colour when held between the eye and the light. Our author has alſo ſeen ſome glaſs paſtes made in London by Edward Delaval, Eſq. and others by Mr. More, Secretary to the Society of Arts, which appeared of a yellow-brown or other colour by reflection; but when held againſt the light tranſmitted a fine blue, purple, or red colour, like the ſapphires, rubies, garnets, and other precious ſtones.—Wallerius gives directions for making theſe paſtes; and M. Magellan informs us, that he by chance diſcovered that the red glaſs of Kunckel, when over-melted, or burnt in a common fire, produces a ſimilar effect, tranſmiting one colour by refraction and another by reflection. The fine imitations of the true white opals, which Pliny ſays were made by the Indians, have, in our author's opinion, hitherto baffled the art of the moderns.

The *fangenon* or *nonnius* opal is found in the Eaſt Indies: the Iris, in Ceylon; the milky opal, at Eilbenſtock and Fryberg; the blueiſh or moſt common and leaſt eſteemed, in Hungary, Sileſia, Saxony, &c.; the olive and bottle coloured cat's eye, in Ceylon; the inferior, in different countries of Europe. Mr. Born mentions what he calls an *avanturine cat's eye*, of a fleſh colour and tranſparent, poſſeſſing the curious ſtructure of the avanturine, viz. compoſed of little plates likes ſcales, with a metallic ſplendour, which reflect the rays of light like the opal. This ſtone we ſuſpect to be that which has led authors to claſs the avanturine with the opal, although it is in fact a fine opaque quartz. Ruſſia produces the opal at the rivulet Katſcha, near the city of Kraſnajark, in the Altai mountains in Siberia. The cat's-eye is found in Mount Caucaſus, and is often confounded with the opal, though improperly. See ASTERIA. The oculus mundi (ſee HYDROPHANES) has a very intimate connection with opal, being generally found in beds over it, and being regarded by ſome naturaliſts as the ſame ſtone in a ſtate of decompoſition by the action of the air. Ruſſia poſſeſſes this ſtone in the Altai mountains, where the opals are found.

No method of eſtimating the opal is given by authors that we know of. But thoſe of uncommon beauty and ſize are ſold for very large ſums.

The late Leopold II. emperor of Germany, was in poſſeſſion of an oriental ſtone, ſometimes deſcribed as a cat's eye and ſometimes as an opal, of one inch diameter, and which was valued at a great price. Prince Potemkin, the Ruſſian general, purchaſed for 1000 ducats a ſtone of the ſame kind, ſaid to have been taken by the famous Nadir Shah from the head of a Gentoo idol, of which it made one of the eyes. By what circuitous road it found its way to Potemkin, we have not been informed; but with many other gems it diſappeared from the tent of the Perſian conqueror when he was aſſaſſinated.

Opals are commonly found in detached pieces, in an envelope of a different kind of ſtone, from the ſize of a pin-head to that of a walnut. Beautiful opals of this laſt ſize are extremely rare; ſo that it is difficult to find an opal ſufficiently perfect and large to be completely poſſeſſed of all its beauties: this renders it ſo precious, and makes it almoſt impoſſible to determine its value. They have agreed, however, to value a beautiful oriental opal at double the price of a ſapphire of the ſame ſize.

It is very remarkable, that all the beautiful colours of the opal may entirely change or diſappear when the ſtone is divided into pieces. This phenomenon, which has been demonſtrated more than once by experience, leads us to think that all the ſparkling play of the opal is owing to the refraction of the rays of the ſun from the ſurface of the ſtone, which is naturally formed to produce this refraction.

OPALIA, in antiquity, feaſts celebrated at Rome in honour of the goddeſs Ops. Varro ſays they were held on the 19th of December, which was one of the days of the Saturnalia: theſe two feaſts were celebrated in the ſame month, becauſe Saturn and Ops were huſband and wife: the vows offered to the goddeſs were made ſitting on the ground.

OPERA, a dramatic compoſition ſet to muſic, and ſung on the ſtage, accompanied with muſical inſtruments, and enriched with magnificent dreſſes, machines, and other decorations.—This ſpecies of drama is of modern invention. In its preſent ſtate it was not known even in Italy before the beginning of the laſt century; and at its introduction into England, a century afterwards, it divided the wits, literati, and muſicians of the age. By thoſe who were eſteemed the beſt judges of the art, the Engliſh language was conſidered as too rough and inharmonious for the muſic of the opera; and, on the other hand, critics, whoſe taſte was built on the baſis of common ſenſe, looked upon a drama in a foreign and unknown tongue as the greateſt of all abſurdities. Many of them, however, pleaded for operas in the Engliſh language; and it is well known that Addiſon, who was one of the oppoſers of the Italian opera on the London ſtage, wrote in his native tongue the opera of Roſamond. This is confeſſedly a beautiful poem; but, in the opinion of Dr. Burney, it adds nothing to Addiſon's fame, as it ſhows his total ignorance of the firſt principles of muſic, and of courſe his unfitneſs for the taſk he had undertaken.

In queſtions reſpecting the fine arts there is no appeal from the general taſte; and therefore, as the French opera, which is in the language of the country where it is acted, has always been admired by perſons of liberal education, it doubtleſs has merit conſidered as a drama; but how the dramas of this kind which are compoſed in Italian ſhould find admirers in England, among perſons who underſtand not a word of the language, is to us a matter of aſtoniſhment. The muſic of them may deſerve and command the admiration of every one who has an ear; and the action of the fingers may be perfectly ſuitable to the ſubject repreſented; but of this ſuitableneſs the majority of the audience can be no judges.

Even when the language is thoroughly underſtood, we ſhould imagine, that, to make an opera agreeable to good ſenſe, much would depend upon the choice of the ſubject; for it is ſurely abſurd to have perſons of all ranks, and on every occaſion, perpetually accompanied with the regular reſponſes of ſymphony. To hear Cæſar, Scipio, or Macbeth, when forming plans to enſure victory, or hatching plots of treaſon and murder, talking in recitative and keeping time with fiddles, would ſurely diſguſt every perſon whoſe ſenſe had not all evaporated in ſound; but when the ſubject repreſented naturally admits of muſic in real life, we can ſuppoſe an opera to afford to perſons of taſte one of the moſt exquiſite and refined entertainments of which human nature is capable. For a further account of the opera, ſee MUSIC, POETRY, &c.

OPERATION, in ſurgery, denotes a methodical action of the hand on the human body, in order to re-eſtabliſh health.

OPHIDIUM, a genus of fiſhes belonging to the order of apodes. See Pl. 3. The principal characters of this genus are the following. The head is ſomewhat naked; the teeth are in the jaws, palate, and fauces; the body long; the fins of the back, tail, and anus, confounded in one; no fin on the under part of the body; and the eyes covered by the common ſkin. Of this genus there are ſeveral ſpecies, of which the moſt curious is the *ophidium barbatum* of Linnæus, thus deſcribed by Dr. Brouſſonet in the 71ſt volume of the Philoſophical Tranſactions.

"The ſcales of the ophidium (ſays he) are irregularly placed and diſperſed over the whole body. Their form is ſometimes round, ſometimes nearly oval. They are larger near the head, and in the lower part of the body; but are hardly to be diſtinguiſhed near the tail. They adhere to the body by means of a particular tranſparent ſkin, which is in general very thin, but

ſomewhat thicker near the neck, and extended looſely over the whole head: this ſkin is very eaſily deſtroyed, after which the ſcales falling, the body appears ſpotted (fig. 1.) When you look at them with the naked eye (fig. 2.) they appear as covered with very ſmall grains; but viewed through a microſcope (fig. 3.) the middle of them appears more elevated than the margin; and from the centre to the margin, cloſe by each other, there are many lines or rays formed by ſmall ſcales placed upon one another, like tiles upon a roof, the ſuperior being always the nearer to the centre. This ſort of ſcales, which may be called *umbonatæ*, are faſtened to the body by very ſmall veſſels which are inſerted in their middle; they are to be ſeen on the body only, not on the head nor the fins."

The anatomy of this fiſh comprehends ſome very remarkable circumſtances, which, our author thinks, were never obſerved in any other ſpecies. When the ſkin is drawn off, there appears a thin membrane of a ſilver colour, which covers the muſcles. The muſcles being removed, we find the peritoneum, which lines the abdominal cavity, and is adherent to the ſwimming bladder by ſome elongations. It is of a ſilver hue, with ſome very ſmall black points. The ventricle is not to be diſtinguiſhed from the inteſtines by any other mark but by its ſize; its form is oblong; it is extended almoſt to the anus, from whence the inteſtinal duct has a retrograde courſe, and then deſcends again, having a little dilatation near the anus. On the vertebræ next the anus on the outſide of the peritoneum is a kind of cavity of an oblong form, containing a reddiſh viſcus, which he takes to be the kidney.

The firſt vertebra from the head has nothing very remarkable in its ſtructure. The ſecond has on each ſide an elongated and ſharp apophyſis, to the apex of which is annexed a ſmall ligament. The third is very flat, and has on each ſide a kind of triangular and ſharp apophyſis, to which adheres a ligament as to the ſecond. The fourth is remarkable in having a ſharp apophyſis on each ſide, articulated with the body of the vertebra; and under each of them is another articulated apophyſis, flattiſh, thick, roundiſh at its extremities, and forked at its baſis (fig. 5.) The fifth, which is ſtrongly adherent to the former, has in its middle a bifid proceſs. The ſixth has in its middle a flattiſh elevation, ſharp on each ſide. Between the extremity of the larger apophyſis of the fourth vertebra is a bone, or rather a hard cartilage, which bears the figure of a kidney (fig. 6.); its convexity being turned towards the body of the vertebra: its poſition is parallel to the bodies of the vertebræ; its motion is half circular; one of its parts, *viz.* the loweſt, being in the cavity of the ſwimming-bladder, to which it adheres by a thin membrane, ſo that no air can eſcape at that part. It is covered by membranes, which adhere ſtrongly to its middle; in this part are faſtened the two ligaments of the apophyſis of the ſecond and third vertebræ, of which we ſpoke before, and which are of a great tenuity. In the ſame point are faſtened alſo two ligaments, each of which belongs to an oblong muſcle parallel to each other, and fixed to the bones of the loweſt and poſterior part of the head (fig. 4.)

All this apparatus is certainly ſubſervient to the purpoſe of ſwimming; but it is very remarkable, if theſe parts are neceſſary to ſome animal function, that they ſhould not be found in all the individuals; "for I have ſeen (ſays our author) two, of which the vertebræ were not different from the vertebræ of the other ſpecies: which difference depends, perhaps, on the difference of ſex. I am inclined to believe ſo; but the generation in this fiſh ſeems to be no leſs myſterious than that of the eel: I could never diſtinguiſh a male from a female in this ſpecies."

This fiſh commonly grows to the ſize of eight or nine inches. It is to be found in all the Mediterranean ſea, and in great plenty in the Adriatic: its fleſh is not of a good taſte, rather coarſe, as is that of all the ſpecies of fiſhes which, having no ventral fins, are obliged to make great efforts in ſwimming, and have conſequently the muſcles harder.

OPHIOGLOSSUM, ADDER'S TONGUE: A genus of the natural order of filices, belonging to the cryptogamia claſs of plants. The ſpike is articulated, flat, and turned to the two ſides; with the articuli or joints opening acroſs. There are ſeven ſpecies; of which the only remarkable one is the vulgatum, or common adder's-tongue, which is a native of ſeveral places of Britain, growing in meadows and moiſt paſtures. The country people make an ointment of the freſh leaves, and uſe it as a vulnerary to green wounds; which is a very ancient application, recommended by Matthiolus, Tragus, and others.

OPHIOMANCY, in antiquity, the art of making predictions from ſerpents. Thus Calchas, on ſeeing a ſerpent devour eight ſparrows with their dam, foretold the duration of the ſiege of Troy: and the ſeven coils of a ſerpent that was ſeen on Anchiſes's tomb, were interpreted to mean the ſeven years that Æneas wandered from place to place before he arrived at Latium.

OPHIORHIZA, in botany: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is funnel-ſhaped; the capſule twin, bilocular, and polyſpermous. There are two ſpecies; the moſt remarkable of which is the Aſiaticum, or true lignum colubrinum. The root of this is known in the Eaſt Indies to be a ſpecific againſt the poiſon of the moſt dreadful animal called the *hooded-ſerpent*. There is a treatiſe in *Amœn. Acad.* tom. iv. upon this ſubject, wherein the author, Joh. And. Darelius, undertakes, from the deſcription of ſuch authors as had ſeen it upon the ſpot, to aſcertain the plant from which the genuine root is taken. It appears in this account, that it had puzzled the European phyſicians; and what had been ſold in the ſhops for it, is the root of a very different plant, and of a poiſonous nature.

The true root is called *mungus*, for the following reaſon.—There is a kind of weaſel in the Eaſt Indies, called *mungutia* by the natives, *mungo* by the Portugueſe, and *muncas* by the Dutch. This animal purſues the hooded ſerpent, as the cat does the mouſe with us. As ſoon as the ſerpent appears, the weaſel attacks him; and if ſhe chances to be bit by him, ſhe immediately runs to find a certain vegetable, upon eating which ſhe returns, and renews the fight.—The Indians are of opinion that this plant is the mungus.

That celebrated traveller Kæmpfer, who kept one of theſe weaſels tame, that ate with him, lived with him, and was his companion wherever he went, ſays he ſaw one of theſe battles between her and the ſerpent, but could not certainly find out what root the weaſel looked out for. But whether the weaſel firſt diſcovered this antidote or not, it is an infallible remedy againſt the bite of the hooded-ſerpent. And this he undertakes to aſcertain.

OPHIOXYLON, in botany: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The hermaphrodite calyx is quinquefid; the corolla quinquefid and funnel-ſhaped; with a cylindrical nectarium within its mouth.

OPHIR, a country mentioned in Scripture, from which Solomon had great quantities of gold brought home in ſhips which he ſent out for that purpoſe; but where to fix its ſituation is the great difficulty, authors running into various opinions on that head. Some have gone to the Weſt, others to the Eaſt Indies, and the eaſtern coaſts of Africa, in ſearch of it.—Mr. Bruce the celebrated Abyſſinian traveller has diſplayed much learning and ingenuity in ſettling this queſtion of biblical hiſtory. To the ſatisfaction of moſt of his readers he has determined Ophir to be Sofala, a kingdom of Africa, on the coaſt of

Moſambique, near Zanguebar (ſee SOFALA). His reaſons for this determination are ſo generally known, that it would be improper to repeat them here at length; becauſe ſuch as are not already acquainted with them may conſult his book, which has been long in the hands of the public. He juſtly obſerves, that in order to come to a certainty where this Ophir was, it will be neceſſary to examine what Scripture ſays of it, and to keep preciſely to every thing like deſcription which we can find there, without indulging our fancy farther. 1ſt, Then, the trade to Ophir was carried on from the Elanitic gulf through the Indian ocean. 2dly, The returns were gold, ſilver, and ivory, but eſpecially ſilver. (1 Kings, x. 22.) 3dly, The time of the going and coming of the fleet was preciſely three years, at no period more nor leſs. (1 Kings, x. 22. 2 Chron. ix. 21.)

OPHIRA, in botany: A genus of the monogynia order, belonging to the octandria claſs of plants. The involucrum is bivalvular and triflorous; the corolla tetrapetalous above; the berry unilocular.

OPHITES, in natural hiſtory, a ſort of variegated marble, of a duſky green ground, ſprinkled with ſpots of a lighter green, otherwiſe called *ſerpentine*. See the article MARBLE.

OPHITES, in church-hiſtory, Chriſtian heretics, ſo called both from the veneration they had for the ſerpent that tempted Eve, and the worſhip they paid to a real ſerpent: they pretended that the ſerpent was Jeſus Chriſt, and that he taught men the knowledge of good and evil. They diſtinguiſhed between *Jeſus* and *Chriſt*: Jeſus, they ſaid, was born of the Virgin, but Chriſt came down from heaven to be united with him; Jeſus was crucified, but Chriſt had left him to return to heaven. They diſtinguiſhed the God of the Jews, whom they termed *Jaldabaoth*, from the ſupreme God: to the former they aſcribed the body, to the latter the ſoul of men. They had a live ſerpent, which they kept in a kind of cage; at certain times they opened the cage-door, and called the ſerpent: the animal came out, and, mounting upon the table, twined itſelf about ſome loaves of bread; this bread they broke, and diſtributed it to the company, who all kiſſed the ſerpent: this they called their *Euchariſt*.

OPHRYS, TWYBLADE: A genus of the diandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 7th order, *Orchideæ*. The nectarium is a little carinated below.

The *ſpecies* are numerous; but the moſt remarkable are the following: 1. The *ovata, oval-leaved ophrys*, or *common twyblade*, hath a bulbous, fibrated root; crowned by two oval, broad, obtuſe, veined, oppoſite leaves; an erect, ſucculent, green ſtalk, ſix or eight inches high, naked above, and terminated by a looſe ſpike of greeniſh flowers, having the lip of the nectarium bifid. The flowers of this ſpecies reſemble the figure of gnats. 2. The *ſpiralis, ſpiral orchis*, or *triple ladies-treſſes*, hath bulbous, oblong, aggregated roots; crowned by a cluſter of oval, pointed, ribbed leaves; erect ſimple ſtalks, half a foot high; terminated by long ſpikes of white odoriferous flowers, hanging to one ſide, having the lip of the nectarium entire, and crenated. 3. The *nidus-avis*, or *bird's-neſt*, hath a bulbous, fibrated, cluſtered root; upright, thick, ſucculent ſtalks, a foot high, ſheathed by the leaves, and terminated by looſe ſpikes of pale-brown flowers having the lip of the nectarium bifid. 4. The *anthropophora, man-ſhaped ophrys*, or *man-orchis*, hath a roundiſh bulbous root, crowned with three or four oblong leaves; upright thick ſtalks, riſing a foot and a half high; adorned with narrow leaves, and terminated by looſe ſpikes of greeniſh flowers, repreſenting the figure of a naked man; the lip of the nectarium linear tripartite, with the middle ſegment longeſt and bifid. There is a variety with browniſh flowers tinged with green. 5. The *inſectifera*, or *inſect-orchis*, hath two roundiſh bulbous roots, crowned with oblong leaves; erect leafy ſtalks, from ſix to 10 or 12 inches high, terminated by ſpikes of inſect-ſhaped greeniſh flowers, having the lip of the nectarium almoſt five-lobed. This wonderful ſpecies exhibits flowers in different varieties, that repreſent ſingular figures of flies, bees, and other inſects; and are of different colours in the varieties. 6. The *monorchis*, or *muſky ophrys*, hath a roundiſh bulbous root, crowned with three or four oblong leaves; an erect naked ſtalk, ſix inches high, terminated by a looſe ſpike of yellowiſh, muſky-ſcented flowers.

All theſe ſix ſpecies of ophrys flower in ſummer, at different times in different ſorts, from May until July; and in moſt of the ſorts exhibit a ſingularly curious appearance. The plants are all perennial in root, which are of the bulbous fleſhy kind, from which the flower-ſtalks riſe annually in ſpring, and decay in autumn; at which period is the proper time for removing the roots from one place to another. They all grow wild in Britain, &c.; are reſidents of woods, bogs, marſhy grounds, ſterile paſtures, chalky ſoils, and the like places, where they flouriſh and diſplay their ſingular flowers in great abundance, from which places they are introduced into gardens for variety; and having procured ſome plants at the proper ſeaſon, and planted them in ſoils and ſituations ſomewhat ſimilar to that where they naturally grow, the roots will abide for ſeveral years, and flower annually.

As to their propagation, it may be tried by ſeed in a ſhady border, as ſoon as it is ripe; likewiſe by offsets from the root, though they multiply ſparingly in gardens: however, roots of ſome ſtanding may be examined at the proper ſeaſon, and any off-ſets ſeparated and planted in the proper places.

OPHTHALMOSCOPY, a branch of phyſiognomy, which deduces the knowledge of a man's temper and manner from the appearance of his eyes.

OPHTHALMIA, in medicine, an inflammation of the membranes which inveſt the eye; eſpecially of the adnata, or albugineous coat. See MEDICINE and SURGERY.

OPIATES, medicines of a thicker conſiſtence than a ſyrup, prepared with opium ſcarcely fluid. They conſiſt of various ingredients, made up with honey or ſyrup; and are to be uſed for a long time either for purgative, alterative, or corroborative intentions. The word *opiate* is alſo uſed, in general, for any medicine given with an intention to procure ſleep, whether in the form of electuaries, drops, or pills.

OPINION is that judgment which the mind forms of any propoſition for the truth or falſehood of which there is not ſufficient evidence to produce ſcience or abſolute belief. That the three angles of a plane triangle are equal to two right angles, is not a matter of *opinion*, nor can it with propriety be called an object of the mathematician's *belief*: he does more than believe it; he *knows* it to be true. When two or three men, under no temptation to deceive, declare that they were witneſſes of an uncommon, though not preternatural event, their teſtimony is complete evidence, and produces abſolute *belief* in the minds of thoſe to whom it is given; but it does not produce *ſcience* like rigid demonſtration. The fact is not doubted, but thoſe who have it on report do not *know* it to be true, as they know the truth of propoſitions intuitively or demonſtrably certain. When one or two men relate a ſtory including many circumſtances to a third perſon, and another comes who poſitively contradicts it either in whole or in part; he to whom thoſe jarring teſtimonies are given, weighs all the circumſtances in his own mind, balances the one againſt the other, and lends an aſſent, more or leſs wavering, to that ſide on which the evidence appears to preponderate. This aſſent is his *opinion* reſpecting the facts of which he has received ſuch different accounts.

Opinions are often formed of events not yet in being. Were an officer from the continent to come into the room where we are writing, and tell us that the Ruſſian army now beſieging

Mantua (May 1799) is in good health and high ſpirits; that every ſhot which is fired upon the fortreſs produces ſome effect; and that they have greatly the advantage of the beſieged; we ſhould abſolutely *believe* every fact which he had told us upon the evidence of his teſtimony; but we could only be of *opinion* that the garriſon muſt ſoon ſurrender. In forming opinions of this kind, upon which, in a great meaſure, depends our ſucceſs in any purſuit, every circumſtance ſhould be carefully attended to, and our judgment guided by former experience. Truth is a thing of ſuch importance to man, that he ſhould always purſue the beſt methods for attaining it; and when the object eludes all his reſearches, he ſhould remedy the diſappointment, by attaching himſelf to that which has the ſtrongeſt reſemblance to it; and that which moſt reſembles truth is called *probability*, as the judgment which is formed of it is termed *opinion*. See PROBABILITY.

OPITS, or OPITIUS (MARTIN), a celebrated German poet, born at Breſlau in 1507. He acquired great fame by his Latin, and more by his German poems; and, retiring to Dantzic, wrote a hiſtory of the ancient Daci: he died of the plague in 1639.

OPITS (Henry), a learned Lutheran divine, born at Altenburg in Miſnia in 1642. He was profeſſor of theology and of the oriental languages at Kiel, where he acquired great reputation by a variety of excellent works concerning oriental literature and Hebrew antiquities. He died in 1712.

OPIUM, in the materia medica, is an inſpiſſated juice, partly of the reſinous and partly of the gummy kind, brought to us in cakes from eight ounces to a pound weight. It is very heavy, of a denſe texture, and not perfectly dry; but, in general, eaſily receives an impreſſion from the finger: its colour is a browniſh yellow, ſo very dark and duſky that at firſt it appears black: it has a dead and faint ſmell, and its taſte is very bitter and acrid. It is to be choſen moderately firm, and not too ſoft: its ſmell and taſte ſhould be very ſtrong, and care is to be taken that there be no dirty or ſtony matter in it.

Opium is the juice of the papaver album, or white poppy, with which the fields of Aſia Minor are in many places ſown, as ours are with corn. When the heads are near ripening, they wound them with an inſtrument that has five edges, which on being ſtuck into the head makes at once five long cuts in it; and from theſe wounds the opium flows, and is next day taken off by a perſon who goes round the field, and put up in a veſſel which he carries faſtened to his girdle: at the ſame time that this opium is collected, the oppoſite ſide of the poppy-head is wounded, and the opium collected from it the next day. They diſtinguiſh, however, the produce of the firſt wounds from that of the ſucceeding ones; for the firſt juice afforded by the plant is greatly ſuperior to what is obtained afterwards. After they have collected the opium, they moiſten it with a ſmall quantity of water or honey, and work it a long time upon a flat, hard, and ſmooth board, with a thick and ſtrong inſtrument of the ſame wood, till it becomes of the conſiſtence of pitch; and then work it up with their hands, and form it into cakes or rolls for ſale. It has lately been diſcovered that the poppy of our own country will produce opium of equal ſtrength with the eaſtern opium.

Opium at preſent is in great eſteem, and is one of the moſt valuable of all the ſimple medicines. In its effects on the animal ſyſtem it is the moſt extraordinary ſubſtance in nature. It touches the nerves as it were by magic and irreſiſtible power, and ſteeps the ſenſes in forgetfulneſs; even in oppoſition to the determined will of the philoſopher or phyſiologiſt, appriſed of its narcotic effect.

The firſt effects of opium are like thoſe of a ſtrong, ſtimulating cordial, but are ſoon ſucceeded by univerſal languor or irreſiſtible propenſity to ſleep, attended with dreams of the moſt rapturous and enthuſiaſtic kind. After thoſe contrary effects are over, which are generally terminated by a profuſe ſweat, the body becomes cold and torpid; the mind penſive and deſponding; the head is affected with ſtupor, and the ſtomach with ſickneſs and naufea.

It is not our buſineſs, neither is it in our power, to reconcile that diverſity of opinion which has lately prevailed concerning the manner in which opium produces its effects; or to determine whether it acts ſimply on the brain and nerves, or, according to the experiments of Fontana, on the maſs of blood only.

Opium is the moſt ſovereign remedy in the materia medica, for eaſing pain and procuring ſleep, and alſo the moſt certain antiſpaſmodic yet known; but, like other powerful medicines, becomes highly noxious to the human conſtitution, and even mortal, when improperly adminiſtered. Its liberal and long continued uſe has been obſerved greatly to injure the brain and nerves, and to diminiſh their influence on the vital organs of the body. By its firſt effects, which are exhilarating, it excites a kind of temporary delirium, which diſſipates and exhauſts the ſpirits; and, by its ſubſequent narcotic power, occaſions confuſion of ideas and loſs of memory, attended with naufea, giddineſs, headach, and conſtipation of the bowels; in a word, it ſeems to ſuſpend or diminiſh all the natural ſecretions and excretions of the body, that of perſpiration only excepted.

Thoſe who take opium to exceſs become enervated and ſoon look old; when deprived of it, they are faint, and experience the languor and dejection of ſpirits common to ſuch as drink ſpirituous liquors in exceſs; to the bad effects of which it is ſimilar, ſince, like thoſe, they are not eaſily removed without a repetition of the doſe.

By the indiſcriminate uſe of that preparation of opium called *Godfrey's cordial*, many children are yearly cut off; for it is frequently given doſe after doſe, without moderation, by ignorant women and mercenary nurſes, to ſilence the cries of infants and lull them to ſleep, by which they are at laſt rendered ſtupid, inactive, and rickety.

Opium is univerſally known to be uſed as a luxury in the Eaſt. Mr. Groſe informs us, that moſt of the hard-labouring people at Surat, and eſpecially the porters, take great quantities of this drug, which, they pretend, enables them to work, and carry heavier burdens than they otherwiſe could do. Some of theſe, our author aſſures us, will take more than an ounce at a time without detriment. Many people in opulent circumſtances follow the ſame cuſtom, but with very different motives. Some uſe it merely for the ſake of the pleaſing delirium it occaſions; others for venereal purpoſes, as by this means they can lengthen the amorous congreſs as much as they pleaſe, though they thus are certain to bring on an abſolute impotency and premature old age at laſt. For this purpoſe it is uſually taken in milk; and when they have a mind to check or put an end to its operation, they ſwallow a ſpoonful or two of lime juice, or any ſimilar acid.

Beſides theſe effects of opium, it is ſaid by the Indians to have a very ſingular one in bringing on a ſeeming heavineſs of the head and ſleepineſs of the eye, at the ſame time that it really produces great watchfulneſs. It is alſo conſidered as a great inſpirer of courage, or rather inſenſibility to danger; ſo that the commanders make no ſcruple of allowing large quantities of it to the ſoldiers when they are going to battle or engaged in any hazardous enterpriſe.

The beſt opium in the world is ſaid to come from Patna on the river Ganges, where, at leaſt, the greateſt traffic of it is made, and from whence it is exported all over India; though in ſome parts, eſpecially on the Malay coaſts, it is prohibited under pain of death, on account of the madneſs, and murders conſequent upon that madneſs, which are occaſioned by it; notwithſtanding which ſevere prohibition, however, it is plenti-

fully fmuggled into all theſe countries.—The ſoil about the Ganges is accounted beſt for producing the ſtrongeſt kind of opium; of which the following remarkable inſtance is related. "A nabob of theſe parts having invited an Engliſh factory to an entertainment, a young gentleman, a writer in the company's ſervice, ſauntering about the garden, plucked a poppy and ſucked the head of it. In conſequence of this he fell into a profound ſleep; of which the nabob being appriſed, and likewiſe informed of the particular bed out of which he had taken the flower, expreſſed his ſorrow; acquainting his friends at the ſame time that the poiſon was too ſtrong to admit of any remedy; which accordingly proved true, and the unfortunate gentleman never awaked."

Opium applied externally is emollient, relaxing, and diſcutient, and greatly promotes ſuppuration: if long kept upon the ſkin, it takes off the hair, and always occaſions an itching in it; ſometimes it exulcerates it, and raiſes little bliſters, if applied to a tender part. Sometimes, on external application, it allays pain, and even occaſions ſleep: but it muſt by no means be applied to the head, eſpecially to the ſutures of the ſkull; for it has been known to have the moſt terrible effects in this application, and even to bring on death itſelf.

It appears, too, from ſome curious experiments made by Dr. Leigh, to act as the moſt powerful of all ſtyptics. "Having laid bare the crural artery of a rabbit (ſays the Doctor), I divided it, when the blood inſtantly flew out with conſiderable velocity; ſome of a ſtrong ſolution was then applied to the divided artery, the ends of which in a ſhort ſpace of time contracted, and the hæmorrhagy ceaſed. The ſame experiment was performed on the brachial artery with like ſucceſs."

The effects of a ſtrong ſolution of opium upon the heart, appears from the ſame experiments to be very extraordinary. "I opened the thorax of a rabbit (ſays the Doctor), and by diſſection placed the heart in full view; the aorta was then divided, and the animal bled till it expired. After the heart had remained motionleſs ten minutes, and every appearance of life had ceaſed for the ſame length of time, I poured on the heart a quantity of my ſtrong ſolution; it was inſtantly thrown into motion, which continued two minutes: I then added more of the ſolution, and the action was again renewed. By thus repeating my applications, the motions of the heart were ſupported more than ten minutes. I afterwards opened the thorax of a rabbit, and, without doing any injury to the large blood-veſſels, placed the heart in view. A quantity of my ſtrong ſolution was then applied to it, which ſo accelerated the motions as to render it impoſſible to number them: by renewing the application, theſe were continued for ſome conſiderable time. The ſurface of the heart now appeared uncommonly red, and continued ſo ſome time."

Opium contains gum, reſin, eſſential oil, ſalt, and earthy matter; but its *narcotic* or ſomniferous power has been experimentally found to reſide in its *eſſential oil*.

OPOBALSAMUM, in the materia medica. Opobalſam, or balm of Gilead. See AMYRIS. Mr. Bruce, the celebrated traveller, whom we have frequently had occaſion to introduce to our readers with that praiſe to which we think his labours have fully entitled him, employs ſeveral pages of his Appendix in aſcertaining the antiquity and native ſoil of the balſam-tree, with other particulars of that nature; after which he gives us the following account of the opobalſamum, or juice flowing from it: "At firſt when it is received into the bottle or vaſe from the wound from whence it iſſues, it is of a light yellow colour, apparently turbid, in which there is a whitiſh caſt, which I apprehend are the globules of air that pervade the whole of it in its firſt ſtate of fermentation; it then appears very light upon ſhaking. As it ſettles and cools, it turns clear, and loſes that milkineſs which it firſt had when flowing from the tree into the bottle. It then has the colour of honey, and appears more fixed and heavy than at firſt. After being kept for years, it grows a much deeper yellow, and of the colour of gold. I have ſome of it, which, as I have already mentioned in my Travels, I got from the cadi of Medina in the year 1768; it is now ſtill deeper in colour, full as much ſo as the yelloweſt honey. It is perfectly fluid, and has loſt very little either of its taſte, ſmell, or weight. The ſmell at firſt is violent and ſtrongly pungent, giving a ſenſation to the brain like to that of volatile ſalts when raſhly drawn up by an incautious perſon. This laſts in proportion to its freſhneſs; for, being neglected, and the bottle uncorked, it quickly loſes this quality, as it probably will at laſt by age, whatever care is taken of it.

"In its pure and freſh ſtate it diſſolves eaſily in water. If dropped on a woollen cloth, it will waſh out eaſily, and leaves no ſtain. It is of an acrid, rough, pungent taſte; is uſed by the Arabs in all complaints of the ſtomach and bowels, is reckoned a powerful antiſeptic, and of uſe in preventing any infection of the plague. Theſe qualities it now enjoys, in all probability, in common with the various balſams we have received from the New World, ſuch as the balſam of Tolu, of Peru, and the reſt; but it is always uſed, and in particular eſteemed by the ladies, as a coſmetic: as ſuch it has kept up its reputation in the Eaſt to this very day. The manner of applying it is this: You firſt go into the tepid bath till the pores are ſufficiently opened; you then anoint yourſelf with a ſmall quantity, and as much as the veſſels will abſorb. Never-fading youth and beauty are ſaid to be the conſequences of this. The purchaſe is eaſy enough. I do not hear that it ever has been thought reſtorative after the loſs of either."

OPOCALPASUM, OPOCARBASUM, or APOCALPASUM; a gummy reſinous ſubſtance, which has a ſtrong reſemblance to the beſt liquid myrrh, and which in the time of Galen they mixed with myrrh. It was difficult, according to this writer, to diſtinguiſh the one from the other unleſs by their effects. It was a poiſonous juice, which frequently produced lethargy and ſudden ſtrangling. He declares, that he has known ſeveral perſons who died in conſequence of inadvertently taking myrrh in which there was a mixture of opocarbaſum. Perhaps it was only a juice compoſed of a ſolution of euphorbia, in which drops of opium were macerated. Poiſons of this kind have from time immemorial been as common in Africa as that of arrows poiſoned with the juice of the mancanilla is in America.

Mr. Bruce, the Abyſſinian traveller, ſays that he ſaw in a Mahometan village a large tree, which was ſo covered with knots and balls of gum on the upper part of the trunk and on the large branches, that it had a monſtrous appearance. From ſome inquiries which he made on this ſubject, he found that certain merchants had brought this tree from the country of the good myrrh, which is Troglodytria (for it does not grow in Arabia), and that they had planted it for the ſake of its gum; with which theſe Muſſulmen ſtarch the blue ſtuffs of Surat, which they receive damaged from Mocha, in order to barter them with the Galla and the Abyſſinians. This tree is called *faſſa*; and Mr. Bruce declares that he has ſeen it completely covered with beautiful crimſon flowers of a very uncommon ſtructure. The ſame traveller obſerves, that the faſſa gum is well calculated, both on account of its abundance and its colour, to augment the quantity of myrrh; and he is the more confirmed in his opinion, becauſe every thing leads him to think that no other gummiferous tree, poſſeſſed of the ſame properties with the faſſa, grows in the myrrh country. In ſhort, he thinks it almoſt beyond a doubt that the gum of the faſſa-tree is the opocalpaſum; and he ſuppoſes Galen miſtaken in aſcribing any fatal property to this drug; and that many were believed to be killed by it, whoſe death might, perhaps,

with more juſtice, have been placed to the account of the phyſician. Mr. Bruce adds, that though the Troglodites of the myrrh country are at preſent more ignorant than formerly, they are nevertheleſs well acquainted with the properties of their ſimples; and that while they wiſh to increaſe the ſale of their commodities, they would never mix with them a poiſon, which muſt neceſſarily diminiſh it. In this we accede to his opinion; but we muſt differ from him when he ſays, that no gum or reſin with which we are acquainted is a mortal poiſon: the ſavages of both hemiſpheres are acquainted with but too many of them. The gum of the ſaſſa-tree, according to Mr. Bruce, is of a cloſe ſmooth grain, of a brown dull colour, but ſometimes very tranſparent; it ſwells and becomes white in water; it has a great reſemblance in its properties to gum tragacanth, and may be eaten with all ſafety. From all this it appears that the opocalpaſum mentioned by Pliny is not the ſaſſa gum deſcribed by Mr. Bruce.

OPOPANAX, in the materia medica, is a gum-reſin of a tolerably firm texture, uſually brought to us in looſe granules or drops, and ſometimes in large maſſes, formed of a number of theſe connected by a quantity of matter of the ſame kind; but theſe are uſually loaded with extraneous matter, and are greatly inferior to the pure looſe kind. The drops or granules of the fine opopanax are on the outſide of a browniſh red colour, and of a duſky yellowiſh or whitiſh colour within: they are of a ſomewhat unctuous appearance, ſmooth on the ſurface; and are to be choſen in clear pieces, of a ſtrong ſmell and acrid taſte.

This gummy ſubſtance is obtained from the roots of an umbelliferous plant, which grows ſpontaneouſly in the warmer countries, and bears the colds of this. The juice is brought from Turkey and the Eaſt Indies; and its virtues are thoſe of an attenuating and aperient medicine. Boerhaave frequently employed it, along with ammoniacum and galbanum, in hypochondriacal diſorders, obſtructions of the abdominal viſcera, and ſuppreſſions of the menſtrual evacuations from a ſluggiſhneſs of mucous humours, and a want of due elaſticity of the ſolids: with theſe intentions it is an uſeful ingredient in the pilulæ gummoſæ and compound powder of myrrh of the London pharmacopœia, but it is not employed in any compoſition of the Edinburgh. It may be given by itſelf in the doſe of a ſcruple, or half a dram: a whole dram proves in many conſtitutions gently purgative: alſo diſpels flatulencies, is good in aſthmas, in inveterate coughs, and in diſorders of the head and nerves.

Doctor Woodville, in his Medical Botany, gives the following account of this vegetable: "It is of the *digynia* order, and *pentandria* claſs of plants: the root is perennial, thick, fleſhy, tapering like the garden parſnep: the ſtalk is ſtrong, branched, rough towards the bottom, and riſes ſeven or eight feet in height; the leaves are pinnated, conſiſting of ſeveral pairs of pinnæ, which are oblong, ſerrated, veined, and towards the baſe appear unformed on the upper ſide: the flowers are ſmall, of a yellowiſh colour, and terminate the ſtem and branches in flat umbels; the general and partial umbels are compoſed of many radii; the general and partial involucra are commonly both wanting; all the florets are fertile, and have an uniform appearance; the petals are five, lance-ſhaped, and curled inwards; the five filaments are ſpreading, curved, longer than the petals, and furniſhed with roundiſh antheræ; the germen is placed below the corolla, ſupporting two reflexed ſtyles, which are ſupplied with blunt ſtigmata; the fruit is elliptical, compreſſed, divided into two parts, containing two flat ſeeds, encompaſſed with a narrow border. See Pl. 3. It is a native of the ſouth of Europe, and flowers in June and July.

"This ſpecies of parſnep was cultivated in 1731 by Mr. P. Miller, who obſerves, that its 'roots are large, ſweet, and accounted very nouriſhing,' therefore recommended for cultivation in kitchen-gardens. It bears the cold of our climate very well, and commonly maturates its ſeeds, and its juice here manifeſts ſome of thoſe qualities which are diſcovered in the officinal opopanax; but it is only in the warm regions of the eaſt, and where this plant is a native, that its juice concretes into this gummy reſinous drug. Opopanax is obtained by means of inciſions made at the bottom of the ſtalk of the plant, from whence the juice gradually exudes; and, by undergoing ſpontaneous concretion, aſſumes the appearance under which we have it imported from Turkey and the Eaſt Indies. It readily mingles with water, by trituie, into a milky liquor, which on ſtanding depoſits a portion of reſinous matter, and becomes yellowiſh: to rectified ſpirit it yields a gold coloured tincture, which taſtes and ſmells ſtrongly of opopanax. Water diſtilled from it is impregnated with its ſmell, but no eſſential oil is obtained on committing moderate quantities to the operation." See PASTINACA, of which opopanax is a ſpecies.

OPORTO, or PORRO; a rich, handſome, and conſiderable town of Portugal, in the province of Entre Douro and Minho, with a biſhop's ſee. It is a place of great importance, and by nature almoſt impregnable. It is noted for its ſtrong wines; and a large quantity is from thence exported into Britain, whence all red wines that come from Spain or Portugal are called *port-wines*. It is ſeated on the declivity of a mountain near the river Douro, which forms an excellent harbour. W. lon. 8. 1. N. lat. 41. 0.

OPOSSUM, in zoology. See DIDELPHIS.

OPPENHEIM, a town of Germany, in the lower Palatinate of the Rhine, and capital of a bailiwic of the ſame name; ſeated on the declivity of a hill near the Rhine. E. lon. 8. 20. N. lat. 49. 48.

OPPIANUS, a poet and grammarian of Anazarba in Cilicia, in the ſecond century. He compoſed a poem on hunting, and another on fiſhing, for which Antoninus Caracalla gave him as many golden crowns as there were verſes in his poems; they were hence called *Oppian's golden verſes*. He died in the 30th year of his age.

OPPILATION, in medicine, the act of obſtructing or ſtopping up the paſſage of the body, by redundant or peccant humours. This word is chiefly uſed for obſtructions in the lower belly.

OPTATIVE MOOD, in grammar, that which ſerves to expreſs an ardent deſire or wiſh for ſomething. In moſt languages, except the Greek, the optative is only expreſſed by prefixing to the ſubjunctive an adverb of wiſhing; as *utinam*, in Latin; *plut à Dieu*, in French; and *would to God*, in Engliſh.

OPTIC ANGLE, the angle which the optic axes of both eyes make with one another, as they tend to meet at ſome diſtance before the eyes.

OPTIC *Axis*, the axis of the eye, or a line going through the middle of the pupil and the centre of the eye.

OPTICS,

THAT ſcience which treats of the element of light, and the various phenomena of viſion.

HISTORY.

§ 1. *Diſcoveries concerning the Light.*

THE element of light has occupied much of the attention of thinking men ever ſince the phenomena of nature have been the objects of rational inveſtigation. The diſcoveries that have from time to time been made concerning it, are ſo fully inſerted under the article LIGHT, that there is little room for any further addition here. The nature of that ſubtile element is indeed very little known as yet, notwithſtanding all the endeavours of philoſophers; and whatever ſide is taken with regard to it, whether we ſuppoſe it to conſiſt of an infinity of ſmall particles propagated by a repulſive power from the luminous body, or whether we ſuppoſe it to conſiſt in the vibrations of a ſubtile fluid, there are prodigious difficulties, almoſt if not totally inſuperable, which will attend the explanation of its phenomena. In many parts of this work the identity of light and of the electric fluid is aſſerted: this, however, doth not in the leaſt interfere with the phenomena of optics; all of which are guided by the ſame invariable laws, whether we ſuppoſe light to be a vibration of that fluid, or any thing elſe. We ſhall therefore proceed to,

§ 2. *Diſcoveries concerning the Refraction of Light.*

WE find that the ancients, though they made very few optical experiments, nevertheleſs knew, that when light paſſed through mediums of different denſities, it did not move forward in a ſtraight line, but was bent, or *refracted*, out of its courſe. This was probably ſuggeſted to them by the appearance of a ſtraight ſtick partly immerſed in water: and we find many queſtions concerning this and other optical appearances in Ariſtotle; to which, however, his anſwers are inſignificant. Archimedes is even ſaid to have written a treatiſe concerning the appearance of a ring or circle under water, and therefore could not have been ignorant of the common phenomena of refraction. But the ancients were not only acquainted with theſe more ordinary appearances of refraction, but knew alſo the production of colours by refracted light. Seneca ſays, that if the light of the ſun ſhines through an angular piece of glaſs, it will ſhow all the colours of the rainbow. Theſe colours, however, he ſays, are falſe, ſuch as are ſeen in a pigeon's neck when it changes its poſition; and of the ſame nature, he ſays, is a ſpeculum, which, without having any colour of its own, aſſumes that of any other body. It appears alſo, that the ancients were not unacquainted the magnifying power of glaſs globes filled with water, though they do not ſeem to have known any thing of the reaſon of this power; and the ancient engravers are ſuppoſed to have made uſe of a glaſs globe filled with water to magnify their figures, and thereby to work to more advantage. That the power of tranſparent bodies of a ſpherical form in magnifying or burning was not wholly unknown to the ancients, is further probable from certain gems preſerved in the cabinets of the curious, which are ſuppoſed to have belonged to the Druids. They are made of rock-cryſtal of various forms, amongſt which are found ſome that are lenticular and others that are ſpherical: and though they are not ſufficiently wrought to perform their office as well as they might have done if they had been more judiciouſly executed, yet it is hardly poſſible that their effect, in magnifying at leaſt, could have eſcaped the notice of thoſe who had often occaſion to handle them; if indeed, in the ſpherical or lenticular form, they were not ſolely intended for the purpoſes of burning. One of theſe, of the ſpherical kind, of about an inch and a half diameter, is preſerved among the foſſils given to the univerſity of Cambridge by Dr. Woodward.

The firſt treatiſe of any note written on the ſubject of optics, was by the celebrated aſtronomer Claudius Ptolomæus, who lived about the middle of the ſecond century. The treatiſe is loſt; but from the accounts of others we find that he treated of aſtronomical refractions. Though refraction in general had been obſerved very early, it is poſſible that it might not have occurred to any philoſopher much before his time, that the light of the ſun, moon, and ſtars, muſt undergo a ſimilar refraction in conſequence of falling obliquely upon the groſs atmoſphere that ſurrounds the earth; and that they muſt, by that means, be turned out of their rectilinear courſe, ſo as to cauſe thoſe luminaries to appear higher in the heavens than they would otherwiſe do. The firſt aſtronomers were not aware that the intervals between ſtars appear leſs near the horizon than near the meridian; and, on this account, they muſt have been much embarraſſed in their obſervations. But it is evident that Ptolemy was aware of this circumſtance, by the caution that he gives to allow ſomething for it, upon every recourſe to ancient obſervations.

This philoſopher alſo advances a very ſenſible hypotheſis to account for the remarkably greater apparent ſize of the ſun and moon when ſeen near the horizon. The mind, he ſays, judges of the ſize of objects by means of a pre-conceived idea of their diſtance from us: and this diſtance is fancied to be greater when a number of objects are interpoſed between the eye and the body we are viewing; which is the caſe when we ſee the heavenly bodies near the horizon. In his Almageſt, however, he aſcribes this appearance to a refraction of the rays by vapours, which actually enlarge the angle under which the luminaries appear; juſt as the angle is enlarged by which an object is ſeen from under water.

In the 12th century, the nature of refraction was largely conſidered by Alhazen, an Arabian writer; in ſo much that, having made experiments upon it at the common ſurface between air and water, air and glaſs, water and glaſs or cryſtal, and being prepoſſeſſed with the ancient opinion of cryſtalline orbs in the regions above the atmoſphere, he even ſuſpected a refraction there alſo, and fancied he could prove it by aſtronomical obſervations. This author deduces from hence ſeveral properties of atmoſpherical refraction, as that it increaſes the altitudes of all objects in the heavens; and he firſt advanced, that the ſtars are ſometimes ſeen above the horizon by means of refraction, when they are really below it. This obſervation was confirmed by Vitellio, B. Waltherus, and eſpecially by the excellent obſervations of Tycho Brahe. Alhazen obſerved, that refraction contracts the vertical diameters and diſtances of the heavenly bodies, and that it is the cauſe of the twinkling of the ſtars. But we do not find that either he, or his follower Vitellio, knew any thing of its juſt quantity. Indeed it is too ſmall to be determined except by very accurate inſtruments, and therefore we hear little more of it till about the year 1500; at which time great attention was paid to it by Bernard Walther, Mæſtlin, and others, but chiefly by Tycho Brahe.

Alhazen ſuppoſed that the refraction of the atmoſphere did

not depend upon the vapours in it, as was probably the opinion of philoſophers before his time, but on the different tranſparency; by which, as Montucla conjectures, he meant the denſity of the groſs air contiguous to the earth, and the ether or ſubtile air that lies beyond it. In examining the effects of refraction, he endeavours to prove, that it is ſo far from being the cauſe of the heavenly bodies appearing larger near the horizon, that it would make them appear leſs; two ſtars, he ſays, appearing nearer together in the horizon than near the meridian. This phenomenon he ranks among optical deceptions. We judge of d ſtance, he ſays, by comparing the angle under which objects appear, with their ſuppoſed diſtance; ſo that if theſe angles be nearly equal, and the diſtance of one object be conceived greater than that of the other, it will be imagined to be larger. And the ſky near the horizon, he ſays, is always imagined to be further from us than any other part of the concave ſurface. Roger Bacon aſcribes this account of the horizontal moon to Ptolemy; and as ſuch it is examined, and objected to, by B. Porta.

In the writings of this Bacon, whoſe genius perhaps equalled that of his great nameſake Lord Verulam, we find the firſt diſtinct account of the magnifying power of glaſſes; and it is not improbable, that what he wrote upon this ſubject gave riſe to that moſt uſeful invention of ſpectacles. For he ſays, that if an object be applied cloſe to the baſe of the larger ſegment of a ſphere of glaſs, it will appear magnified. He alſo treats of the appearance of an object through a globe, and ſays that he was the firſt who obſerved the refraction of rays into it.

In 1270, Vitellio, a native of Poland, publiſhed a treatiſe of optics, containing all that was valuable in Alhazen, and digeſted in a much more intelligible and methodical manner. He obſerves, that light is always loſt by refraction, in conſequence of which the objects ſeen by refracted light always appear leſs luminous; but he does not pretend to eſtimate the quantity of this loſs. He reduced into a table the reſult of his experiments on the refractive powers of air, water, and glaſs, correſponding to different angles of incidence. In his account of the horizontal moon he agrees exactly with Alhazen; obſerving, that in the horizon ſhe ſeems to touch the earth, and appears much more diſtant from us than in the zenith, on account of the intermediate ſpace containing a greater variety of objects upon the viſible ſurface of the earth. He aſcribes the twinkling of the ſtars to the motion of the air in which the light is refracted; and to illuſtrate this hypotheſis, he obſerves, that they twinkle ſtill more when viewed in water put in motion. He alſo ſhows, that refraction is neceſſary as well as reflection, to form the rainbow; becauſe the body which the rays fall upon is a tranſparent ſubſtance, at the ſurface of which one part of the light is always reflected and another refracted. But he ſeems to conſider refraction as ſerving only to condenſe the light, and thereby enabling it to make a ſtronger impreſſion upon the eye. This writer alſo makes ſome ingenious attempts to explain refraction, or to aſcertain the law of it. He alſo conſiders the foci of glaſs ſpheres, and the apparent ſize of objects ſeen through them; though upon theſe ſubjects he is not at all exact. It is ſufficient indeed to ſhow the ſtate of knowledge, or rather of ignorance, at that time, to obſerve, that both Vitellio and his maſter Alhazen endeavour to account for objects appearing larger when they are ſeen under water by the circular figure of its ſurface; ſince, being fluid, it conforms to the figure of the earth.

Contemporary with Vitellio was Roger Bacon, a man of very extenſive genius, and who wrote upon almoſt every branch of ſcience; yet in this branch he does not ſeem to have made any conſiderable advances beyond what Alhazen had done before him. Even ſome of the wildeſt and moſt abſurd of the opinions of the ancients have had the ſanction of his authority. He does not heſitate to aſſent to an opinion adopted by many of the ancients, and indeed by moſt philoſophers till his time, that viſual rays proceed from the eye; giving this reaſon for it, that every thing in nature is qualified to diſcharge its proper functions by its own powers, in the ſame manner as the ſun and other celeſtial bodies. In his *Specula Mathematica*, he added ſome obſervations on the refraction of the light of the ſtars; the apparent ſize of objects; the extraordinary ſize of the ſun and moon in the horizon: but in all this he is not very exact, and advances but little. In his *Opus Majus* he demonſtrates, that if a tranſparent body, interpoſed between the eye and an object, be convex towards the eye, the object will appear magnified. This obſervation, however, he certainly had from Alhazen; the only difference between them is, that Bacon prefers the ſmaller ſegment of a ſphere, and Alhazen the larger; in which the latter certainly was right.

From this time, to that of the revival of learning in Europe, we have no farther treatiſe on the ſubject of refraction, or indeed on any other part of optics. One of the firſt who diſtinguiſhed himſelf in this way was Maurolycus, teacher of mathematics at Meſſina. In a treatiſe *De Lumine et Umbra*, publiſhed in 1575, he demonſtrates that the cryſtalline humour of the eye is a lens that collects the rays of light iſſuing from the objects, and throws them upon the retina, where is the focus of each pencil. From this principle he diſcovered the reaſon why ſome people were ſhort-ſighted and others long-ſighted; and why the former are relieved by concave, and the others by convex, glaſſes.

About the ſame time that Maurolycus made ſuch advances towards the diſcovery of the nature of viſion, Joannes Baptiſta Porta of Naples diſcovered the *camera obſcura*, which throws ſtill more light on the ſame ſubject. His houſe was conſtantly reſorted to by all the ingenious perſons at Naples, whom he formed into what he called *an academy of ſecrets*; each member being obliged to contribute ſomething that was not generally known, and might be uſeful. By this means he was furniſhed with materials for his *Magia Naturalis*, which contains his account of the *camera obſcura*, and the firſt edition of which was publiſhed, as he informs us, when he was not quite 15 years old. He alſo gave the firſt hint of the magic lantern; which Kircher afterwards followed and improved. His experiments with the *camera obſcura* convinced him, that viſion is performed by the intromiſſion of ſomething into the eye, and not by viſual rays proceeding from the eye, as had been formerly imagined; and he was the firſt who fully ſatisfied himſelf and others upon this ſubject. Indeed, the reſemblance between experiments with the *camera obſcura* and the manner in which viſion is performed in the eye, was too ſtriking to eſcape the obſervation of a leſs ingenious perſon. But when he ſays that the eye is a *camera obſcura*, and the pupil the hole in the window-ſhutter, he was ſo far miſtaken as to ſuppoſe that it was the cryſtalline humour that correſponds to the wall which receives the images; nor was it diſcovered till the year 1604, that this office is performed by the retina. He makes a variety of juſt obſervations concerning viſion; and particularly explains ſeveral caſes in which we imagine things to be without the eye, when the appearances are occaſioned by ſome affection of the eye itſelf, or ſome motion within the eye. He obſerves alſo, that, in certain circumſtances, viſion will be aſſiſted by convex or concave glaſſes; and he ſeems alſo to have made ſome ſmall advances towards the diſcovery of teleſcopes. He takes notice, that a round and flat ſurface plunged into water, will appear hollow as well as magnified to an eye perpendicularly over it; and he very well explains by a figure the manner in which it is done.

All this time, however, the great problem concerning the meaſuring of refractions had remained unſolved. Alhazen and Vitellio, indeed, had attempted it; but failed, by attempting to meaſure the angle itſelf inſtead of its ſine. At laſt it was diſcovered by Snellius, profeſſor of mathematics at Leyden.

This philoſopher, however, did not perfectly underſtand his own diſcovery, nor did he live to publiſh any account of it himſelf. It was afterwards explained by profeſſor Hortenſius both publicly and privately before it appeared in the writings of Deſcartes, who publiſhed it under a different form, without making any acknowledgment of his obligations to Snellius, whoſe papers, Huygens aſſures us from his own knowledge, Deſcartes had ſeen. Before this time Kepler had publiſhed a New Table of refracted Angles, determined by his own experiments for every degree of incidence. Kircher had done the ſame, and attempted a rational or phyſical theory of refraction, on principle, and on a mode of inveſtigation, which, if conducted with preciſion, would have led him to the law aſſumed or diſcovered by Snellius.

Deſcartes undertook to explain the cauſe of refraction by the reſolution of forces, on the principles of mechanics. In conſequence of this, he was obliged to ſuppoſe that light paſſes with more eaſe through a denſe medium than through a rare one. The truth of this explanation was firſt queſtioned by M. Fermat, counſellor to the parliament of Thouloufe, and an able mathematician. He aſſerted, contrary to the opinion of Deſcartes, that light ſuffers more reſiſtance in water than air, and more in glaſs than in water; and he maintained, that the reſiſtance of different mediums with reſpect to light is in proportion to their denſities. M. Leibnitz adopted the ſame general idea; and theſe gentlemen argued upon the ſubject in the following manner:

Nature, ſay they, accompliſhes her ends by the ſhorteſt methods. Light therefore ought to paſs from one point to another, either by the ſhorteſt road, or that in which the leaſt time is required. But it is plain that the line in which light paſſes, when it falls obliquely upon a denſer medium, is not the moſt direct or the ſhorteſt; ſo that it muſt be that in which the leaſt time is ſpent. And whereas it is demonſtrable, that light falling obliquely upon a denſer medium (in order to take up the leaſt time poſſible in paſſing from a point in one medium to a point in the other) muſt be refracted in ſuch a manner, that the ſines of the angles of incidence and of refraction muſt be to one another, as the different facilities with which light is tranſmitted in thoſe mediums; it follows, that ſince light approaches the perpendicular when it paſſes obliquely from air into water, ſo that the ſine of the angle of refraction is leſs than that of the angle of incidence, the facility with which water ſuffers light to paſs through it, is leſs than that of the air; ſo that light meets with more reſiſtance in water than air.

Arguments of this kind could not give ſatisfaction; and a little time ſhowed the fallacy of the hypotheſis. At a meeting of the Royal Society, Aug. 31, 1664, an experiment for meaſuring the refraction of common water was made with a new inſtrument which they had prepared for that purpoſe; and, the angle of incidence being 40 degrees, that of refraction was found to be 30. About this time alſo we find the firſt mention of mediums not refracting the light in an exact proportion to their denſities. For Mr. Boyle, in a letter to Mr. Oldenburgh, dated Nov. 3, 1664, obſerves, that in ſpirit-of-wine, the proportion of the ſines of the angles of incidence to the ſines of the angles of refraction was nearly the ſame as 4 to 3; and that, as ſpirit-of-wine occaſions a greater refraction than common water, ſo oil of turpentine, which is lighter than ſpirit of-wine, produces not only a greater refraction than common water, but a much greater than ſalt water. And at a meeting held Nov. 9, the ſame year, Dr. Hooke (who had been ordered to proſecute the experiment) brought in an account of one that he had made with pure and clear ſalad oil, which was found to have produced a much greater refraction than any liquor which he had then tried; the angle of refraction that anſwered to an angle of incidence of 30° being found no leſs than 40° 30′, and the angle of refraction that anſwered to an angle of incidence of 20° being 29° 47′.—M. de la Hire alſo made ſeveral experiments to aſcertain the refractive power of oil with reſpect to that of water and air, and found the ſine of the angle of incidence to that of refraction to be as 60 to 42; which, he obſerves, is a little nearer to that of glaſs than to that of water, though oil is much lighter than water, and glaſs much heavier.

The members of the Royal Society, finding that the refraction of ſalt water exceeded that of freſh, purſued the experiment farther with ſolutions of vitriol, ſaltpetre, and alum, in water; when they found the refraction of the ſolution of vitriol and ſaltpetre a little more, but that of alum a little leſs, than common water.

Dr. Hooke made an experiment before the Royal Society, Feb. 11, 1663, which clearly proves that ice refracts the light leſs than water; which he took to be a good argument that the lightneſs of ice, which cauſes it to ſwim in water, is not cauſed only by the ſmall bubbles which are viſible in it, but that it ariſes from the uniform conſtitution or general texture of the whole maſs. M. de la Hire alſo took a good deal of pains to determine whether, as was then the common opinion, the refractive power of ice and water were the ſame; and he found, as Dr. Hooke had done before, that ice refracts leſs than water.

By a moſt accurate and elaborate experiment made in the year 1698, in which a ray of light was tranſmitted through a Torricellian vacuum, Mr. Lowthorp found, that the refractive power of air is to that of water as 36 to 34,400. He concludes his account of the experiment with obſerving, that the refractive power of bodies is not proportioned to the denſity, at leaſt not to the gravity, of the refracting medium. For the refractive power of glaſs to that of water is as 55 to 34, whereas its gravity is as 87 to 34; that is, the ſquares of their refractive powers are very nearly as their reſpective gravities. And there are ſome fluids, which, though they are lighter than water, yet have a greater power of refraction. Thus the refractive power of ſpirit-of-wine, according to Dr Hooke's experiment, is to that of water as 36 to 33, and its gravity reciprocally as 33 to 36, or $36\frac{1}{2}$. But the refractive powers of air and water ſeem to obſerve the ſimple proportion of their gravities directly. And if this ſhould be confirmed by ſucceeding experiments, it is probable, he ſays, that the refractive powers of the atmoſphere are everywhere, and at all heights above the earth, proportioned to its denſity and expanſion: and then it would be no difficult matter to trace the light through it, ſo as to terminate the ſhadow of the earth; and, together with proper expedients for meaſuring the quantity of light illuminating an opaque body, to examine at what diſtances the moon muſt be from the earth to ſuffer eclipſes of the obſerved durations.

Caſſini the younger happened to be preſent when Mr. Lowthorp made the above-mentioned experiment before the Royal Society; and upon his return home, having made a report of it to the members of the Royal Academy of Sciences, thoſe gentlemen endeavoured to repeat the experiment in 1700; but they did not ſucceed.—For, as they ſaid, beams of light paſſed through the vacuum without ſuffering any refraction. The Royal Society being informed of this, were deſirous that it might be put paſt diſpute, by repeated and well-atteſted trials; and ordered Mr. Hauksbee to make an inſtrument for the purpoſe, by the direction of Dr. Halley. It conſiſted of a ſtrong braſs priſm, two ſides of which had ſockets to receive two plane glaſſes, whereby the air in the priſm might either be exhauſted or condenſed. The priſm had alſo a mercurial gauge fixed to it, to diſcover the denſity of the contained air; and was contrived to turn upon its axis, in order to make the refractions equal on each ſide when it was fixed to the end of a teleſcope. The refracting angle was near 64°; and the length of the teleſcope was about 10 feet, having a fine hair in its focus. The event of this accurate experiment was as follows:

Having chosen a proper and very distinct erect object, whose distance was 2588 feet, June 15, O. S. 1708, in the morning, the barometer being then at 29.7½, and the thermometer at 60, they first exhausted the prism, and then applying it to the telescope, the horizontal hair in the focus covered a mark on the object distinctly seen through the vacuum, the two glasses being equally inclined to the visual ray. Then admitting the air into the prism, the object was seen to rise above the hair gradually as the air entered, and in the end the hair was observed to hide a mark 10¼ inches below the former mark. This they often repeated, and with the same success.

After this they applied the condensing engine to the prism; and having forced in another atmosphere, so that the density of the included air was double to that of the outward, they again placed it before the telescope, and, letting out the air, the object which before seemed to rise, appeared gradually to descend, and the hair at length rested on an object higher than before by the same interval of 10¼ inches. This experiment they likewise frequently repeated without any variation in the event.

They then forced in another atmosphere; and upon discharging the condensed air, the object was seen near 21 inches lower than before.

Now the radius in this case being 2588 feet, 10¼ inches will subtend an angle of one minute and 8 seconds, and the angle of incidence of the visual ray being 32 degrees (because the angle of the glass planes was 64), it follows from the known laws of refraction, that as the sine of 39° is to that of 31°, 59′, 26″, differing from 32° by 34″ the half of 1′ 8″; so is the sine of any other incidence to the sine of its angle of refraction; and so is radius, or 1000000, to 999736; which, therefore, is the proportion between the sine of incidence *in vacuo* and the sine of refraction from thence into common air.

It appears, by these experiments, that the refractive power of the air is proportionable to its density. And since the density of the atmosphere is as its weight directly, and its heat inversely; the ratio of its density, at any given time, may be had by comparing the heights of the barometer and thermometer; and thence he concludes that this will also be the ratio of the refraction of the air. But Dr. Smith observes, that, before we can depend upon the accuracy of this conclusion, we ought to examine whether heat and cold alone may not alter the refractive power of air, while its density continues the same. This, he says, may be tried, by heating the condensed or rarefied air, shut up in the prism, just before it is fixed to the telescope, and by observing whether the hair in its focus will continue to cover the same mark all the while that the air is cooling.

The French academicians, being informed of the result of the above mentioned experiment, employed M. Delisle the younger to repeat their former experiment with more care; and he presently found, that their operators had never made any vacuum at all, there being chinks in their instrument, through which the air had insinuated itself. He therefore annexed a gage to his instrument, by which means he was sure of his vacuum; and then the result of the experiment was the same with that in England. The refraction was always in proportion to the density of the air, excepting when the mercury was very low, and consequently the air very rare; in which case, the whole quantity being very small, he could not perceive much difference in them. Comparing, however, the refractive power of the atmosphere, observed at Paris, with the result of his experiment, he found, that the best vacuum he could make was far short of that of the etherial regions above the atmosphere.

Dr. Hooke first suggested the thought of making allowance for the effect of the refraction of light, in passing from the higher and rarer to the lower and denser regions of the atmosphere, in the computed height of mountains. To this he ascribes the different opinions of authors concerning the height of several very high hills. He could not account for the appearance of the Peak of Teneriff, and several very high mountains, at so great a distance as that at which they are actually seen, but upon the supposition of the curvature of the visual ray, that is made by its passing obliquely through a medium of such different density, from the top of them to the eye, very far distant in the horizon. All calculations of the height of mountains, that are made upon the supposition that the rays of light come from the tops of them, to our eyes, in straight lines, must, he says, be very erroneous.

Dr. Hooke gives a very good account of the twinkling of the stars; ascribing it to the irregular and unequal refraction of the rays of light; which is also the reason why the limbs of the sun, moon, and planets appear to wave or dance. And that there is such an unequal distribution of the parts of the atmosphere, he says, is manifest from the different degrees of heat and cold in the air. This, he says, will be evident by looking upon distant objects, over a piece of hot glass, which cannot be supposed to throw out any kind of exhalation from itself, as well as through ascending steams of water.

About this time Grimaldi first observed that the coloured image of the sun refracted through a prism is always oblong, and that colours proceed from refraction.—The way in which he first discovered this was by Vitellio's experiment above mentioned, in which a piece of white paper placed at the bottom of a glass vessel filled with water, and exposed to the light of the sun, appears coloured. However, he observed, that in case the two surfaces of the refracting medium were exactly parallel to each other, no colours were produced. But of the true cause of those colours, viz. the different refrangibility of the rays of light, he had not the least suspicion. This discovery was reserved for Sir Isaac Newton, and which occurred to him in the year 1666. At that time he was busied in grinding optic glasses, and procured a triangular glass prism to satisfy himself concerning the phenomena of colours. While he amused himself with this, the oblong figure of the coloured spectrum first struck him. He was surprised at the great disproportion betwixt its length and breadth; the former being about five times the measure of the latter. He could hardly think that any difference in the thickness of the glass, or in the composition of it, could have such an influence on the light. However, without concluding any thing *à priori*, he proceeded to examine the effects of these circumstances, and particularly tried what would be the consequence of transmitting the light through parts of the glass that were of different thicknesses, or through holes in the window-shutter of different sizes; or by setting the prism on the outside of the shutter, that the light might pass through it, and be refracted before it was terminated by the hole.

He then suspected that these colours might arise from the light being dilated by some unevenness in the glass, or some other accidental irregularity; and to try this, he took another prism, like the former, and placed it in such a manner, as that the light, passing through them both, might be refracted contrariwise, and so be returned by the latter into the same course from which it had been diverted by the former. In this manner he thought that the regular effects of the first prism would be destroyed by the second; but that the irregular ones would be augmented by the multiplicity of refractions. The event was, that the light, which by the first prism was diffused into an oblong form, was by the second reduced into a circular one, with as much regularity as if it had not passed through either of them.

At last, after various experiments and conjectures, he hit upon what he calls the *experimentum crucis*, and which completed this great discovery. He took two boards, and placed one of them close behind the prism at the windows, so that the light might pass through a small hole made in it for the purpose, and fall on the other board, which he placed at the dis-

tance of about 12 feet; having firſt made a ſmall hole in it alſo, for ſome of that incident light to paſs through. He then placed another priſm behind the ſecond board, ſo that the light which was tranſmitted through both the boards might paſs through that alſo, and be again refracted before it arrived at the wall. This being done, he took the firſt priſm in his hand, and turned it about its axis, ſo much as to make the ſeveral parts of the image, caſt on the ſecond board, ſucceſſively to paſs through the hole in it, that he might obſerve to what places on the wall the ſecond priſm would refract them; and he ſaw, by the change of thoſe places, that the light tending to that end of the image towards which the refraction of the firſt priſm was made, did, in the ſecond priſm, ſuffer a refraction conſiderably greater than the light which tended to the other end. The true cauſe, therefore, of the length of the image was diſcovered to be no other than that light is not ſimilar or homogeneal; but that it conſiſts of rays, ſome of which are more refrangible than others: ſo that, without any difference in their incidence on the ſame medium, ſome of them ſhall be more refracted than others; and therefore, that, according to their particular degrees of refrangibility, they will be tranſmitted through the priſm to different parts of the oppoſite wall.

Since it appears from theſe experiments that different rays of light have different degrees of refrangibility, it neceſſarily follows, that the rules laid down by preceding philoſophers concerning the refractive power of water, glaſs, &c. muſt be limited to the middle kind of rays. Sir Iſaac, however, proves that the ſine of the incidence of every kind of light, conſidered apart, is to its ſine of refraction in a given ratio. This he deduces, both by experiment and alſo geometrically, from the ſuppoſition that bodies refract the light hy acting upon its rays in lines perpendicular to their ſurfaces.

The moſt important diſcovery with regard to refraction ſince the time of Sir Iſaac Newton is that of Mr. Dollond, who found out a method of curing the faults of refracting teleſcopes ariſing from the different refrangibility of the rays, and which had been generally thought impoſſible to be removed. Notwithſtanding the great diſcovery of Sir Iſaac Newton concerning the different refrangibility of the rays of light, he had no idea but that they were all affected in the ſame proportion by every medium, ſo that the refrangibility of the extreme rays might be determined if that of the mean ones was given. From this it would follow, as Mr. Dollond obſerves, that equal and contrary refractions muſt not only deſtroy each other, but that the divergency of the colours from one refraction would likewiſe be corrected by the other, and that there could be no poſſibility of producing any ſuch thing as refraction which would not be affected by the different refrangibility of light; or, in other words, that however a ray of light might be refracted backwards and forwards by different mediums, as water, glaſs, &c. provided it was ſo done, that the emergent ray ſhould be parallel to the incident one, it would ever after be white; and conſequently, if it ſhould come out inclined to the incident, it would diverge, and ever after be coloured; and from this it was natural to infer, that all ſpherical object-glaſſes of teleſcopes muſt be equally affected by the different refrangibility of light, in proportion to their apertures, of whatever materials they may be formed.

For this reaſon, Sir Iſaac Newton, and all other philoſophers and opticians, had deſpaired of bringing refracting teleſcopes to any great degree of perfection, without making them of an immoderate and very inconvenient length. They therefore applied themſelves chiefly to the improvement of the reflecting teleſcope; and the buſineſs of refraction was dropped till about the year 1747, when M. Euler, improving upon a hint of Sir Iſaac Newton's, formed a ſcheme of making object-glaſſes of two materials, of different refractive powers; hoping, that by this difference the refractions would balance one another, and thereby prevent the diſperſion of the rays that is occaſioned by the difference of refrangibility. Theſe object-glaſſes were compoſed of two lenſes of glaſs with water between them. This memoir of M. Euler excited the attention of Mr. Dollond. He carefully went over all M. Euler's calculations, ſubſtituting for his hypothetical laws of refraction thoſe which had been actually aſcertained by the experiments of Newton; and found, that, after this neceſſary ſubſtitution, it followed from M. Euler's own principles, that there could be no union of the foci of all kinds of colours, but in a lens infinitely large.

M. Euler did not mean to controvert the experiments of Newton: but he ſaid, that they were not contrary to his hypotheſis, but in ſo ſmall a degree as might be neglected; and aſſerted, that, if they were admitted in all their extent, it would be impoſſible to correct the difference of refrangibility occaſioned by the tranſmiſſion of the rays from one medium into another of different denſity; a correction which he thought was very poſſible, ſince he ſuppoſed it to be actually effected in the ſtructure of the eye, which in his opinion was made to conſiſt of different mediums for that very purpoſe. To this kind of reaſoning Mr. Dollond made no reply, but by appealing to the experiments of Newton, and the great circumſpection with which it was known that he conducted all his inquiries.

In this ſtate of the controverſy, the friends of M. Clairaut engaged him to attend to it; and it appeared to him, that, ſince the experiments of Newton cited by Mr. Dollond could not be queſtioned, the ſpeculations of M. Euler were more ingenious than uſeful.

The ſame paper of M. Euler was alſo particularly noticed by M Klingenſtierna of Sweden, who gave a conſiderable degree of attention to the ſubject, and diſcovered, that, from Newton's own principles, the reſult of the 8th experiment of the ſecond book of his Optics could not anſwer his deſcription of it.

He found, he ſays, that when light goes out of air through ſeveral contiguous refracting mediums, as through water and glaſs, and thence goes out again into air, whether the refracting ſurfaces be parallel or inclined to one another, that light, as often as by contrary refractions it is ſo corrected as to emerge in lines parallel to thoſe in which it was incident, continues ever after to be white; but if the emergent rays be inclined to the incident, the whiteneſs of the emerging light will, by degrees, in paſſing on from the place of emergence, become tinged at its edges with colours. This he tried hy refracting light with priſms of glaſs, placed within a priſmatic veſſel of water.

By theorems deduced from this experiment he infers, that the refractions of the rays of *every* ſort, made out of any medium into air, are known by having the refraction of the rays of *any one* ſort; and alſo that the refraction out of one medium into another is found as often as we have the refractions out of them both into any third medium.

On the contrary, the Swediſh philoſopher obſerves, that, in this experiment, the rays of light, after paſſing through the water and the glaſs, though they come out parallel to the incident rays, will be coloured; but that the ſmaller the glaſs priſm is, the nearer will the reſult of it approach to Newton's deſcription.

This paper of M. Klingenſtierna being communicated to Mr. Dollond by M. Mallet, made him entertain doubts concerning Newton's report, and determined him to have recourſe to experiment.

He therefore cemented together two plates of parallel glaſs at their edges, ſo as to form a priſmatic veſſel, when ſtopped at the ends or baſes; and the edge being turned downwards, he placed in it a glaſs priſm, with one of its edges upwards, and filled up the vacancy with clear water; ſo that the refraction of the priſm was contrived to be contrary to that of the water, in order that a ray of light, tranſmitted through both theſe refracting mediums, might be affected by the difference

only between the two refractions. As he found the water to refract more or leſs than the glaſs priſm, he diminiſhed or increaſed the angle between the glaſs plates, till he found the two contrary refractions to be equal; which he diſcovered by viewing an object through this double priſm. For, when it appeared neither raiſed nor depreſſed, he was ſatisfied that the refractions were equal, and that the emergent rays were parallel to the incident.

Now, according to the prevailing opinion, he obſerves, the object ſhould have appeared through this double priſm in its natural colour; for, if the difference of refrangibility had been in all reſpects equal in the two equal refractions, they would have rectified each other. But this experiment fully proved the fallacy of the received opinion, by ſhowing the divergency of the light by the glaſs priſm to be almoſt double of that by the water; for the image of the object, though not at all refracted, was yet as much infected with priſmatic colours, as if it had been ſeen through a glaſs wedge only whoſe refracting angle was near 30 degrees.

This experiment is the very ſame with that of Sir Iſaac Newton above mentioned, notwithſtanding the reſult was ſo remarkably different; but Mr. Dollond aſſures us, that he uſed all poſſible precaution and care in his proceſs; and he kept his apparatus by him, that he might evince the truth of what he wrote, whenever he ſhould be properly required to do it.

He plainly ſaw, however, that if the refracting angle of the water veſſel could have admitted of a ſufficient increaſe, the divergency of the coloured rays would have been greatly diminiſhed, or entirely rectified; and that there would have been a very great refraction without colour, as he had already produced a great diſcolouring without refraction: but the inconveniency of ſo large an angle as that of the priſmatic veſſel muſt have been, to bring the light to an equal divergency with that of the glaſs priſm whoſe angle was about 60 degrees, made it neceſſary to try ſome experiments of the ſame kind with ſmaller angles.

Accordingly, he got a wedge of plate glaſs, the angle of which was only nine degrees; and uſing it in the ſame circumſtances, he increaſed the angle of the water wedge, in which it was placed, till the divergency of the light by the water was equal to that by the glaſs; that is, till the image of the object, though conſiderably refracted by the exceſs of the refraction of the water, appeared nevertheleſs quite free from any colours proceeding from the different refrangibility of the light; and, as near as he could then meaſure, the refraction by the water was about $\frac{3}{4}$ of that by the glaſs. He acknowledges, indeed, that he was not very exact in taking the meaſures, becauſe his buſineſs was not at that time to determine the exact proportions, ſo much as to ſhow that the divergency of the colours, by different ſubſtances, was by no means in proportion to the refractions, and that there was a poſſibility of refraction without any divergency of the light at all.

As theſe experiments clearly proved, that different ſubſtances made the light to diverge very differently in proportion to their general refractive power, Mr. Dollond began to ſuſpect that ſuch variety might poſſibly be found in different kinds of glaſs, eſpecially as experience had already ſhown that ſome of the kinds made much better object-glaſſes in the uſual way than others; and as no ſatisfactory cauſe had been aſſigned for ſuch difference, he thought there was great reaſon to preſume that it might be owing to the different divergency of the light in the ſame refractions.

His next buſineſs, therefore, was to grind wedges of different kinds of glaſs, and apply them together, ſo that the refractions might be made in contrary directions; in order to diſcover, as in the above-mentioned experiments, whether the refraction and the divergency of the colours would vaniſh together. But a conſiderable time elapſed before he could ſet about that work: for though he was determined to try it at his leiſure, for ſatisfying his own curioſity, he did not expect to meet with a difference ſufficient to give room for any great improvement of teleſcopes, ſo that it was not till the latter end of the year 1757 that he undertook it; but his firſt trials convinced him that the buſineſs deſerved his utmoſt attention and application.

He diſcovered a difference far beyond his hopes in the refractive qualities of different kinds of glaſs, with reſpect to the divergency of colours. The yellow or ſtraw-coloured foreign ſort, commonly called *Venice glaſs*, and the *Engliſh crown-glaſs*, proved to be very nearly alike in that reſpect; though, in general, the crown-glaſs ſeemed to make the light diverge the leſs of the two. The common Engliſh plate-glaſs made the light diverge more; and the white cryſtal, or Engliſh flint-glaſs, moſt of all.

It was now his buſineſs to examine the particular qualities of every kind of glaſs that he could come at, not to amuſe himſelf with conjectures about the cauſe of this difference, but to fix upon two ſorts in which it ſhould be the greateſt; and he ſoon found theſe to be the crown-glaſs and the white flint-glaſs. He therefore ground one wedge of white flint, of about 25 degrees, and another of crown-glaſs, of about 29 degrees; which refracted very nearly alike, but their power of making the colours diverge was very different. He then ground ſeveral others of crown-glaſs to different angles, till he got one which was equal, with reſpect to the divergency of the light, to that in the white flint-glaſs: for, when they were put together ſo as to refract in contrary directions, the refracted light was entirely free from colours. Then meaſuring the refraction of each wedge with theſe different angles, he found that of the white glaſs to be to that of the crown-glaſs nearly as two to three: and this proportion held very nearly in all ſmall angles; ſo that any two wedges made in this proportion, and applied together, ſo as to refract in a contrary direction, would refract the light without any diſperſion of the rays.

In a letter to M. Klingenſtierna, quoted by M. Clairaut, Mr. Dollond ſays, that the ſine of incidence in crown-glaſs is to that of its general refraction as 1 to 1.53, and in flint-glaſs as 1 to 1.583.

To apply this knowledge to practice, Mr. Dollond went to work upon the object-glaſſes of teleſcopes; not doubting but that, upon the ſame principles on which a refracted colourleſs ray was produced by priſms, it might be done by lenſes alſo, made of ſimilar materials. And he ſucceeded, by conſidering, that, in order to make two ſpherical glaſſes that ſhould refract the light in contrary directions, the one muſt be concave and the other convex; and as the rays are to converge to a real focus, the exceſs of refraction muſt evidently be in the convex lens. Alſo, as the convex glaſs is to refract the moſt, it appeared from his experiments, that it muſt be made of crown-glaſs, and the concave of white flint-glaſs. Farther, as the refractions of ſpherical glaſſes are in an inverſe ratio of their focal diſtances, it follows, that the focal diſtances of the two glaſſes ſhall be inverſely as the ratios of the refractions of the wedges; for, being thus proportioned, every ray of light that paſſes through this combined glaſs, at whatever diſtance it may paſs from its axis, will conſtantly be refracted, by the difference between two contrary refractions, in the proportion required; and therefore the different refrangibility of the light will be entirely removed.

Notwithſtanding our author had theſe clear grounds in theory and experiment to go upon, he found that he had many difficulties to ſtruggle with when he came to reduce them into actual practice; but, with great patience and addreſs, he at length got into a ready method of making teleſcopes upon theſe new principles.

His principal difficulties arose from the following circumſtances. In the firſt place, the focal diſtances, as well as the particular ſurfaces, muſt be very nicely proportioned to the denſities or refracting powers of the glaſſes, which are very apt to vary in the ſame ſort of glaſs made at different times. Secondly, The centres of the two glaſſes muſt be placed truly in the common axis of the teleſcope, otherwiſe the deſired effect will be in a great meaſure deſtroyed. Add to theſe, that there are four ſurfaces to be wrought perfectly ſpherical; and any perſon, he ſays, but moderately practiſed in optical operations, will allow, that there muſt be the greateſt accuracy throughout the whole work. At length, however, after numerous trials and a reſolute perſeverance, he was able to conſtruct refracting teleſcopes, with ſuch apertures and magnifying powers, under limited lengths, as, in the opinion of the beſt judges, far exceeded any thing that had been produced before, repreſenting objects with great diſtinctneſs, and in their true colours.

It was objected to Mr. Dollond's diſcovery, that the ſmall diſperſion of the rays in crown-glaſs is only apparent, owing to the opacity of that kind of glaſs which does not tranſmit the fainter-coloured rays in a ſufficient quantity; but this objection is particularly conſidered and anſwered by M. Beguelin.

As Mr. Dollond did not explain the methods which he took in the choice of different ſpheres proper to deſtroy the effect of the different refrangibility of the rays of light, and gave no hint that he himſelf had any rule to direct himſelf in it; and as the calculation of the diſperſion of the rays, in ſo complicated an affair, is very delicate; M. Clairaut, who had given a good deal of attention to this ſubject from the beginning of the controverſy, endeavoured to make out a complete theory of it.

Without ſome aſſiſtance of this kind, it is impoſſible, ſays this author, to conſtruct teleſcopes of equal goodneſs with thoſe of Mr. Dollond, except by a ſervile imitation of his; which, however, on many accounts, would be very unlikely to anſwer. Beſides, Mr. Dollond only gave his proportions in general, and pretty near the truth; whereas the greateſt poſſible preciſion is neceſſary. Alſo the beſt of Mr. Dollond's teleſcopes were far ſhort of the Newtonian ones *; whereas it might be expected that they ſhould exceed them, if the foci of all the coloured rays could be as perfectly united after refraction through glaſs, as after reflexion from a mirror; ſince there is more light loſt in the latter caſe than in the former.

With a view, therefore, to aſſiſt the artiſt, he endeavoured to aſcertain the refractive power of different kinds of glaſs, and alſo their property of ſeparating the rays of light, by the following exact methods. He made uſe of two priſms placed cloſe to one another, as Mr. Dollond had done: but, inſtead of looking through them, he placed them in a darkened room; and when the image of the ſun, tranſmitted through them, was perfectly white, he concluded that the different refrangibility of the rays was corrected.

In order to aſcertain with more eaſe the true angles that priſms ought to have to deſtroy the effect of the difference of refrangibility, he conſtructed one which had one of its ſurfaces cylindrical, with ſeveral degrees of amplitude. By this means, without changing his priſms, he had the choice of an infinity of angles; among which, by examining the point of the curve ſurface which, receiving the ſolar ray, gave a white image, he could eaſily find the true one.

He alſo aſcertained the proportion in which different kinds of glaſs ſeparated the rays of light, by meaſuring, with proper precautions, the oblong image of the ſun, made by tranſmitting a beam of light through them. In making theſe experiments, he hit upon an eaſy method of convincing any perſon of the greater refractive power of Engliſh flint-glaſs above the common French glaſs, both with reſpect to the mean refraction and the different refrangibility of the colours; for, having taken two priſms, of theſe two kinds of glaſs, but equal in all other reſpects, and placed them ſo that they received, at the ſame time, two rays of the ſun, with the ſame degree of incidence, he ſaw, that, of the two images, that which was produced by the Engliſh flint-glaſs was a little higher up on the wall than the other, and longer by more than one half.

M. Clairaut was aſſiſted in theſe experiments by M. De Tournieres, and the reſults agreed with Mr. Dollond's in general; but whereas Mr. Dollond had made the diſperſion of the rays in glaſs and in water to be as five to four (acknowledging, however, that he did not pretend to do it with exactneſs), theſe gentlemen, who took more pains and uſed more precautions, found it to be as three to two. For the theorems and problems deduced by M. Clairaut from theſe new principles of optics, with a view to the perfection of teleſcopes, we muſt refer the reader to *Mem. Acad. Par.* 1756, 1757.

The labours of M. Clairaut were ſucceeded by thoſe of M. D'Alembert, which ſeem to have given the makers of theſe achromatic teleſcopes all the aid that calculations can afford them. This excellent mathematician has likewiſe propoſed a variety of new conſtructions of theſe teleſcopes, the advantages and diſadvantages of which he diſtinctly notes; at the ſame time that he points out ſeveral methods of correcting the errors to which they are liable: as by placing the object-glaſſes, in ſome caſes, at a ſmall diſtance from one another, and ſometimes by uſing eye-glaſſes of different refractive powers; which is an expedient that ſeems not to have occurred to any perſon before him. He even ſhows, that teleſcopes may be made to advantage, conſiſting of only one object-glaſs, and an eye-glaſs of a different refractive power. Some of his conſtructions have two or more eye-glaſſes of different kinds of glaſs. This ſubject he conſidered at large in one of the volumes of his *Opuſcules Mathematiques*. We have alſo three memoirs of M. D'Alembert upon this ſubject, among thoſe of the French Academy; one in the year 1764, another in 1765, and a third in 1767.

At the concluſion of his ſecond memoir he ſays, that he does not doubt, but, by the different methods he propoſes, achromatic teleſcopes may be made to far greater degrees of perfection than any that have been ſeen hitherto, and even ſuch as is hardly credible: and though the crown-glaſs, by its greeniſh colour, may abſorb ſome part of the red or violet rays, which, however, is not found to be the caſe in fact; that objection cannot be made to the common French glaſs, which is white, and which on this account he thinks muſt be preferable to the Engliſh crown-glaſs.

Notwithſtanding Meſſrs. Clairaut and D'Alembert ſeemed to have exhauſted the buſineſs of calculation on the ſubject of Mr. Dollond's teleſcopes, no uſe could be made of their labours by foreign artiſts. For ſtill the teleſcopes made in England according to no exact rule, as foreigners ſuppoſed, were greatly ſuperior to any that could be made elſewhere, though under the immediate direction of thoſe able calculators. For this M. Beguelin aſſigned ſeveral reaſons. Among others, he thought that their geometrical theorems were too general, and their calculations too complicated, for the uſe of workmen. He alſo thought, that in conſequence of neglecting ſmall quantities, which theſe calculators profeſſedly did, in order to make their algebraical expreſſions more commodious, their concluſions were not ſufficiently exact. But what he thought to be of the moſt conſequence, was the want of an exact method of meaſuring the refractive and diſperſing powers of the different kinds of glaſs; and for want of this, the greateſt preciſion in calculation was altogether uſeleſs.

* This aſſertion of M. Clairaut might be true at the time that it was made, but is by no means ſo at preſent.

These conſiderations induced this gentleman to take another view of this ſubject; but ſtill he could not reconcile the actual effect of Mr. Dollond's teleſcopes with his own concluſions: ſo that he imagined, either that he had not the true refraction and diſperſion of the two kinds of glaſs given him; or elſe, that the aberration which ſtill remained after his calculations, muſt have been deſtroyed by ſome irregularity in the ſurfaces of the lenſes. He finds ſeveral errors in the calculations both of M. D'Alembert and Clairaut, and concludes with expreſſing his deſign to purſue this ſubject much farther.

M. Euler, who firſt gave occaſion to this inquiry, which terminated ſo happily for the advancement of ſcience, being perſuaded both by his reaſoning and calculations, that Mr. Dollond had diſcovered no new principle in optics, and yet not being able to controvert Mr. Short's teſtimony in favour of the goodneſs of his teleſcopes, concluded that this extraordinary effect was owing, in part, to the crown glaſs not tranſmitting all the red light, which would otherwiſe have come to a different focus, and have diſtorted the image; but principally to his happening to hit on a juſt curvature of his glaſs, which he did not doubt would have produced the ſame effect if his lenſes had all been made of the ſame kind of glaſs. In another place he imagines that the goodneſs of Mr. Dollond's teleſcope might be owing to the eye-glaſs. If my theory, ſays he, be true, this diſagreeable conſequence follows, that Mr. Dollond's object-glaſſes cannot be exempt from the diſperſion of colours: yet a regard to ſo reſpectable a teſtimony embarraſſes me extremely, it being as difficult to queſtion ſuch expreſs authority, as to abandon a theory which appears to me perfectly well founded, and to embrace an opinion, which is as contrary to all the eſtabliſhed laws of nature as it is ſtrange and ſeemingly abſurd. He even appeals to experiments made in a darkened room; in which, he ſays, he is confident that Mr. Dollond's object-glaſſes would appear to have the ſame defects that others are ſubject to.

Not doubting, however, but that Mr. Dollond, either by chance, or otherwiſe, had made ſome conſiderable improvement in the conſtruction of teleſcopes, by the combination of glaſſes, he abandoned his former project, in which he had recourſe to different mediums, and confined his attention to the correction of the errors which ariſe from the curvature of lenſes. But while he was proceeding, as he imagined, upon the true principles of optics, of which, however, he made but little uſe, he could not help expreſſing his ſurpriſe that Mr. Dollond ſhould have been led to ſo important a diſcovery by reaſoning in a manner quite contrary to the nature of things. At length, however, M. Euler was convinced of the reality and importance of Mr. Dollond's diſcoveries; and very frankly acknowledges, that he ſhould perhaps never have been brought to aſſent to it, had not his friend M. Clairaut aſſured him that the experiments of the Engliſh optician might be depended upon. However, the experiments of M. Zeiher of Peterſburgh gave him the moſt complete ſatisfaction with reſpect to this new law of refraction.

This gentleman demonſtrated, that it is the lead in the compoſition of glaſs that gives it this remarkable property, that while the refraction of the mean rays is nearly the ſame, that of the extremes differs conſiderably And, by increaſing the quantity of lead in the mixture, he produced a kind of glaſs, which occaſioned a much greater ſeparation of the extreme rays than the flint-glaſs which Mr. Dollond had made uſe of. By this evidence M Euler owns that he was compelled to renounce the principle which, before this time, had been conſidered as inconteſtable, *viz.* that the diſperſion of the extreme rays depends upon the refraction of the mean: and that the former varies with the quality of the glaſs, while the latter is not affected by it.

From theſe new principles M. Euler deduces theorems concerning the combination of the lenſes, and, in a manner ſimilar to M. Clairaut and D'Alembert, points out methods of conſtructing achromatic teleſcopes.

While he was employed upon this ſubject, he informs us, that he received a letter from M. Zeiher, dated Peterſburgh 30th of January 1764, in which he gives him a particular account of the ſucceſs of his experiments on the compoſition of glaſs; and that, having mixed minium and ſand in different proportions, the reſult of the mean refraction and the diſperſion of the rays varied according to the following table.

	Proportion of minium to flint.	Mean refraction from air into glaſs.	Diſperſion of the rays in compariſon of crown-glaſs.
I.	— 3 : 1	2028 : 1000	4800 : 1000
II.	— 2 : 1	1830 : 1000	3550 : 1000
III.	— 1 : 1	1787 : 1000	3259 : 1000
IV.	— $\frac{3}{4}$: 1	1732 : 1000	2207 : 1000
V.	— $\frac{1}{2}$: 1	1724 : 1000	1800 : 1000
VI.	— $\frac{1}{4}$: 1	1664 : 1000	1354 : 1000

By this table it is evident, that a greater quantity of lead not only occaſions a greater diſperſion of the rays, but alſo conſiderably increaſes the mean refraction. The firſt of theſe kinds of glaſs, which contains three times as much minium as flint, will appear very extraordinary; ſince, hitherto, no tranſparent ſubſtance has been known, whoſe refractive power exceeded the ratio of two to one, and that the diſperſion occaſioned by this glaſs is almoſt five times as great as that of crown glaſs, which could not be believed by thoſe who entertained any doubt concerning the ſame property in flint-glaſs, the effect of which is three times as great as crown glaſs. One may obſerve, however, in theſe kinds of glaſs, ſomething of a proportion between the mean refraction and the diſperſion of rays, which may enable us to reconcile theſe ſurpriſing effects with other principles already known.

Here, however, M. Euler announces to us another diſcovery of the ſame M. Zeiher, no leſs ſurpriſing than the former, and which diſconcerted all his ſchemes for reconciling the above-mentioned phenomena. As the ſix kinds of glaſs mentioned in the above table were compoſed of nothing but minium and flint, M. Zeiher happened to think of mixing alkaline ſalts with them, in order to give the glaſs a conſiſtence more proper for dioptric uſes; when he was much ſurpriſed to find this mixture greatly diminiſhed the mean refraction, almoſt without making any change in the diſperſion. After many trials, he at length obtained a kind of glaſs greatly ſuperior to the flint-glaſs of Mr. Dollond, with reſpect to the conſtruction of teleſcopes; ſince it occaſioned three times as great a diſperſion of the rays as the common glaſs, at the ſame time that the mean refraction was only as 1.61 to 1.

M. Euler alſo gives particular inſtructions how to find both the mean and extreme refractive power of different kinds of glaſs; and particularly adviſes to make uſe of priſms with very large refracting angles, not leſs than 70°.

Notwithſtanding it evidently appeared, we may ſay, to almoſt all philoſophers, that Mr. Dollond had made a real diſcovery of ſomething not comprehended in the optical principles of Sir Iſaac Newton, it did not appear ſo to Mr. Murdoch. Upon this occaſion, he interpoſed in the defence, as he imagined, of Sir Iſaac Newton; maintaining, that Mr. Dollond's poſitions, which, he ſays, he knows not by what miſhap have been deemed paradoxes in Sir Iſaac's theory of light, are really the neceſſary conſequences of it. He alſo endeavours to ſhow that Sir Iſaac might not be miſtaken in his account of the experiment above mentioned. But, admitting all that he advances in this part of his defence, Newton muſt have made uſe

of a prism with a much ſmaller refracting angle than, from his own account of his experiments, we have any reaſon to believe that he ever did make uſe of.

The fact probably was, that Sir Iſaac deceived himſelf in this caſe, by attending to what he imagined to be the clear conſequence of his other experiments; and though the light he ſaw was certainly tinged with colours, and he muſt have ſeen it to be ſo, yet he might imagine that this circumſtance aroſe from ſome imperfection in his priſms, or in the diſpoſition of them, which he did not think it worth his while to examine. It is alſo obſervable, that Sir Iſaac is not ſo particular in his deſcription of his priſms, and other parts of his apparatus, in his account of this experiment, as he generally is in other caſes; and therefore, probably, wrote his account of it from his memory only. In reality, it is no reflection upon Sir Iſaac Newton, who did ſo much, to ſay that he was miſtaken in this particular caſe, and that he did not make the diſcovery that Mr. Dollond did; though it be great praiſe to Mr. Dollond, and all thoſe perſons who contributed to this diſcovery, that they ventured to call in queſtion the authority of ſo great a man.

Mr. Dollond, however, was not the only optician who had the merit of making this diſcovery; it had been made and applied to the ſame purpoſe by a private gentleman, Mr. Cheſt of Cheſt-hall. He had obſerved that priſms of flint glaſs gave larger ſpectrums than priſms of water when the mean refraction was the ſame in both, *i. e.* when the deviation of the refracted ray from the direction of the incident was the ſame. He tried priſms of other glaſs, and found ſimilar differences; and he employed the diſcovery in the ſame manner, and made achromatic experiments ſome time before Dollond. Theſe facts came out in a proceſs raiſed at the inſtance of Mr. Watkins optician at Charing-croſs, as alſo in a publication by Mr. Ramſden optician. There is, however, no evidence that Dollond ſtole the idea from Mr. Cheſt, or that they had not both claims to the diſcovery.

Still the beſt refracting teleſcopes, conſtructed on the principles of Mr. Dollond, are defective, on account of that colour which, by the aberration of the rays, they give to objects viewed through them, unleſs the object glaſs be of ſmall diameter. This defect men of genius and ſcience have laboured to remove, ſome by one contrivance and ſome by another. Father Boſowich, to whom every branch of opties is much indebted, has, in his attempts for this purpoſe, diſplayed much ingenuity; but the philoſopher whoſe exertions have been crowned with moſt ſucceſs, and who has perhaps made the moſt important diſcovery in this branch of ſcience ſince the æra of Newton, is Dr. Robert Blair, regius profeſſor of aſtronomy in the college of Edinburgh. By a judicious ſet of experiments, ably conducted, he has proved, that the quality of diſperſing the rays in a greater degree than crown glaſs, is not confined to a few mediums, but is poſſeſſed by a great variety of fluids, and by ſome of theſe in a moſt extraordinary degree. He has ſhown, that although the greater refrangibility of the violet rays than of the red rays, when light paſſes from any medium whatever into a vacuum, may be conſidered as a law of nature; yet in the paſſages of light from one medium into another, it depends entirely on the qualities of the mediums which of theſe rays ſhall be the moſt refrangible, or whether there ſhall be any difference in their refrangibility. In order to correct the aberration ariſing from difference of refrangibility among the rays of light, he inſtituted a ſet of experiments, in the conducting of which he detected a very ſingular and important quality in the muriatic acid. In all the diſperſive mediums hitherto examined, the green rays, which are the mean refrangible in crown glaſs, were found among the leſs refrangible; but in the muriatic acid, theſe ſame rays were by him found to make a part of the more refrangible. This diſcovery led to complete ſucceſs in removing the great defect of optical inſtruments, viz. that diſſipation or aberration of the rays which ariſe from their unequal refrangibility, and has hitherto rendered it impoſſible to converge all of them to one point either by ſingle or oppoſite refractions. A fluid, in which the particles of marine acid and metalline particles hold a due proportion, at the ſame time that it ſeparates the extreme rays of the ſpectrum much more than crown glaſs, refracts all the orders of the rays in the ſame proportion that glaſs does: and hence rays of all colours made to diverge by the refraction of the glaſs, may either be rendered parallel by a ſubſequent refraction made in the confine of the glaſs and this fluid; or, by weakening the refractive denſity of the fluid, the refraction which takes place in the confine of it and glaſs may be rendered as regular as reflection, without the leaſt colour whatever. The Doctor has a teleſcope, not exceeding 15 inches in length, with a compound object glaſs of this kind, which equals in all reſpects, if it does not ſurpaſs, the beſt of Dollond's 42 inches long. Of this object glaſs a figure will be found in the third volume of the Tranſactions of the Royal Society of Edinburgh; and to that volume we muſt refer our readers for a full and perſpicuous account of the experiments which led to this diſcovery, as well as of the important purpoſes to which it may be applied.

We ſhall conclude the hiſtory of the diſcoveries concerning refraction, with ſome account of the refractions of the atmoſphere.—Tables of this have been calculated by Mr. Lambert, with a view to correct the inaccuracies of geometrical obſervations of the altitudes of mountains. The obſervations of Mr. Lambert, however, go upon the ſuppoſition that the refractive power of the atmoſphere is invariable: But this is by no means the caſe; and therefore his rules muſt be conſidered as true for the mean ſtate of the air only.

A moſt remarkable variety in the refractive power of the atmoſphere was obſerved by Dr. Nettleton, near Halifax in Yorkſhire, which demonſtrates how little we can depend upon the calculated heights of mountains, when the obſervations are made with an inſtrument, and the refractive power of the air is to be allowed for. Being deſirous to learn, by obſervation, how far the mercury would deſcend in the barometer at any given elevation (for which there is the beſt opportunity in that hilly country), he propoſed to take the height of ſome of their higheſt hills; but when he attempted it, he found his obſervation ſo much diſturbed by refraction, that he could come to no certainty. Having meaſured one hill of a conſiderable height, in a clear day, and obſerved the mercury at the bottom and at the top, he found, according to that eſtimation, that about 90 feet or more were required to make the mercury fall $\frac{1}{10}$th of an inch; but afterwards, repeating the experiment on a cloudy day, when the air was rather groſs and hazy, he found the ſmall angles ſo much increaſed by refraction as to make the hill much higher than before. He afterwards frequently made obſervations at his own houſe, by pointing a quadrant to the tops of ſome neighbouring hills, and obſerved that they would appear higher in the morning before ſunriſe, and alſo late in the evening, than at noon in a clear day, by ſeveral minutes. In one caſe the elevations of the ſame hill differed more than 30 minutes. From this he infers, that obſervations made on very high hills, eſpecially when viewed at a diſtance, and under ſmall angles, as they generally are, are probably uncertain, and not much to be depended upon.

M. Euler conſidered with great accuracy the refractive power of the atmoſphere, as affected by different degrees of heat and elaſticity; in which he ſhows, that its refractive power, to a conſiderable diſtance from the zenith, is ſufficiently near the proportion of the tangent of that diſtance, and that the law of refraction follows the direct ratio of the height of the barometer, and the inverſe ratio of the difference marked by the thermometer; but when ſtars are in the horizon, the changes are in a

ratio ſomewhat greater than this, more eſpecially on account of the variation in the heat.

The cauſe of the twinkling of the ſtars is now generally acknowledged to be the unequal refraction of light, in conſequence of inequalities and undulations in the atmoſphere.

Mr. Michell ſuppoſes that the arrival of fewer or more rays at one time, eſpecially from the ſmaller or the more remote fixed ſtars, may make ſuch an unequal impreſſion upon the eye, as may, at leaſt, have ſome ſhare in producing this effect; ſince it may be ſuppoſed, that even a ſingle particle of light is ſufficient to make a ſenſible impreſſion upon the organs of ſight; ſo that very few particles arriving at the eye in a ſecond of time, perhaps no more than three or four may be ſufficient to make an object conſtantly viſible. For though the impreſſion may be conſidered as momentary, yet the perception occaſioned by it is of ſome duration. Hence, he ſays, it is not improbable that the number of the particles of light which enter the eye in a ſecond of time, even from Sirius himſelf (the light of which does not exceed that of the ſmalleſt viſible fixed ſtar, in a greater proportion than that of about 1000 to 1), may not exceed 3000 or 4000, and from ſtars of the ſecond magnitude they may, therefore, probably not exceed 100. Now the apparent increaſe and diminution of the light which we obſerve in the twinkling of the ſtars, ſeems to be repeated at not very unequal intervals, perhaps about four or five times in a ſecond. He therefore thought it reaſonable to ſuppoſe, that the inequalities which will naturally ariſe from the chance of the rays coming ſometimes a little denſer, and ſometimes a little rarer, in ſo ſmall a number of them as muſt fall upon the eye in the fourth or fifth part of a ſecond, may be ſufficient to account for this appearance. An addition of two or three particles of light, or perhaps a ſingle one, upon 20, eſpecially if there ſhould be an equal deficiency out of the next 20, would, he ſuppoſed, be very ſenſible, as he thought was probable from the very great difference in the appearance of ſtars, the light of which does not differ ſo much as is commonly imagined. The light of the middlemoſt ſtar in the tail of the Great Bear does not, he thinks, exceed the light of the very ſmall ſtar that is next to it in a greater proportion than that of about 16 or 20 to 1; and M. Bouguer found, that a difference in the light of objects of one part in 66 was ſufficiently diſtinguiſhable.

It will perhaps, he ſays, be objected, that the rays coming from Sirius are too numerous to admit of a ſufficient inequality ariſing from the common effect of chance ſo frequently as would be neceſſary to produce this effect, whatever might happen with reſpect to the ſmaller ſtars; but he obſerves, that, till we know what inequality is neceſſary to produce this effect, we can only gueſs at it one way or the other.

Since theſe obſervations were publiſhed, Mr. Michell has entertained ſome ſuſpicion that the unequal denſity of light does not contribute to this effect in ſo great a degree as he had imagined, eſpecially in conſequence of obſerving that even Venus does ſometimes twinkle. This he once obſerved her to do remarkably when ſhe was about 6 degrees high, though Jupiter, which was then about 16 degrees high, and was ſenſibly leſs luminous, did not twinkle at all. If, notwithſtanding the great number of rays which, no doubt, come to the eye from ſuch a ſurface as this planet preſents, its appearance be liable to be affected in this manner, it muſt be owing to ſuch undulations in the atmoſphere, as will probably render the effect of every other cauſe altogether inſenſible. The conjecture, however, has ſo much probability in it, that it well deſerved to be recited.

M. Muſchenbroek ſuſpects, that the twinkling of the ſtars ariſes from ſome affection of the eye, as well as the ſtate of the atmoſphere. For he ſays, that in Holland, when the weather is froſty, and the ſky very clear, the ſtars twinkle moſt manifeſtly to the naked eye, though not in teleſcopes; and ſince he does not ſuppoſe that there is any great exhalation, or dancing of the vapour at that time, he queſtions whether the vivacity of the light affecting the eye may not be concerned in the phenomenon.

But this philoſopher might very eaſily have ſatisfied himſelf with reſpect to this hypotheſis, by looking at the ſtars near the zenith, when the light traverſes but a ſmall part of the atmoſphere, and therefore might be expected to affect the eye the moſt ſenſibly. For he would not have perceived them to twinkle near ſo much, as they do near the horizon, when much more of their light is intercepted by the atmoſphere.

Some aſtronomers have lately endeavoured to explain the twinkling of the fixed ſtars by the extreme minuteneſs of their apparent diameter; ſo that they ſuppoſe the ſight of them is intercepted by every mote that floats in the air. But Mr. Michell obſerves, that no object can hide a ſtar from us that is not large enough to exceed the apparent diameter of the ſtar, by the diameter of the pupil of the eye; ſo that if a ſtar was a mathematical point, the interpoſing object muſt ſtill be equal in ſize to the pupil of the eye; nay, it muſt be large enough to hide the ſtar from both eyes at the ſame time.

Beſides a variation in the quantity of light, a momentary change of colour has likewiſe been obſerved in ſome of the fixed ſtars. Mr. Melville ſays, that when one looks ſtedfaſtly at Sirius, or any bright ſtar not much elevated above the horizon, its colour ſeems not to be conſtantly white, but appears tinctured, at every twinkling, with red and blue. This obſervation Mr. Melville puts among his queries, with reſpect to which he could not entirely ſatisfy himſelf; and he obſerves, that the ſeparation of the colours by the refractive power of the atmoſphere is, probably, too ſmall to be perceived. But the ſuppoſition of Mr. Michell above-mentioned will pretty well account for this circumſtance, though it may be thought inadequate to the former caſe. For the red and blue rays being much fewer than thoſe of the intermediate colours, and therefore much more liable to inequalities, from the common effect of chance, a ſmall exceſs or defect in either of them will make a very ſenſible difference in the colour of the ſtars.

§ 3. *Diſcoveries concerning the Reflection of Light.*

However much the ancients might have been miſtaken with regard to the nature of light, we find that they were acquainted with two very important obſervations concerning it; viz. that light is propagated in right lines, and that the angle of incidence is equal to the angle of reflection. Who it was that firſt made theſe important obſervations is not known. But indeed, important as they are, and the foundation of a great part of even the preſent ſyſtem of optics, it is poſſible that, if he were known, he might not be allowed to have any ſhare of merit, at leaſt for the *former* of them; the fact is ſo very obvious, and ſo eaſily aſcertained. As to the latter, that *the angle of incidence is equal to the angle of reflection*, it was probably firſt diſcovered by obſerving a ray of the ſun reflected from the ſurface of water, or ſome other poliſhed body; or from obſerving the images of objects reflected by ſuch ſurfaces. If philoſophers attended to this phenomenon at all, they could not but take notice, that, if the ray fell nearly perpendicular upon ſuch a ſurface, it was reflected near the perpendicular; and if it fell obliquely, it was reflected obliquely: and if they thought of applying any kind of meaſures to theſe angles, however coarſe and imperfect, they could not but ſee that there was ſufficient reaſon to aſſert their equality. At the ſame time they could not but know that the incident and reflected rays were both in the ſame plane.

Ariſtotle was ſenſible that it is the reflection of light from the atmoſphere which prevents total darkneſs after the ſun ſets, and in places where he doth not ſhine in the day-time. He was alſo

of opinion, that rainbows, halos, and mock ſuns, were all occaſioned by the reflection of the ſun-beams in different circumſtances, by which an imperfect image of his body was produced, the colour only being exhibited, and not his proper figure. The image, he ſays, is not ſingle, as in a mirror; for each drop of rain is too ſmall to reflect a viſible image, but the conjunction of all the images is viſible.

Without inquiring any farther into the nature of light or viſion, the ancient geometricians contented themſelves with deducing a ſyſtem of optics from the two obſervations mentioned above, viz. the rectilinear progreſs of light, and the equality of the angles of incidence and reflection. The treatiſe of optics which has been aſcribed to Euclid is employed about determining the apparent ſize and figure of objects, from the angle under which they appear, or which the extremities of them ſubtend at the eye, and the apparent place of the image of an object reflected from a poliſhed mirror; which he fixes at the place where the reflected ray meets a perpendicular to the mirror drawn through the object. But this work is ſo imperfect, and ſo inaccurately drawn up, that it is not generally thought to be the production of that great geometrician.

It appears from a circumſtance in the hiſtory of Socrates, that the effects of burning-glaſſes had alſo been obſerved by the ancients; and it is probable that the Romans had a method of lighting their ſacred fire by means of a concave ſpeculum. It ſeems indeed to have been known pretty early, that there is an increaſe of heat in the place where the rays of light meet, when they are reflected from a concave mirror. The burning power of concave mirrors is taken notice of by Euclid in the ſecond book of the treatiſe above-mentioned. If we give but a ſmall degree of credit to what ſome ancient hiſtorians are ſaid to have written concerning the exploits of Archimedes, we ſhall be induced to think that he made great uſe of this principle, in conſtructing ſome very powerful burning-mirrors; but nothing being ſaid of other perſons making uſe of his inventions, the whole account is very doubtful. It is allowed, however, that this eminent geometrician did write a treatiſe on the ſubject of burning-mirrors, though it be not now extant.

B. Porta ſuppoſes that the burning-mirrors of the ancients were of metal, in the form of a ſection of a parabola. It follows from the properties of this curve, that all the rays which fall upon it, parallel to its axis, will meet in the ſame point at the focus. Conſequently, if the vertex of the parabola be cut off, as in Pl. 4. fig. 1 it will make a convenient burning-mirror. In ſome drawings of this inſtrument the fruſtum is ſo ſmall as to look like a ring. With an inſtrument of this kind it is thought that the Romans lighted their ſacred fire. Some have alſo thought that this was the form of the mirror with which Archimedes burnt the Roman fleet; uſing either a lens, to throw the rays parallel, when they had been brought to a focus; or applying a ſmaller parabolic mirror for this purpoſe, as is repreſented fig. 2. But Dechales ſhows, that it is impoſſible to convey any rays in a direction parallel to one another, except thoſe that come from the ſame point in the ſun's diſk.

All this time, however, the nature of reflection was very far from being underſtood. Even lord Bacon, who made much greater advances in natural philoſophy than his predeceſſors, and who pointed out the true method of improving it, was ſo far deceived with regard to the nature of reflection and refraction, that he ſuppoſed it poſſible to ſee the image reflected from a looking-glaſs, without ſeeing the glaſs itſelf; and to this purpoſe he quotes a ſtory of friar Bacon, who is reported to have apparently walked in the air between two ſteeples, and which was thought to have been effected by reflection from glaſſes while he walked upon the ground.

The whole buſineſs of ſeeing images in the air may be traced up to Vitellio; and what he ſaid upon the ſubject ſeems to have paſſed from writer to writer, with conſiderable additions, to the time of lord Bacon. What Vitellio endeavours to ſhow is, that it is poſſible, by means of a cylindrical convex ſpeculum, to ſee the images of objects in the air, out of the ſpeculum, when the objects themſelves cannot be ſeen. But, if his deſcription of the apparatus requiſite for this experiment be attended to, it will be ſeen that the eye was to be directed towards the ſpeculum, which was placed within a room, while both the object and the ſpectator were without it. But though he recommends this obſervation to the diligent ſtudy of his readers, he has not deſcribed it in ſuch a manner as is very intelligible; and, indeed, it is certain, that no ſuch effect can be produced by a convex mirror. If he himſelf did make any trial with the apparatus that he deſcribes for this purpoſe, he muſt have been under ſome deception with reſpect to it.

B. Porta ſays, that this effect may be produced by a plane mirror only; and that an ingenious perſon may ſucceed in it: but his more particular deſcription of a method to produce this extraordinary appearance is by a plane mirror and a concave one combined.

Kircher alſo ſpeaks of the poſſibility of exhibiting theſe pendulous images, and ſuppoſes that they are reflected from the denſe air; and the moſt perfect and pleaſing deception depending upon the images in the air is one of which this writer gives a particular account in his *Ars Magna Lucis et Umbræ*, p. 783. In this caſe the image is placed at the bottom of a hollow poliſhed cylinder, by which means it appears like a real ſolid ſubſtance, ſuſpended within the mouth of the veſſel. In this manner, he ſays, he once exhibited a repreſentation of the aſcenſion of Chriſt; when the images were ſo perfect, that the ſpectators could not be perſuaded, but by attempting to handle them, that they were not real ſubſtances.

Among other amuſing things that were either invented or improved by Kircher, was the method of throwing the appearance of letters, and other forms of things, into a darkened room from without by means of a lens and a plane mirror. The figures or letters were written upon the face of the mirror, and inverted; and the focus of the lens was contrived to fall upon the ſcreen or wall that received their images. In this manner, he ſays, that with the light of the ſun he could throw a plain and diſtinct image 500 feet.

It was Kepler who firſt diſcovered the true reaſon of the apparent places of objects ſeen by reflecting mirrors, as it depends upon the angle which the rays of light, iſſuing from the extreme part of an object, make with one another after ſuch reflections. In plane mirrors theſe rays are reflected with the ſame degree of inclination to one another that they had before their incidence; but he ſhows that this inclination is changed in convex and concave mirrors.

Mr. Boyle made ſome curious obſervations concerning the reflecting powers of differently coloured ſubſtances. Many learned men, he ſays, imagined that ſnow affects the eyes, not by a *borrowed*, but by a *native* light; but having placed a quantity of ſnow in a room from which all foreign light was excluded, neither he nor any body elſe was able to perceive it. To try whether white bodies reflect more light than others, he held a ſheet of white paper in a ſun-beam admitted into a darkened room; and obſerved that it reflected much more light than a paper of any other colour, a conſiderable part of the room being enlightened by it. Farther, to ſhow that white bodies reflect the rays outwards, he adds, that common burning-glaſſes will not of a long time burn or diſcolour white paper. When he was a boy, he ſays, and took great pleaſure in making experiments with theſe glaſſes, he was much ſurpriſed at this remarkable circumſtance; and it ſet him very early upon gueſſing at the nature of whiteneſs, eſpecially as he obſerved that the image of the ſun was not ſo well defined upon white paper as upon black; and as, when he put

ink upon the paper, the moiſture would be quickly dried up, and the paper, which he could not burn before, would preſently take fire. He alſo found, that, by expoſing his hand to the ſun, with a thin black glove upon it, it would be ſuddenly and more conſiderably heated, than if he held his naked hand to the rays, or put on a glove of thin white leather.

To prove that black is the reverſe of white, with reſpect to its property of reflecting the rays of the ſun, he procured a large piece of black marble; and having got it ground into the form of a large ſpherical concave ſpeculum, he found that the image of the ſun reflected from it was far from offending or dazzling his eyes, as it would have done from another ſpeculum; and though this was large, he could not in a long time ſet a piece of wood on fire with it; though a far leſs ſpeculum, of the ſame form, and of a more reflecting ſubſtance, would preſently have made it flame.

To ſatisfy himſelf ſtill farther with reſpect to this ſubject, he took a broad and large tile; and having made one half of its ſurface white and the other black, he expoſed it to the ſummer ſun. And having let it lie there ſome time, he found, that while the whited part remained cool, the part that was black was grown very hot. For his farther ſatisfaction, he ſometimes left part of the tile of its native red; and, after expoſing the whole to the ſun, obſerved that this part grew hotter than the white, but was not ſo hot as the black part. He alſo obſerves, that rooms hung with black are not only darker than they would otherwiſe be, but warmer too; and he knew ſeveral perſons, who found great inconvenience from rooms hung with black. As another proof of his hypotheſis, he informs us, that a virtuoſo, of unſuſpected credit, acquainted him, that, in a hot climate, he had ſeen eggs well roaſted in a ſhort time, by firſt blacking the ſhells, and then expoſing them to the ſun.

We have already taken notice of the remarkable property of lignum nephriticum firſt obſerved by Kircher. (See GUILANDINA.) However, all his obſervations with regard to it fell very ſhort of Mr. Boyle. He deſcribes this lignum nephriticum to be a whitiſh kind of wood, that was brought from Mexico, which the natives call *coatl* or *tlapazatli*, and which had been thought to tinge water of a green colour only; but he ſays that he found it to communicate all kinds of colours. If, ſays he, an infuſion of this wood be put into a glaſs globe, and expoſed to a ſtrong light, it will be as colourleſs as pure water; but if it be carried into a place a little ſhaded, it will be a moſt beautiful green; in a place ſtill more ſhaded, it will incline to red; and in a very ſhady place, or in an opaque veſſel, it will be green again.

A cup of this remarkable wood was ſent to Kircher by the procurator of his ſociety at Mexico, and was preſented by him to the emperor as a great curioſity. It is called *lignum nephriticum*, becauſe the infuſion of it was imagined to be of ſervice in diſeaſes of the kidneys and bladder, and the natives of the country where it grows do make uſe of it for that purpoſe.

Mr. Boyle corrected ſeveral of the haſty obſervations of Kircher concerning the colours that appear in the infuſion of lignum nephriticum, and he diverſified the experiments with it in a very pleaſing manner. He firſt diſtinctly noted the two very different colours which this remarkable tincture exhibits by tranſmitted and reflected light. If, ſays he, it be held directly between the light and the eye, it will appear tinged (excepting the very top of it, where a ſky-coloured circle ſometimes appears) almoſt of a golden colour, except the infuſion be too ſtrong; in which caſe it will be dark or reddiſh, and requires to be diluted with water. But if it be held from the light, ſo that the eye be between the light and the phial, it will appear of a deep lovely blue colour; as will alſo the drops, if any lie on the outſide of the glaſs.

When a little of this tincture was poured upon a ſheet of white paper, and placed in a window where the ſun could ſhine upon it, he obſerved, that if he turned his back upon the ſun, the ſhadow of his pen, or any ſuch ſlender ſubſtance, projected upon the liquor, would not be all dark, like other ſhadows; but that part of it would be curiouſly coloured, the edge of it next the body being almoſt of a lively golden colour, and the more remote part blue. Theſe, and other experiments of a ſimilar nature, many of his friends, he ſays, beheld with wonder; and he remembered an excellent oculiſt, who accidentally meeting with a phial full of this liquor, and being unacquainted with this remarkable property of it, imagined, after he had viewed it a long time, that ſome new and ſtrange diſtemper had ſeized his eyes: and Mr. Boyle himſelf acknowledges, that the oddneſs of the phenomenon made him very deſirous to find out the cauſe of it; and his inquiries were not altogether unſuccefsful.

Obſerving that this tincture, if it were too deep, was not tinged in ſo beautiful a manner, and that the impregnating virtue of the wood did, by being frequently infuſed in freſh water, gradually decay, he conjectured that the tincture contained much of the eſſential ſalt of the wood; and to try whether the ſubtle parts, on which the colour depended, were volatile enough to be diſtilled without diſſolving their texture, he applied ſome of it to the gentle heat of a lamp-furnace; but he found all that came over was as limpid and colourleſs as rock-water, while that which remained behind was of ſo deep a blue, that it was only in a very ſtrong light that it appeared of any colour.

Suſpecting that the tingeing particles abounded with ſalts, whoſe texture, and the colour thence ariſing, would probably be altered by acids, he poured into a ſmall quantity of it a very little ſpirit of vinegar, and found that the blue colour immediately vaniſhed, while the golden one remained, on whichever ſide it was viewed with reſpect to the light.

Upon this he imagined, that as the acid ſalts of the vinegar had been able to deprive the liquor of its blue colour, a ſulphureous ſalt, which is of a contrary nature, would deſtroy their effects; and having placed himſelf betwixt the window and the phial, and let fall into the ſame liquor a few drops of oil of tartar *per deliquium*, he found that it was immediately reſtored to its former blue colour, and exhibited all the ſame phenomena which it had done at the firſt.

Having ſometimes brought a round long-necked phial, filled with this tincture, into a darkened room, into which a beam of the ſun was admitted by a ſmall aperture; and holding the phial ſometimes near the ſun-beams, and ſometimes partly in them and partly out of them, changing alſo the poſition of the glaſs, and viewing it from ſeveral parts of the room, it exhibited a much greater variety of colours than it did in an enlightened room. Beſides the uſual colours, it was red in ſome places and green in others, and within were intermediate colours produced by the different degrees and odd mixtures of light and ſhade.

It was not only in this tincture of lignum nephriticum that Mr. Boyle obſerved the difference between reflected and tranſmitted light. He obſerved it even in gold, though no perſon explained the cauſe of theſe effects before Sir Iſaac Newton. He took a piece of leaf-gold, and, holding it betwixt his eye and the light, obſerved that it did not appear of a golden colour, but of a greeniſh blue. He alſo obſerved the ſame change of colour by candle-light; but the experiment did not ſucceed with a leaf of ſilver.

The conſtitution of the atmoſphere and of the ſea, we ſhall find, by obſervations made in later periods, to be ſimilar to that of this infuſion; for the blue rays, and others of a faint colour, do not penetrate ſo far into them as the red, and others of a ſtronger colour: but what this conſtitution is, which is common to them all, deſerves to be inquired into. For almoſt all other tinctures, and this of lignum nephriticum too, after ſome change made in it by Mr. Boyle, as well as all other ſemi-tranſparent coloured ſubſtances, as glaſs, appear of the ſame hue in all poſi-

tions of the eye. To increaſe or diminiſh the quantity makes no difference, but to make the colour deeper or more dilute.

The firſt diſtinct account of the colours exhibited by thin plates of various ſubſtances, are met with among the obſervations of Mr. Boyle. To ſhow the chemiſts that colours may be made to appear or vaniſh, where there is no acceſſion or change either of the ſulphureous, the ſaline, or the mercurial principle of bodies, he obſerves, that all chemical eſſential oils, as alſo good ſpirit of wine, being ſhaken till they riſe in bubbles, appear of various colours; which immediately vaniſh when the bubbles burſt, ſo that a colourleſs liquor may be immediately made to exhibit a variety of colours, and loſe them in a moment, without any change in its eſſential principles. He then mentions the colours that appear in bubbles of ſoap and water, and alſo in turpentine. He ſometimes got glaſs blown ſo thin as to exhibit ſimilar colours; and obſerves, that a feather, of a proper ſhape and ſize, and alſo a black ribbon, held at a proper diſtance, between his eye and the ſun, ſhowed a variety of little rainbows, as he calls them, with very vivid colours, none of which were conſtantly to be ſeen in the ſame objects.

Much more pains were taken with this ſubject, and a much greater number of obſervations reſpecting it were made, by Dr. Hooke. As he loved to give ſurpriſe by his diſcoveries, he promiſed, at a meeting of the ſociety on the 7th of March 1672, to exhibit, at their next meeting, ſomething which had neither reflection nor refraction, and yet was diaphanous. Accordingly, at the time appointed, he produced the famous coloured bubble of ſoap and water, of which ſuch admirable uſe was afterwards made by Sir Iſaac Newton, but which Dr. Hooke and his contemporaries ſeem to have overlooked in Mr. Boyle's treatiſe on colours, though it was publiſhed nine years before. It is no wonder that ſo curious an appearance excited the attention of that inquiſitive body, and that they ſhould deſire him to bring an account of it in writing at their next meeting.

By the help of a ſmall glaſs-pipe, there were blown ſeveral ſmall bubbles, out of a mixture of ſoap and water; where it was obſervable, that, at firſt, they appeared white and clear; but that, after ſome time, the film of water growing thinner, there appeared upon it all the colours of the rainbow: Firſt a pale yellow; then orange, red, purple, blue, green, &c. with the ſame ſeries of colours repeated; in which it was farther obſervable, that the firſt and laſt ſeries were very faint, and that the middlemoſt order or ſeries was very bright. After theſe colours had paſſed over the changes above mentioned, the film of the bubble began to appear white again; and preſently, in ſeveral parts of this ſecond white film, there appeared ſeveral holes, which by degrees grew very big, ſeveral of them running into one another. After reciting other obſervations, which are not of much conſequence, he ſays, it is ſtrange, that though both the encompaſſing and encompaſſed air have ſurfaces, yet he could not obſerve that they afforded either reflection or refraction, which all the other parts of the encompaſſed air did. This experiment, he ſays, at firſt ſight, may appear very trivial; yet, as to the finding out the nature and cauſe of reflection, refraction, colours, congruity and incongruity, and ſeveral other properties of bodies, he looked upon it as one of the moſt inſtructive. And he promiſed to conſider it more afterwards; but we do not find that ever he did; nor indeed is it to be much regretted, as we ſhall ſoon find this buſineſs in better hands. He adds, that that which gives one colour by reflection gives another by trajection; not much unlike the tincture of lignum nephriticum.

Dr. Hooke was the firſt to obſerve, if not to deſcribe, the beautiful colours that appear in thin plates of muſcovy glaſs. Theſe, he ſays, are very beautiful to the naked eye, but much more when they are viewed with a microſcope. With this inſtrument he could perceive that theſe colours were ranged in rings ſurrounding the white ſpecks or flaws in this thin ſubſtance, that the order of the colours was the very ſame as in the rainbow, and that they were often repeated ten times. But the colours, he ſays, were diſpoſed as in the outer bow, and not the inner. Some of them alſo were much brighter than others, and ſome of them very much broader.

He alſo obſerved, that if there was a place where the colours were very broad, and conſpicuous to the naked eye, they might be made, by preſſing the place with the finger, to change places, and move from one part to another. Laſtly, he obſerved, that if great care be uſed, this ſubſtance may be ſplit into plates of $\frac{1}{3}$ or $\frac{1}{4}$ of an inch in diameter, each of which will appear through a microſcope to be uniformly adorned with ſome one vivid colour, and that theſe plates will be found upon examination to be of the ſame thickneſs throughout.

As a fact ſimilar to this, but obſerved previous to it, we ſhall here mention that lord Brereton, at a meeting of the Royal Society in 1666, produced ſome pieces of glaſs taken out of a window of a church, both on the north and on the ſouth ſide of it; obſerving, that they were all eaten in by the air, but that the piece taken from the ſouth ſide had ſome colours like thoſe of the rainbow upon it, which the others on the north ſide had not. This phenomenon has been frequently obſerved ſince, and in other circumſtances. It is not to be doubted, but that in all theſe caſes the glaſs is divided into thin plates, which exhibit colours, upon the ſame principle with thoſe which Dr. Hooke obſerved in the bubble of ſoap and water, and in the thin plate of air, which we ſhall find more fully explained by Sir Iſaac Newton. With care the thin plates of the glaſs may be ſeparated, and the theory verified.

An obſervation made by Otto Guericke well explains the reaſon why ſtars are viſible at the bottom of a deep well. It is, ſays he, becauſe the light that proceeds from them is not overpowered by the rays of the ſun, which are loſt in the number of reflections which they muſt undergo in the pit, ſo that they can never reach the eye of a ſpectator at the bottom of it.

But of all thoſe who have given their attention to this ſubject of the reflection of light, none ſeems to have given ſuch ſatisfaction as M. Bouguer; and next to thoſe of Sir Iſaac Newton, his labours ſeem to have been the moſt ſucceſsful. The object of his curious and elaborate experiments was to meaſure the degrees of light, whether emitted, reflected, or refracted, by different bodies. They were originally occaſioned by an article of M. Mairan's in the memoirs of the French academy for 1721, in which the proportion of the light of the ſun at the two ſolſtices was ſuppoſed to be known; and his laudable attempt to verify what had been before taken for granted, ſuggeſted a variety of new experiments, and opened to him and to the world a new field of optical knowledge. His firſt production upon this ſubject was a treatiſe entitled *Eſſai d'Optique*, which was received with general approbation. Afterwards, giving more attention to this ſubject, he formed an idea of a much larger work, to which many more experiments were neceſſary: but he was prevented, by a variety of interruptions, from executing his deſign ſo ſoon as he had propoſed; and he had hardly completed it at the time of his death, in 1758; ſo that we are obliged to his friend M. de la Caille for the care of the publication. At length, however, it was printed at Paris in 1760, under the title of *Traité d'Optique*.

At the entrance upon this treatiſe, we are induced to form the moſt pleaſing expectations from our author's experiments, by his account of the variety, the ſingular accuracy, and circumſpection, with which he made them; whereby he muſt, to all appearance, have guarded againſt every avenue to error, and particularly againſt thoſe objections to which the few attempts that had been made, of a ſimilar nature, before him had been

liable. In order to compare different degrees of light, he always contrived to place the bodies from which it proceeded, or other bodies illuminated by them, in ſuch a manner as that he could view them diſtinctly at the ſame time; and he either varied the diſtances of theſe bodies, or modified their light in ſome other way, till he could perceive no difference between them. Then, conſidering their different diſtances, or the other circumſtances by which their light was affected, he calculated the proportion which they would have borne to each other at the ſame diſtance, or in the ſame circumſtances.

To aſcertain the quantity of light loſt by reflection, he placed the mirror, or reflecting ſurface, B (pl. 4. fig. 3.), on which the experiment was to be made, truly upright; and having taken two tablets, of preciſely the ſame colour, or of an equal degree of whiteneſs, he placed them exactly parallel to one another at E and D, and threw light upon them by means of a lamp or candle, P, placed in a right line between them. He then placed himſelf ſo, that with his eye at A he could ſee the tablet E, and the image of the tablet D, reflected from the mirror B, at the ſame time: making them, as it were, to touch one another. He then moved the candle along the line ED, ſo as to throw more or leſs light upon either of them, till he could perceive no difference in the ſtrength of the light that came to his eye from them. After this, he had nothing more to do than to meaſure the diſtances EP and DP; for the ſquares of thoſe diſtances expreſſed the degree in which the reflection of the mirror diminiſhed the quantity of light. It is evident, that if the mirror reflected all the rays it received, the candle P muſt have been placed at C, at an equal diſtance from each of the tablets, in order to make them appear equally illuminated; but becauſe much of the light is loſt in reflection, they can only be made to appear equally bright by placing the candle nearer the tablet D, which is ſeen by reflection only.

To find how much light is loſt by oblique reflection, he took two equally poliſhed plates, D and E, fig. 4. and cauſed them to be enlightened by the candle P; and while one of them, D, was ſeen at A, by reflection from B, placed in a poſition oblique to the eye, the other, E, was ſo placed as to appear contiguous to it; and removing the plate E, till the light which it reflected was no ſtronger than that which came from the image D, ſeen by reflection at B, he eſtimated the quantity of light that was loſt by this oblique reflection, by the ſquares of the diſtances of the two objects from the candle.

It need ſcarcely be added, that in theſe experiments all foreign light was excluded, that his eye was ſhaded, and that every other precaution was obſerved in order to make his concluſions unqueſtionable.

In order to aſcertain the quantity of light loſt by reflection with the greateſt exactneſs, M. Bouguer introduced two beams of light into a darkened room, as by the apertures P and Q, fig. 5; which he had ſo contrived, that he could place them higher or lower, and enlarge or contract them at pleaſure; and the reflecting ſurface (as that of a fluid contained in a veſſel) was placed horizontally at O, from whence the light coming through the hole P was reflected to R, upon the ſcreen GH, where it was compared with another beam of light that fell upon S, through the hole Q; which he made ſo much leſs than P, as that the ſpaces S and R were equally illuminated; and by the proportion that the apertures P and Q bore to each other, he calculated what quantity of light was loſt by the reflection at O.

It was neceſſary, he obſerves, that the two beams of light PO and QS (which he uſually made 7 or 8 feet long) ſhould be exactly parallel, that they might come from two points of the ſky equally elevated above the horizon, and having preciſely the ſame intenſity of light. It was alſo neceſſary that the hole Q ſhould be a little higher than P, in order that the two images ſhould be at the ſame height, and near one another. It is no leſs neceſſary, he ſays, that the ſcreen GH be exactly vertical, in order that the direct and reflected beams may fall upon it with the ſame inclination; ſince, otherwiſe, though the two lights were perfectly equal, they would not illuminate the ſcreen equally. This diſpoſition, he ſays, ſerves to anſwer another important condition in theſe experiments; for the direct ray QS muſt be of the ſame length with the ſum of the incident and reflected rays, PO and OR, in order that the quantity of light introduced into the room may be ſenſibly proportional to the ſizes of the apertures.

We ſhall now proceed to recite the reſult of the experiments which he made to meaſure the quantity of light that is loſt by reflection in a great variety of circumſtances; but we ſhall introduce them by the recital of ſome which were made previous to them on the diminution of light by reflection, and the tranſmiſſion of it to conſiderable diſtances through the air, by M. Buffon, at the time that he was conſtructing his machine to burn at great diſtances, mentioned under the article BURNING-*Glaſs*.

Receiving the light of the ſun in a dark place, and comparing it with the ſame light of the ſun reflected by a mirror, he found, that at ſmall diſtances, as four or five feet, about one half was loſt by reflection; as he judged by throwing two reflected beams upon the ſame place, and comparing them with a beam of direct light; for then the intenſity of them both ſeemed to be the ſame.

Having received the light at greater diſtances, as at 100, 200, and 300 feet, he could hardly perceive that it loſt any of its intenſity by being tranſmitted through ſuch a ſpace of air.

He afterwards made the ſame experiments with candles, in the following manner: He placed himſelf oppoſite to a looking-glaſs, with a book in his hand, in a room perfectly dark; and having one candle lighted in the next room, at the diſtance of about 40 feet, he had it brought nearer to him by degrees, till he was juſt able to diſtinguiſh the letters of the book, which was then 24 feet from the candle. He then received the light of the candle, reflected by the looking-glaſs, upon his book, carefully excluding all the light that was reflected from any thing elſe; and he found that the diſtance of the book from the candle, including the diſtance from the book to the looking-glaſs (which was only half a foot), was in all 15 feet. He repeated the experiment ſeveral times, and always with nearly the ſame reſult; and therefore concluded, that the quantity of direct light is to that of reflected as 576 to 225; ſo that the light of five candles reflected from a plane mirror is about equal to that of two candles.

From theſe experiments it appeared, that more light was loſt by reflection of the candles than of the ſun, which M. Buffon thought was owing to this circumſtance, that the light iſſuing from the candle diverges, and therefore falls more obliquely upon the mirror than the light of the ſun, the rays of which are nearly parallel.

Theſe experiments and obſervations of M. Buffon are curious; though it will be ſeen that they fall far ſhort of thoſe of M. Bouguer, both in extent and accuracy. We ſhall begin with thoſe which he made to aſcertain the difference in the quantity of light reflected by glaſs and poliſhed metal.

Uſing a ſmooth piece of glaſs one line in thickneſs, he found, that when it was placed at an angle of 15 degrees with the incident rays, it reflected 628 parts of 1000 which fell upon it; at the ſame time that a metallic mirror, which he tried in the ſame circumſtances, reflected only 561 of them. At a leſs angle of incidence much more light was reflected; ſo that at an angle of three degrees the glaſs reflected 700 parts, and the metal ſomething leſs, as in the former caſe.

Trying the reflection of bodies that were not poliſhed, he

found that a piece of white plaſter, placed at an angle of 75° with the incident rays, reflected $\frac{1}{17}$ part of the light that is received from a candle nine inches from it. White paper, in the ſame circumſtances, reflected in the ſame proportion; but at the diſtance of three inches, they both reflected 150 parts of 1000 that were incident.

Proceeding to make farther obſervations on the ſubject of reflected light, he premiſes the two following theorems, which he demonſtrates geometrically. 1. When the luminous body is at an infinite diſtance, and its light is received by a globe, the ſurface of which has a perfect poliſh, and abſorbs no light, it reflects the light equally in all directions, provided it be received at a conſiderable diſtance. He only excepts the place where the ſhadow of the globe falls; but this, he ſays, is no more than a ſingle point, with reſpect to the immenſity of the ſpherical ſurface which receives its light.

2. The quantity of light reflected in one certain direction will always be exactly the ſame, whether it be reflected by a very great number of ſmall poliſhed hemiſpheres, by a leſs number of larger hemiſpheres, or by a ſingle hemiſphere, provided they occupy the ſame baſe, or cover the ſame ground-plan.

The uſe he propoſes to make of theſe theorems is, to aſſiſt him in diſtinguiſhing whether the light reflected from bodies be owing to the extinction of it within them, or whether the roughneſs or eminences which cover them have not the ſame effect with the ſmall poliſhed hemiſpheres above mentioned.

He begins with obſerving, that, of the light reflected from Mercury, $\frac{1}{4}$ at leaſt is loſt, and that probably no ſubſtances reflect more than this. The rays were received at an angle of $11\frac{1}{2}$ degrees of incidence, that is, meaſured from the ſurface of the reflecting body, and not from the perpendicular, which, he ſays, is what we are from this place to underſtand whenever he mentions the angle of incidence.

The moſt ſtriking obſervations which he made with reſpect to this ſubject, are thoſe which relate to the very great difference in the quantity of light reflected at different angles of incidence. In general, he ſays, that reflection is ſtronger at ſmall angles of incidence, and weaker at large ones. The difference is exceſſive when the rays ſtrike the ſurface of tranſparent ſubſtances with different degrees of obliquity; but it is almoſt as great in ſome opaque ſubſtances, and it was always more or leſs ſo in every thing that he tried. He found the greateſt inequality in black marble; in which he was aſtoniſhed to find, that, with an angle of 3° 35′ of incidence, though not perfectly poliſhed, yet it reflected almoſt as well as quickſilver. Of 1000 rays which it received, it returned 600; but when the angle of incidence was 14 degrees, it reflected only 156; when it was 30, it reflected 51; and when it was 80, it reflected only 23.

Similar experiments made with metallic mirrors always gave the differences much leſs conſiderable. The greateſt was hardly ever an eighth or a ninth part of it, but they were always in the ſame way.

The great difference between the quantity of light reflected from the ſurface of water, at different angles of incidence, is truly ſurpriſing; but our author obſerves, that this difference was greater when the ſmalleſt inclinations were compared with thoſe which were near to a right angle. He ſometimes ſuſpected, that, at very ſmall angles of incidence, the reflection from water was even greater than from quickſilver. All things conſidered, he thought it was not quite ſo great, though it was very difficult to determine the preciſe difference between them. In very ſmall angles, he ſays, that water reflects nearly $\frac{3}{4}$ of the direct light.

There is no perſon, he ſays, but has ſometimes felt the force of this ſtrong reflection from water, when he has been walking in ſtill weather on the brink of a lake oppoſite to the ſun. In this caſe, the reflected light is $\frac{1}{3}$, $\frac{1}{2}$, or ſometimes a greater proportion of the light that comes directly from the ſun, which is an addition to the direct rays of the ſun that cannot fail to be very ſenſible. The direct light of the ſun diminiſhes gradually as it approaches the horizon, while the reflected light at the ſame time grows ſtronger: ſo that there is a certain elevation of the ſun, in which the united force of the direct and reflected light will be the greateſt poſſible, and this he ſays is 12 or 13 degrees.

On the other hand, the light reflected from water at great angles of incidence is extremely ſmall. Our author was aſſured, that, when the light was perpendicular, it reflected no more than the 37th part that quickſilver does in the ſame circumſtances; for it did not appear, from all his obſervations, that water reflects more than the 60th, or rather the 55th, part of perpendicular light. When the angle of incidence was 50 degrees, the light reflected from the ſurface of water was about the 32d part of that which mercury reflected; and as the reflection from water increaſes with the diminution of the angle of incidence, it was twice as ſtrong in proportion at 39 degrees; for it was then the 16th part of the quantity that mercury reflected.

In order to procure a common ſtandard by which to meaſure the proportion of light reflected from various fluid ſubſtances, he pitched upon water as the moſt commodious; and partly by obſervation, and partly by calculation, which he always found to agree with his obſervations, he drew up the following table of the quantity of light reflected from the ſurface of water, at different angles with the ſurface.

Angles of incidence.	Rays reflected of 1000.	Angles of incidence.	Rays reflected of 1000.
$\frac{1}{2}$	721	17 $\frac{1}{2}$	178
1	692	20	145
1 $\frac{1}{2}$	669	25	97
2	639	30	65
2 $\frac{1}{2}$	614	40	34
5	501	50	22
7 $\frac{1}{2}$	409	60	19
10	333	70	18
12 $\frac{1}{2}$	271	80	18
15	211	90	18

In the ſame manner, he drew up the following table of the quantity of light reflected from the looking-glaſs not quickſilvered.

Angles of incidence.	Rays reflected of 1000.	Angles of incidence.	Rays reflected of 1000.
2 $\frac{1}{2}$	584	30	112
5	543	40	57
7 $\frac{1}{2}$	474	50	34
10	412	60	27
12 $\frac{1}{2}$	356	70	25
15	299	80	25
20	222	90	25
25	157		

Pouring a quantity of water into a veſſel containing quickſilver, it is evident that there will be two images of any objects ſeen by reflection from them, one at the ſurface of the water and the other at that of the quickſilver. In the largeſt angles of incidence, the image at the ſurface of the water will diſappear, which will happen when it is about a 60th or an 80th part leſs luminous than the image at the ſurface of the quickſilver. Depreſſing the eye, the image on the water will grow

ſtronger, and that on the quickſilver weaker in proportion; till at laſt the latter will be incomparably weaker than the former, and at an angle of about 10 degrees they will be equally luminous. According to the table, $\frac{3}{7}\frac{3}{6}\frac{3}{5}$ of the incident rays are reflected from the water at this angle of 10 degrees. At the ſurface of the mercury they were reduced to 500; and of theſe, part being reflected back upon it from the under ſurface of the water, only 333 remained to make the image from the mercury.

It has been obſerved by ſeveral perſons, particularly by Mr. Edwards, (ſee Phil. Tranſ. vol. 53. p. 229.) that there is a remarkably ſtrong reflection into water, with reſpect to rays iſſuing from the water; and perſons under water have ſeen images of things in the air in a manner peculiarly diſtinct and beautiful: but this fact had not been obſerved with a ſufficient degree of attention, till it came into M. Bouguer's way to do it, and he acknowledges it to be very remarkable. In this caſe, he ſays, that from the ſmalleſt angles of incidence, to a certain number of degrees, the greateſt part of the rays are reflected, perhaps in as great a proportion as at the ſurface of metallic mirrors, or of quickſilver; while the other part, which does not eſcape into the air, is extinguiſhed or abſorbed; ſo that the ſurface of the tranſparent body appears opaque on the inſide. If the angle of incidence be increaſed only a few degrees, the ſtrong reflection ceaſes altogether, a great number of rays eſcape into the air, and very few are abſorbed or extinguiſhed. In proportion as the angle of incidence is farther increaſed, the quantity of the light reflected becomes leſs and leſs; and when it is near 90 degrees, almoſt all the rays eſcape out of the tranſparent body, its ſurface loſing almoſt all its power of reflection, and becoming almoſt as tranſparent as it is in other caſes, or when the light falls upon it from without.

This property belonging to the ſurfaces of tranſparent bodies, of abſorbing or extinguiſhing the rays of light, is truly remarkable, and, as there is reaſon to believe, had not been noticed by any perſon before M. Bouguer. It had been conjectured by Sir Iſaac Newton, that rays of light become extinct only by impinging upon the ſolid parts of bodies; but theſe obſervations of M. Bouguer ſhow that the fact is quite otherwiſe; and that this effect is to be attributed, not to the ſolid parts of bodies, which are certainly more numerous in a long tract of water than juſt in the paſſage out of water into air, but to ſome power lodged at the ſurfaces of bodies only, and therefore probably the ſame with that which reflects, refracts, and inflects the light.

One of the above-mentioned obſervations, viz. all the light being reflected at certain angles of incidence from air into denſer ſubſtances, had frequently been made, eſpecially in glaſs priſms; ſo that Newton made uſe of one of them, inſtead of a reflecting mirror, in the conſtruction of his teleſcope. If a beam of light fall upon the air from within theſe priſms, at an angle of 10, 20, or 30 degrees, the effect will be nearly the ſame as at the ſurface of quickſilver, a fourth or a third of the rays being extinguiſhed, and $\frac{2}{3}$ or $\frac{3}{4}$ths reflected. This property retains its full force as far as an incidence of 49° 49′, (ſuppoſing the proportion of the ſines of refraction to be 31 and 20 for the mean refrangible rays); but if the angle of incidence be increaſed but one degree, the quantity of light reflected inwards decreaſes ſuddenly, and a great part of the rays eſcape out of the glaſs, ſo that the ſurface becomes ſuddenly tranſparent.

All tranſparent bodies have the ſame property, with this difference, that the angle of incidence at which the ſtrong reflection ceaſes, and at which the light which is not reflected is extinguiſhed, is greater in ſome than in others. In water this angle is about 41° 32′; and in every medium it depends ſo much on the invariable proportion of the ſine of the angle of refraction to the ſine of the angle of incidence, that this law alone is ſufficient to determine all the phenomena of this new circumſtance, at leaſt as to this accidental opacity of the ſurface.

When our author proceeded to meaſure the quantity of light reflected by theſe internal ſurfaces at great angles of incidence, he found many difficulties, eſpecially on account of the many alterations which the light underwent before it came to his eye: but at length, uſing a plate of cryſtal, he found, that, at an angle of 75 degrees, this internal reflection diminiſhed the light 27 or 28 times; and as the external reflection at the ſame angle diminiſhed the light only 26 times, it follows that the internal reflection is a little ſtronger than the other.

Repeating theſe experiments with the ſame and different pieces of cryſtal, he ſometimes found the two reflections to be equally ſtrong; but, in general, the internal was the ſtronger. Alſo, the image reflected internally was always a little redder than an object which was ſeen directly through the plate of cryſtal.

Reſuming his obſervations on the diminution of light, occaſioned by the reflection of opaque bodies obliquely ſituated, he compared it with the appearances of ſimilar ſubſtances which reflected the light perpendicularly. Uſing pieces of ſilver made very white, he found, that, when one of them was placed at an angle of 75 degrees with reſpect to the light, it reflected only 640 parts out of 1000. He then varied the angle, and alſo uſed white plaſter and fine Dutch paper, and drew up the following table of the proportion of the light reflected from each of thoſe ſubſtances at certain angles.

Quantity of Light reflected from

Angles of incidence.	Silver.	Plaſter.	Dutch Paper.
90	1000	1000	1000
75	802	762	971
60	640	640	743
45	455	529	507
30	319	352	332
15	209	194	203

Suppoſing the aſperities of opaque bodies to conſiſt of very ſmall planes, it appears from theſe obſervations, that there are fewer of them in thoſe bodies which reflect the light at ſmall angles of incidence than at greater; and our author ſays, that the caſe was nearly the ſame with reſpect to all the opaque bodies that he tried. None of them had their roughneſs equivalent to ſmall hemiſpheres, which would have diſperſed the light equally in all directions; and, from the *data* in the preceding table, he deduces mathematically the number of the little planes that compoſe thoſe ſurfaces, and that are inclined to the general ſurface at the angles above-mentioned, ſuppoſing that the whole ſurface contains 1000 of them that are parallel to itſelf, ſo as to reflect the light perpendicularly, when the luminous body is ſituated at right angles with reſpect to it. His concluſions reduced to a table, correſponding to the preceeding, are as follow:

Inclinations of the ſmall ſurfaces with reſpect to the large one.	The diſtribution of the ſmall planes that conſtitute the aſperities of the opaque ſurface in the		
	Silver.	Plaſter.	Paper.
0	1000	1000	1000
15	777	736	937
30	554	554	545
45	333	374	358
60	161	176	166
75	53	50	52

Theſe variations in the number of little planes, or ſurfaces, he expreſſes in the form of a curve; and afterwards he ſhows, geometrically, what would be the effect if the bodies were enlightened in one direction, and viewed in another; upon which ſubject he has ſeveral curious theorems and problems: as, the poſition of the eye being given, to find the angle at which the luminous body muſt be placed, in order to its reflecting the moſt light; or, the ſituation of the luminous body being given, to find a proper ſituation for the eye, in order to ſee it the moſt enlightened, &c. But it would carry us too far into geometry to follow him through all theſe diſquiſitions.

Since the planets, as this accurate obſerver takes notice, are more luminous at their edges than at their centres, he concludes, from the above-mentioned principles, that the bodies which form them are conſtituted in a manner different from ours; particularly that their opaque ſurfaces conſiſt of ſmall planes, more of which are inclined to the general ſurface than they are in terreſtrial ſubſtances; and that there are in them an infinity of points, which have exactly the ſame ſplendour.

Our philoſopher and geometrician next proceeds to aſcertain the quantity of ſurface occupied by the ſmall planes of each particular inclination, from conſidering the quantity of light reflected by each, allowing thoſe that have a greater inclination to the common ſurface to take up proportionably leſs ſpace than thoſe which are parallel to it. And comparing the quantity of light that would be reflected by ſmall planes thus diſpoſed, with the quantity of light that was actually reflected by the three ſubſtances above-mentioned, he found, that plaſter, notwithſtanding its extreme whiteneſs, abſorbs much light; for that, of 1000 rays that fall upon it, of which 166 or 167 ought to be reflected at an angle of 77 degrees, only 67 are in fact returned; ſo that 100 out of 167 were extinguiſhed, that is, about three-fifths.

With reſpect to the planets, our author concludes, that of 300,000 rays which the moon receives, 172,000 are abſorbed, or perhaps 204,100.

Having conſidered the ſurfaces of bodies as conſiſting of planes only, he thus explains himſelf.—Each ſmall ſurface, ſeparately taken, is extremely irregular, and ſome of them are really concave, and others convex; but, in reducing them to a middle ſtate, they are to be conſidered as planes. Nevertheleſs he conſiders them as planes only with reſpect to the reception of the rays; for as they are almoſt all curves, and as, beſides this, many of thoſe whoſe ſituation is different from others contribute to the ſame effect, the rays always iſſue from an actual or imaginary focus, and after reflection always diverge from another.

If it be aſked, what becomes of thoſe rays that are reflected from one aſperity to another? he ſhows that very few of the rays can be in thoſe circumſtances; ſince they muſt fall upon planes which have more than 45 degrees of obliquity to the ſurface, of which there are very few in natural bodies. Theſe rays muſt alſo fall at the bottom of thoſe planes, and muſt meet with other planes ſimilarly ſituated to receive them; and conſidering the great irregularity of the ſurfaces of opaque bodies, it may be concluded that very few of the rays are thus reflected upon the body itſelf; and that the little that is ſo reflected is probably loſt to the ſpectators, being extinguiſhed in the body.

We are obliged to Mr. Melville for ſome ingenious obſervations on the manner in which bodies are heated by light. He obſerves, that, as each colorific particle of an opaque body muſt be ſomewhat moved by the reaction of the particles of light, when it is reflected backwards and forwards between the ſame particles, it is manifeſt that they muſt likewiſe be agitated with a vibratory motion, and the time of a vibration will be equal to that which light takes up in moving from one particle of a body to another adjoining. This diſtance, in the moſt ſolid opaque bodies, cannot be ſuppoſed greater than $\frac{1}{1250}$th of an inch, which ſpace a particle of light deſcribes in $\frac{1}{1250000000000}$th of a ſecond. With ſo rapid a motion, therefore, may the internal parts of bodies be agitated by the influence of light, as to perform 125,000,000,000,000 vibrations, or more, in a ſecond of time.

The arrival of different particles of light at the ſurface of the ſame colorific particle, in the ſame or different rays, may diſturb the regularity of its vibrations, but will evidently increaſe their frequency, or raiſe ſtill ſmaller vibrations among the parts which compoſe thoſe particles; by which means the inteſtine motion will become more ſubtle, and more thoroughly diffuſed. If the quantity of light admitted into the body be increaſed, the vibrations of the particles muſt likewiſe increaſe in magnitude and velocity, till at laſt they may be ſo violent, as to make all the component particles daſh one another to pieces by their mutual colliſion; in which caſe, the colour and texture of the body muſt be deſtroyed.

Since there is no reflection of light but at the ſurface of a medium, the ſame perſon obſerves, that the greateſt quantity of rays, though crowded into the ſmalleſt ſpace, will not of themſelves produce any heat. From hence it follows, that the portion of air which lies in the focus of the moſt potent ſpeculum, is not at all affected by the paſſage of light through it, but continues of the ſame temperature with the ambient air; though any opaque body, or even any tranſparent body denſer than air, when put in the ſame place, would be intenſely heated in an inſtant.

This conſequence, evidently flowing from the plaineſt and moſt certain principles, not ſeeming to have been rightly underſtood by many philoſophers, and even the ſilence of moſt phyſical writers concerning this paradoxical truth making it probable that they were unacquainted with it, he thought it worth his while to ſay ſomething in explication of it. He obſerves, that the eaſieſt way to be ſatisfied of the matter experimentally is, to hold a hair, or a piece of down, immediately above the focus of a lens or ſpeculum, or to blow a ſtream of ſmoke from a pipe horizontally over it; for if the air in the focus were hotter than the ſurrounding fluid, it would continually aſcend upon account of its rarefaction, and thereby ſenſibly agitate thoſe ſlender bodies. Or a lens may be ſo placed as to form its focus within a body of water, or ſome other tranſparent ſubſtance, the heat of which may be examined from time to time with a thermometer; but care muſt be taken, in this experiment, to hold the lens as near as poſſible to the tranſparent body, leſt the rays, by falling cloſer than ordinary on its ſurface, ſhould warm it more than the common ſun-beams *.

To apply theſe obſervations to the explication of natural phenomena, he obſerves, that the atmoſphere is not much warmed by the paſſage of the ſun's light through it, but chiefly by its contact with the heated ſurface of the globe. This, he thought, furniſhed one very ſimple and plauſible reaſon why it is coldeſt in all climates on the tops of very high mountains; namely, becauſe they are removed to the greateſt diſtance from the general ſurface of the earth. For it is well known, that a fluid heated by its contact with a ſolid body, decreaſes in heat in ſome inverſe proportion to the diſtance from the body. He himſelf found, by repeated trials, that the heat of water in deep lakes decreaſes regularly from the ſurface downwards. But to have this queſtion fully determined, the temperature of the air in the valley and on the mountain-top muſt be ob-

* To theſe obſervations objections might be made which it would not perhaps be eaſy to anſwer; but we are at preſent giving only the *hiſtory* of optics.

ſerved every hour, both night and day, and carefully compared together.

From this doctrine he thinks it reaſonable to ſuppoſe, that the heat produced by a given number of rays, in an opaque body of a given magnitude, muſt be greater when the rays are more inclined to one another, than when they are leſs ſo; for the direction of the vibrations raiſed by the action of the light, whether in the colorific particles, or thoſe of an inferior order, will more interfere with one another; from whence the inteſtine ſhocks and colliſions muſt increaſe. Beſides this, the colorific particles of opaque bodies being diſpoſed in various ſituations, perhaps, upon the whole, the rays will fall more directly on each, the more they are inclined to one another. Is not this, ſays he, the reaſon of what has been remarked by philoſophers, that the heat of the ſun's light collected into a cone, increaſes in approaching the focus in a much higher proportion than according to its denſity? That the difference of the angle in which the rays fall on any particle of a given magnitude, placed at different diſtances from the focus, is but ſmall, is no proof that the phenomenon cannot be aſcribed to it; ſince we know not in what high proportion one or both the circumſtances now mentioned may operate. However, that it proceeds not from any unknown action of the rays upon one another, as has been inſinuated, is evident from this, that each particular ray, after paſſing through the focus, preſerves its own colour and its own direction, in the ſame manner as if it were alone.

The attempts of the Abbé Nollet to fire inflammable ſubſtances by the power of the ſolar rays collected in the foci of burning-mirrors, have a near relation to the preſent ſubject. Conſidering the great power of burning-mirrors and lenſes, eſpecially thoſe of late conſtruction, it will appear ſurpriſing that this celebrated experimental philoſopher ſhould not be able to fire any liquid ſubſtance. But though he made the trial with all the care imaginable on the 19th of February 1757, he was not able to do it either with ſpirit of wine, olive-oil, oil of turpentine, or æther; and though he could fire ſulphur, yet he could not ſucceed with Spaniſh-wax, roſin, black pitch, or ſuet. He both threw the focus of theſe mirrors upon the ſubſtances themſelves, and alſo upon the fumes that roſe from them; but all the effect was, that the liquor boiled, and was diſperſed in vapour or very ſmall drops, but would not take fire. When linen rags, and other ſolid ſubſtances, were moiſtened with any of theſe inflammable liquids, they would not take fire till the liquid was diſperſed in a copious fume; ſo that rags thus prepared were longer in burning than thoſe that were dry.

M. Baumé, who aſſiſted M. Nollet in ſome of theſe experiments, obſerved farther, that the ſame ſubſtances which were eaſily fired by the flame of burning bodies, could not be ſet on fire by the contact of the hotteſt bodies that did not actually flame. Neither æther nor ſpirit of wine could be fired with a hot coal, or even red-hot iron, unleſs they were of a white heat.

From theſe experiments our author concludes, that, ſuppoſing the electric matter to be the ſame thing with fire or light, it muſt fire ſpirit of wine by means of ſome other principle. The members of the academy Del Cimento had attempted to fire ſeveral of theſe ſubſtances, though without ſucceſs; but this was ſo early in the hiſtory of philoſophy, that nobody ſeems to have concluded, that, becauſe they failed in this attempt, the thing could not be done. However, the Abbé informs us, that he read an account of his experiments to the Royal Academy at Paris ſeveral years before he attended to what had been done by the Italian philoſophers.

By the help of optical principles, and eſpecially by obſervations on the reflection of light, Mr. Melville diſcovered that bodies which ſeem to touch one another are not always in actual contact. "It is common (ſays he) to admire the volubility and luſtre of drops of rain that lie on the leaves of colewort, and ſome other vegetables;" but no philoſopher, as far as he knew, had put himſelf to the trouble of explaining this curious phenomenon. Upon inſpecting them narrowly, he found that the luſtre of the drop is produced by a copious reflection of light from the flattened part of its ſurface contiguous to the plant. He obſerved farther, that, when the drop rolls along a part which has been wetted, it immediately loſes all its luſtre, the green plant being then ſeen clearly through it; whereas, in the other caſe, it is hardly to be diſcerned.

From theſe two obſervations put together, he concluded, that the drop does not really touch the plant, when it has the mercurial appearance, but is ſuſpended in the air at ſome diſtance from it by the force of a repulſive power. For there could not be any copious reflection of white light from its under-ſurface, unleſs there were a real interval between it and the ſurface of the plant.

If that ſurface were perfectly ſmooth, the under-ſurface of the drop would be ſo likewiſe, and would therefore ſhow an image of the illuminating body by reflection, like a piece of poliſhed ſilver; but as it is conſiderably rough and unequal, the under-ſurface becomes rough likewiſe, and ſo, by reflecting the light copiouſly in different directions, aſſumes the reſplendent white colour of unpoliſhed ſilver.

It being thus proved by an optical argument, that the drop is not really in contact with the plant which ſupports it, it may eaſily be conceived whence its volubility ariſes, and why it leaves no moiſture where it rolls.

Before we conclude the hiſtory of the obſervations concerning the reflection of light, we muſt not omit to take notice of two curious miſcellaneous ones. Baron Alexander Funk, viſiting ſome ſilver mines in Sweden, obſerved, that, in a clear day, it was as dark as pitch underground in the eye of a pit, at 60 or 70 fathoms deep; whereas, in a cloudy or rainy day, he could even ſee to read at 106 fathoms deep. Inquiring of the miners, he was informed that this is always the caſe; and, reflecting upon it, he imagined that it aroſe from this circumſtance, that when the atmoſphere is full of clouds, light is reflected from them into the pit in all directions, and that thereby a conſiderable proportion of the rays are reflected perpendicularly upon the earth; whereas, when the atmoſphere is clear, there are no opaque bodies to reflect the light in this manner, at leaſt in a ſufficient quantity; and rays from the ſun itſelf can never fall perpendicularly in that country. The other was that of the ingenious Mr. Grey, who makes ſuch a figure in the hiſtory of electricity. This gentleman took a piece of ſtiff brown paper, and pricking a ſmall hole in it, he held it at a little diſtance before him; when, applying a needle to his eye, he was ſurpriſed to ſee the point of it inverted. The nearer the needle was to the hole, the more it was magnified, but the leſs diſtinct; and if it was ſo held, as that its image was near the edge of the hole, its point ſeemed crooked. From theſe appearances he concluded, that theſe ſmall holes, or ſomething in them, produce the effects of concave ſpeculums; and from this circumſtance he took the liberty to call them *aerial ſpeculums*.

§ 4. *Diſcoveries concerning the Inflection of Light.*

This property of light was not diſcovered till about the middle of the laſt century. The perſon who firſt made the diſcovery was Father Grimaldi; at leaſt he firſt publiſhed an account of it in his treatiſe *De lumine, coloribus, et iride*, printed in 1666. Dr. Hooke, however, laid claim to the ſame diſcovery, though he did not publiſh his obſervations till ſix years after Grimaldi; having probably never ſeen his performance.

Dr. Hooke, having made his room completely dark, admitted into it a beam of the ſun's light by a very ſmall hole in a braſs plate fixed in the window-ſhutter. This beam ſpreading itſelf, formed a cone, the apex of which was in the hole, and the baſe

was on a paper, ſo placed as to receive it at ſome diſtance. In this image of the ſun, thus painted on the paper, he obſerved that the middle was much brighter than the edges, and that there was a kind of dark penumbra about it, of about a 16th part of the diameter of the circle; which penumbra, he ſays, muſt be aſcribed to a property of light, which he promiſed to explain. Having obſerved this, at the diſtance of about two inches from the former he let in another cone of light; and receiving the baſes of them at ſuch a diſtance from the holes as that the circles interſected each other, he obſerved that there was not only a penumbra, or darker ring, encompaſſing the lighter circle, but a manifeſt dark line, or circle, which appeared even where the limb of the one interfered with that of the other. This appearance is diſtinctly repreſented, fig. 6. Pl. 4.

Comparing the diameter of this baſe with its diſtance from the hole, he found it to be by no means the ſame as it would have been if it had been formed by ſtraight lines drawn from the extremities of the ſun's diſk, but varied with the ſize of the holes, and the diſtance of the paper.

Struck with this appearance, he proceeded to make farther experiments concerning the nature of light thus tranſmitted. To give a juſt idea of which, he held an opaque body BB, fig. 7. ſo as to intercept the light that entered at a hole in the window-ſhutter O, and was received on the ſcreen AP. In theſe circumſtances, he obſerved, that the ſhadow of the opaque body (which was a round piece of wood, not bright or poliſhed) was all over ſomewhat enlightened, but more eſpecially towards the edge. Some perſons who were preſent, imagining that this light within the ſhadow might be produced by ſome kind of reflection from the ſide of this opaque body, on account of its roundneſs; and others ſuppoſing it might proceed from ſome reflection from the ſides of the hole in the piece of braſs through which the light was admitted into the room; to obviate both theſe objections, he admitted the light through a hole burnt in a piece of paſteboard, and intercepted it with a razor which had a very ſharp edge; but ſtill the appearances were the very ſame as before: ſo that, upon the whole, he concluded that they were occaſioned by a new property of light, different from any that had been obſerved by preceding writers.

He farther diverſified this experiment, by placing the razor ſo as to divide the cone of light into two parts, the hole in the ſhutter remaining as before, and placing the paper ſo as that none of the enlightened part of the circle fell upon it, but only the ſhadow of the razor; and, to his great ſurpriſe, he obſerved what he calls a *very briſk and viſible radiation* ſtriking down upon the paper, of the ſame breadth with the diameter of the lucid circle; and this radiation always ſtruck perpendicularly from the line of ſhadow, and, like the tail of a comet, extended more than 10 times, and probably more than 100 times the breadth of the remaining part of the circle: nay, as far as he could find by many trials, the light from the edge ſtruck downwards into the ſhadow very near to a quadrant, though the greater were the deflections of this new light from the direct radiations of the cone, the more faint they were.

Obſerving this appearance with more attention, he found, wherever there was a part of the interpoſed body higher than the reſt, that, oppoſite to it, the radiation of light into the ſhadow was brighter, as in the figure; and wherever there was a notch or gap in it, there would be a dark ſtroke in the half-enlightened ſhadow. From all theſe appearances, he concluded, that they were to be aſcribed to a new property of light, whereby it is deflected from ſtraight lines, contrary to what had been before aſſerted by optical writers.

It does not appear, however, that our philoſopher ever proſecuted this experiment to any purpoſe; as all that we find of his on the ſubject of light, after this time, are ſome crude thoughts which he read at a meeting of the Royal Society, on the 18th of March 1675; which, however, as they are only ſhort hints, we ſhall copy.

They conſiſt of eight articles: and, as he thought, contained an account of ſeveral properties of light that had not been noticed before. There is a deflection of light, differing both from reflection and refraction, and ſeeming to depend on the unequal denſity of the conſtituent parts of the ray, whereby the light is diſperſed from the place of condenſation, and rarified, or gradually diverged into a quadrant. 2. This deflection is made towards the ſuperficies of the opaque body perpendicularly. 3. Thoſe parts of the diverged radiations which are deflected by the greateſt angle from the ſtraight or direct radiations are the fainteſt, and thoſe that are deflected by the leaſt angles are the ſtrongeſt. 4. Rays cutting each other in one common foramen do not make the angles at the vertex equal. 5. Colours may be made without refraction. 6. The diameter of the ſun cannot be truly taken with common ſights. 7. The ſame rays of light, falling upon the ſame point of an object, will turn into all ſorts of colours, by the various inclinations of the object. 8. Colours begin to appear when two pulſes of light are blended ſo well, and ſo near together, that the ſenſe takes them for one.

We ſhall now proceed to the diſcoveries of Father Grimaldi. Having introduced a ray of light, through a very ſmall hole, AB, Pl. 4. fig. 8. into a darkened room, he obſerved that the light was diffuſed in the form of a cone, the baſe of which was CD; and that if any opaque body, FE, was placed in this cone of light, at a conſiderable diſtance from the hole, and the ſhadow was received upon a piece of white paper, the boundaries of it were not confined within GH, or the penumbra IL, occaſioned by the light proceeding from different parts of the aperture, and of the diſk of the ſun, but extended to MN; at which he was very much ſurpriſed, ſuſpecting, and finding by calculation, that it was conſiderably broader than it could have been made by rays paſſing in right lines by the edges of the object.

But the moſt remarkable circumſtance in this appearance was, that upon the lucid part of the baſe, CM and ND, ſtreaks of coloured light were plainly diſtinguiſhed, each being terminated by blue on the ſide next to the ſhadow, and by red on the other; and though theſe coloured ſtreaks depended, in ſome meaſure, on the ſize of the aperture AB, becauſe they could not be made to appear if it was large, yet he found that they were not limited either by it, or by the diameter of the ſun's diſk.

He farther obſerved, that theſe coloured ſtreaks were not all of the ſame breadth, but grew narrower as they receded from the ſhadow, and were each of them broader the farther the ſhadow was received from the opaque body, and alſo the more obliquely the paper on which they were received was held with reſpect to it. He never obſerved more than three of theſe ſtreaks.

To give a clearer idea of theſe coloured ſtreaks, he drew the repreſentation of them, exhibited in fig. 9. in which NMO repreſents the broadeſt and moſt luminous ſtreak, next to the dark ſhadow X. In the ſpace in which M is placed there was no diſtinction of colour; but the ſpace NN was blue, and the ſpace OO, on the other ſide of it, was red. The ſecond ſtreak, QPR, was narrower than the former; and of the three parts of which it conſiſted, the ſpace P had no particular colour, but QQ was a faint blue, and RR a faint red. The third ſtreak, TSV, was exactly ſimilar to the two others, but narrower than either of them, and the colours ſtill fainter.

Theſe coloured ſtreaks he obſerved to lie parallel to the ſhadow of the opaque body; but when it was of an angular form, they did not make the ſame acute angles, but were bent into a curve, the outermoſt being rounder than thoſe that were next the ſhadow, as is repreſented in fig. 10. If it was an inward angle, as DCH, the coloured ſtreaks, parallel to each other of the two

ſides, croſſed without obliterating one another; only the colours were thereby rendered either more intenſe or mixed.

The light that formed theſe coloured ſtreaks, the reader will perceive, muſt have been bent from the body; but this attentive obſerver has likewiſe given an account of other appearances, which muſt have been produced by the light bending towards the body. For within the ſhadow itſelf he ſometimes perceived coloured ſtreaks, ſimilar to thoſe above-mentioned on the outſide of the ſhadow. Sometimes he ſaw more of them, and ſometimes fewer; but for this purpoſe a very ſtrong light was requiſite, and the opaque body was obliged to be long, and of a moderate breadth; which, he ſays, is eaſily found by experience. A hair, for inſtance, or a fine needle, did not anſwer ſo well as a thin and narrow plate; and the ſtreaks were moſt diſtinguiſhable when the ſhadow was taken at the greateſt diſtance; but then the light grew fainter in the ſame proportion.

The number of theſe ſtreaks within the ſhadow was greater in proportion to the breadth of the plate. They were at leaſt two, and ſometimes four, if a thicker rod were made uſe of. But, with the ſame plate or rod, more or fewer ſtreaks appeared, in proportion to the diſtance at which the ſhadow was received; but they were broader when they were few, and narrower when there were more of them; and they were all much more diſtinct when the paper was held obliquely.

Theſe coloured ſtreaks within the ſhadow, like thoſe on the outſide of it, were bent in an arch, round the acute angles of the ſhadow, as they are repreſented in fig. 11. At this angle alſo, as at D, other ſhorter lucid ſtreaks were viſible, bent in the form of a plume, as they are drawn betwixt D and C, each bending round and meeting again in D. Theſe angular ſtreaks appeared, though the plate or rod was not wholly immerſed in the beam of light, but the angle of it only; and there were more or fewer in number in proportion to the breadth of the rod or plate. If the plate or rod was very thin, the coloured ſtreaks within the ſhadow might be ſeen to bend round from the oppoſite ſides, and meet one another, as at B. A only repreſents a ſection of the figure, and not a proper termination of the ſhadow, and the ſtreaks within each ſide of it. The coloured ſtreaks without the ſhadow, he alſo obſerves, bend round it in the ſame manner.

Our author acknowledges, that he omits ſeveral obſervations of leſs conſequence, which cannot but occur to any perſon who ſhall make the experiment: and he ſays, that he was not able to give a perfectly clear idea of what he has attempted to deſcribe, nor does he think it in the power of words to do it.

In order to obtain the more ſatisfactory proof that rays of light do not always proceed in ſtraight lines, but really bend, in paſſing by the edges of bodies, he diverſified the firſt of the abovementioned experiments in the following manner. He admitted a beam of light, by a very ſmall aperture, into a darkened room, as before; and, at a great diſtance from it, he fixed a plate EF, fig. 12. with a ſmall aperture, GH, which admitted only a part of the beam of light, and found, that when the light tranſmitted through this plate was received at ſome diſtance upon a white paper, the baſe IK was conſiderably larger than it could poſſibly have been made by rays iſſuing in right lines through the two apertures, as the other ſtraight lines drawn cloſe to their edges plainly demonſtrate.

That thoſe who chooſe to repeat theſe experiments may not be diſappointed in their expectations from them, our author gives the following more particular inſtructions. The ſun's light muſt be very intenſe, and the apertures through which it is tranſmitted very narrow, particularly the firſt, CD; and the white paper, IK, on which it is received, muſt be at a conſiderable diſtance from the hole GH; otherwiſe it will not much exceed NO, which would be the breadth of the beam of light proceeding in ſtraight lines. He generally made the aperture CD $\frac{4}{360}$ or $\frac{6}{360}$ part of an ancient Roman foot, and the ſecond aperture, GH, $\frac{25}{360}$ or $\frac{10}{360}$; and the diſtances DG and GN were, at leaſt, 12 ſuch feet. The obſervation was made in the ſummer time, when the atmoſphere was free from all vapours, and about mid-day.

Father Grimaldi alſo made the ſame experiment that has been recited from Dr. Hooke, in which two beams of light, entering a darkened room by two ſmall apertures near to one another, projected cones of light, which, at a certain diſtance, in part coincided; and he particularly obſerved that the dark boundaries of each of them were viſible within the lucid ground of the other.

To theſe diſcoveries of Grimaldi we ſhall ſubjoin an additional obſervation of Dechales; who took notice, that if ſmall ſcratches be made in any piece of poliſhed metal, and it be expoſed to the beams of the ſun in a darkened room, it will reflect the rays ſtreaked with colours in the direction of the ſcratches; as will appear if the reflected light be received upon a piece of white paper. That theſe colours are not produced by refraction, he ſays, is manifeſt; for that, if the ſcratches be made upon glaſs, the effect will be the ſame; and in this caſe, if the light had been refracted at the ſurface of the glaſs, it would have been tranſmitted through it. From theſe and many other obſervations, he concludes that colour does not depend upon the refraction of light only, nor upon a variety of other circumſtances, which he particularly enumerates, and the effects of which he diſcuſſes, but upon the intenſity of the light only.

We ſhall here give an account of a phenomenon of viſion obſerved by M. De la Hire, becauſe the ſubject of this ſection, viz. the *inflection of light*, ſeems to ſupply the true ſolution of it, though the author himſelf thought otherwiſe. It is obſervable, he ſays, that when we look at a candle, or any luminous body, with our eyes nearly ſhut, rays of light are extended from it, in ſeveral directions, to a conſiderable diſtance, like the tails of comets. This appearance exerciſed the ſagacity of Deſcartes and Rohault, as well as of our author; but all three ſeem to have been miſtaken with reſpect to it. Deſcartes aſcribed this effect to certain wrinkles in the ſurface of the humours of the eye. Rohault ſays, that when the eye-lids are nearly cloſed, the edges of them act like convex lenſes. But our author ſays, that the moiſture on the ſurface of the eye, adhering partly to the eye itſelf, and partly to the edge of the eye-lid, makes a concave mirror, and ſo diſperſes the rays at their entrance into the eye. But the true reaſon ſeems to be, that the light paſſing among the eye-laſhes, in this ſituation of the eye, is inflected by its near approach to them, and therefore enters the eye in a great variety of directions. The two former of theſe opinions are particularly ſtated and objected to by our author.

The experiments of Father Grimaldi and Dr. Hooke were not only repeated with the greateſt care by Sir Iſaac Newton, but carried much farther than they had thought of. So little uſe had been made of Grimaldi's obſervations, that all philoſophers before Newton had aſcribed the broad ſhadows, and even the fringes of light which he deſcribed, to the ordinary refraction of the air: but we ſhall ſee them placed in a very different point of view by our author.

He made in a piece of lead a ſmall hole with a pin, the breadth of which was the 42d part of an inch. Through this hole he let into his darkened chamber a beam of the ſun's light; and found, that the ſhadows of hairs and other ſlender ſubſtances placed in it were conſiderably broader than they would have been if the rays of light had paſſed by thoſe bodies in right lines. He therefore concluded, that they muſt have paſſed as they are repreſented in fig. 1. Pl. 5. in which X repreſents a ſection of the hair, and AD, BE, &c. rays of light paſſing by at different diſtances, and then falling upon the wall GQ. Since, when the paper which receives the rays is at a great diſtance from

the hair, the ſhadow is broad, it muſt follow, as he obſerves, that the hair acts upon the rays of light at ſome conſiderable diſtance from it, the action being ſtrongeſt on thoſe rays which are at the leaſt diſtance, and growing weaker and weaker on thoſe which are farther off, as is repreſented in this figure; and from hence it comes to paſs that the ſhadow of the hair is much broader in proportion to the diſtance of the paper from the hair when it is nearer than when it is at a great diſtance.

He found, that it was not material whether the hair was ſurrounded with air, or with any other pellucid ſubſtance; for he wetted a poliſhed plate of glaſs, and laid the hair in the water upon the glaſs, and then laying another poliſhed plate of glaſs upon it, ſo that the water might fill up the ſpace between the glaſſes, and holding them in the beam of light, he found the ſhadow at the ſame diſtances was as big as before. Alſo the ſhadows of ſcratches made in poliſhed plates of glaſs, and the veins in the glaſs, caſt the like broad ſhadows: ſo that this breadth of ſhadow muſt proceed from ſome other cauſe than the refraction of the air.

The ſhadows of all bodies, metals, ſtones, glaſs, wood, horn, ice, &c. in this light were bordered with three parallel fringes, or bands of coloured light, of which that which was contiguous to the ſhadow was the broadeſt and moſt luminous, while that which was the moſt remote was the narroweſt, and ſo faint as not eaſily to be viſible. It was difficult to diſtinguiſh theſe colours, unleſs when the light fell very obliquely upon a ſmooth paper, or ſome other ſmooth white body, ſo as to make them appear much broader than they would otherwiſe have done; but in theſe circumſtances the colours were plainly viſible, and in the following order. The firſt or innermoſt fringe was violet, and deep blue next the ſhadow, light blue, green, and yellow in the middle, and red without. The ſecond fringe was almoſt contiguous to the firſt, and the third to the ſecond; and both were blue within, and yellow and red without; but their colours were very faint, eſpecially thoſe of the third. The colours, therefore, proceeded in the following order from the ſhadow; violet, indigo, pale blue, green, yellow, red; blue, yellow, red; pale blue, pale yellow, and red. The ſhadows made by ſcratches and bubbles in poliſhed plates of glaſs were bordered with the like fringes of coloured light.

He alſo obſerves, that by looking on the ſun through a feather, or black ribbon, held cloſe to the eye, ſeveral rainbows will appear, the ſhadows which the fibres or threads caſt on the retina being bordered with the like fringes of colours.

Meaſuring theſe fringes and their intervals with the greateſt accuracy, he found the former to be in the progreſſion of the numbers 1, $\sqrt{\frac{1}{2}}$, $\sqrt{\frac{1}{3}}$, and their intervals to be in the ſame progreſſion with them, that is, the fringes and their intervals together to be in continual progreſſion of the numbers 1, $\sqrt{\frac{1}{2}}$, $\sqrt{\frac{1}{3}}$, $\sqrt{\frac{1}{4}}$, $\sqrt{\frac{1}{5}}$, or thereabouts. And theſe proportions held the ſame very nearly at all diſtances from the hair, the dark intervals of the fringes being as broad in proportion to the breadth of the fringes at their firſt appearance as afterwards at great diſtances from the hair, though not ſo dark and diſtinct.

In the next obſervation of our author, we find a very remarkable and curious appearance, which we ſhould hardly have expected from the circumſtances, though it is pretty ſimilar to one that was noticed by Dr. Hooke. The ſun ſhining into his darkened chamber, through a hole $\frac{3}{4}$ of an inch broad, he placed, at the diſtance of two or three feet from the hole, a ſheet of paſteboard, black on both ſides; and in the middle of it he had made a hole about $\frac{1}{4}$ of an inch ſquare, for the light to paſs through; and behind the hole he faſtened to the paſteboard the blade of a ſharp knife, to intercept ſome part of the light which paſſed through the hole. The planes of the paſteboard and blade of the knife were parallel to one another, and perpendicular to the rays; and when they were ſo placed that none of the light fell on the paſteboard, but all of it paſſed through the hole to the knife, and there part of it fell upon the blade of the knife, and part of it paſſed by its edge, he let that part of the light which paſſed by fall on a white paper, 2 or 3 feet beyond the knife, and there ſaw two ſtreams of faint light ſhoot out both ways from the beam of light into the ſhadow, like the tails of comets. But becauſe the ſun's direct light, by its brightneſs upon the paper, obſcured theſe faint ſtreams, ſo that he could ſcarce ſee them, he made a little hole in the midſt of the paper for that light to paſs through and fall on a black cloth behind it; and then he ſaw the two ſtreams plainly. They were like one another, and pretty nearly equal in length, breadth, and quantity of light. Their light, at that end which was next to the ſun's direct light, was pretty ſtrong for the ſpace of about $\frac{1}{4}$ of an inch, or $\frac{1}{2}$ of an inch, and decreaſed gradually till it became inſenſible.

The whole length of either of theſe ſtreams, meaſured upon the paper, at the diſtance of 3 feet from the knife, was about 6 or 8 inches; ſo that it ſubtended an angle, at the edge of the knife, of about 10 or 12, or at moſt 14, degrees. Yet ſometimes he thought he ſaw it ſhoot 3 or 4 degrees farther; but with a light ſo very faint, that he could hardly perceive it. This light he ſuſpected might, in part at leaſt, ariſe from ſome other cauſe than the two ſtreams. For, placing his eye in that light, beyond the end of that ſtream which was behind the knife, and looking towards the knife, he could ſee a line of light upon its edge; and that not only when his eye was in the line of the ſtreams, but alſo when it was out of that line, either towards the point of the knife, or towards the handle. This line of light appeared contiguous to the edge of the knife, and was narrower than the light of the innermoſt fringe, and narroweſt when his eye was fartheſt from the direct light; and therefore ſeemed to paſs between the light of that fringe and the edge of the knife; and that which paſſed neareſt the edge ſeemed to be moſt bent, though not all of it.

He then placed another knife by the former, ſo that their edges might be parallel, and look towards one another, and that the beam of light might fall upon both the knives, and ſome part of it paſs between their edges. In this ſituation he obſerved, that when the diſtance of their edges was about the 400th part of an inch, the ſtream divided in the middle, and left a ſhadow between the two parts. This ſhadow was ſo black and dark, that all the light which paſſed between the knives ſeemed to be bent and turned aſide to the one hand or the other; and as the knives ſtill approached one another, the ſhadow grew broader and the ſtreams ſhorter next to it, till, upon the contact of the knives, all the light vaniſhed.

From this experiment our author concludes, that the light which is leaſt bent, and which goes to the inward ends of the ſtreams, paſſes by the edges of the knives at the greateſt diſtance; and this diſtance, when the ſhadow began to appear between the ſtreams, was about the 800th part of an inch; and the light which paſſed by the edges of the knives at diſtances ſtill leſs and leſs, was more and more faint, and went to thoſe parts of the ſtreams which were farther from the direct light; becauſe, when the knives approached one another till they touched, thoſe parts of the ſtreams vaniſhed laſt which were fartheſt from the direct light.

In the experiment of one knife only, the coloured fringes did not appear; but, on account of the breadth of the hole in the window, became ſo broad as to run into one another, and, by joining, to make one continual light in the beginning of the ſtreams; but in the laſt experiment, as the knives approached one another, a little before the ſhadow appeared between the two ſtreams, the fringes began to appear on the inner ends of the ſtreams, on either ſide of the direct light; three on

one ſide, made by the edge of one knife, and three on the other ſide, made by the edge of the other knife. They were the moſt diſtinct when the knives were placed at the greateſt diſtance from the hole in the window, and became ſtill more diſtinct by making the hole leſs; ſo that he could ſometimes ſee a faint trace of a fourth fringe beyond the three above-mentioned: and as the knives approached one another, the fringes grew more diſtinct and larger, till they vaniſhed; the outermoſt vaniſhing firſt, and the innermoſt laſt. After they were all vaniſhed, and the line of light which was in the middle between them was grown very broad, extending itſelf on both ſides into the ſtreams of light deſcribed before, the above-mentioned ſhadow began to appear in the middle of this line, and to divide it along the middle into two lines of light, and increaſed till all the light vaniſhed. This enlargement of the fringes was ſo great, that the rays which went to the innermoſt fringe ſeemed to be bent about 20 times more when the fringe was ready to vaniſh, than when one of the knives was taken away.

From both theſe experiments compared together, our author concluded, that the light of the firſt fringe paſſed by the edge of the knife at a diſtance greater than the 800th part of an inch; that the light of the ſecond fringe paſſed by the edge of the knife at a greater diſtance than the light of the firſt fringe, and that of the third at a greater diſtance than that of the ſecond; and that the light of which the ſtreams above-mentioned conſiſted, paſſed by the edges of the knives at leſs diſtances than that of any of the fringes.

He then got the edges of two knives ground truly ſtraight; and pricking their points into a board, ſo that their edges might look towards one another, and meeting near their points, contain a rectilinear angle, he faſtened their handles together, to make the angle invariable. The diſtance of the edges of the knives from one another, at the diſtance of 4 inches from the angular point, where the edges of the knives met, was the 8th part of an inch; ſo that the angle contained by their edges was about 1° 54′. The knives being thus fixed together, he placed them in a beam of the ſun's light let into his darkened chamber, through a hole the 42d part of an inch wide, at the diſtance of 10 or 13 feet from the hole; and he let the light which paſſed between their edges fall very obliquely on a ſmooth white ruler, at the diſtance of $\frac{1}{2}$ inch, or an inch, from the knives; and there he ſaw the fringes made by the two edges of the knives run along the edges of the ſhadows of the knives, in lines parallel to thoſe edges, without growing ſenſibly broader, till they met in angles equal to the angle contained by the edges of the knives; and where they met and joined, they ended, without croſſing one another. But if the ruler was held at a much greater diſtance from the knives, the fringes, where they were farther from the place of their meeting, were a little narrower, and they became ſomething broader as they approached nearer to one another, and after they met they croſſed one another, and then became much broader than before.

From theſe obſervations he concluded, that the diſtances at which the light compoſing the fringes paſſed by the knives were not increaſed or altered by the approach of the knives, but that the angles in which the rays were there bent were much increaſed by that approach; and that the knife which was neareſt to any ray, determined which way the ray ſhould be bent, but that the other knife increaſed the bending.

When the rays fell very obliquely upon the ruler, at the diſtance of a third part of an inch from the knives, the dark line between the firſt and ſecond fringe of the ſhadow of one knife, and the dark line between the firſt and ſecond fringe of the ſhadow of the other knife, met one another, at the diſtance of the fifth part of an inch from the end of the light which paſſed between the knives, where their edges met one another; ſo that the diſtance of the edges of the knives, at the meeting of the dark lines, was the 160th part of an inch; and one half of that light paſſed by the edge of one knife, at a diſtance not greater than the 320th part of an inch, and, falling upon the paper, made the fringes of the ſhadow of that knife; while the other half paſſed by the edge of the other knife, at a diſtance not greater than the 320th part of an inch, and, falling upon the paper, made the fringes of the ſhadow of the other knife. But if the paper was held at a diſtance from the knives greater than the third part of an inch, the dark lines abovementionee met at a greater diſtance than the fifth part of an inch from the end of the light which paſſed between the knives, at the meeting of their edges; ſo that the light which fell upon the paper where thoſe dark lines met paſſed between the knives, where their edges were farther diſtant than the 160th part of an inch. For at another time, when the two knives were 8 feet and 5 inches from the little hole in the window, the light which fell upon the paper where the above-mentioned dark lines met paſſed between the knives, where the diſtance between their edges was, as in the following table, at the diſtances from the paper there noted.

Diſtances of the paper from the knives in inches.	Diſtances between the edges of the knives in milleſimal parts of an inch.
1 $\frac{1}{2}$	0,012
3 $\frac{1}{3}$	0,020
8 $\frac{3}{5}$	0,034
32	0,057
96	0,081
131	0,087

From theſe obſervations he concluded, that the light which makes the fringes upon the paper is not the ſame light at all diſtances of the paper from the knives, but that, when the paper is held near the knives, the fringes are made by light which paſſes by the edges of the knives at a leſs diſtance, and is more bent than when the paper is held at a greater diſtance from the knives.

When the fringes of the ſhadows of the knives fell perpendicularly upon the paper, at a great diſtance from the knives, they were in the form of hyperbolas, their dimenſions being as follows. Let CA, CB, Pl. 5. fig. 2, repreſent lines drawn upon the paper, parallel to the edges of the knives; and between which all the light would fall, if it ſuffered no inflection. DE is a right line drawn through C, making the angles ACD, BCE, equal to one another, and terminating all the light which falls upon the paper, from the point where the edges of the knives meet. Then *eis*, *fkt*, and *glv*, will be three hyberbolical lines, repreſenting the boundaries of the ſhadow of one of the knives, the dark line between the firſt and ſecond fringes of that ſhadow, and the dark line between the ſecond and third fringes of the ſame ſhadow. Alſo *xip*, *ykq*, and *zlr*, will be three other hyperbolical lines, repreſenting the boundaries of the ſhadow of the other knife, the dark line between the firſt and ſecond fringes of that ſhadow, and the dark line between the ſecond and third fringes of the ſame ſhadow. Theſe three hyperbolas are ſimilar, and equal to the former three, and croſs them in the points *i*, *k*, and *l*; ſo that the ſhadows of the knives are terminated, and diſtinguiſhed from the firſt luminous fringes, by the lines *eis* and *xip*, till the meeting and croſſing of the fringes; and then thoſe lines croſs the fringes in the form of dark lines terminating the firſt luminous fringes on the inſide, and diſtinguiſhing them from another light, which begins to appear at *i*, and illuminates all the triangular ſpace *ip* D E *s*, comprehended by theſe dark lines and the right line D E. Of

theſe hyperbolas one aſymptote is the line DE, and the other aſymptotes are parallel to the lines CA and CB.

The ſun ſhining into his darkened room through the ſmall hole mentioned above, he placed at the hole a priſm to refract the light, and to form on the oppoſite wall the coloured image of the ſun; and he found, that the ſhadows of all bodies held in the coloured light between the priſm and the wall, were bordered with fringes of the colour of that light in which they were held; and comparing the fringes made in the ſeveral coloured lights, he found, that thoſe made in the red light were the largeſt, thoſe made in the violet were the leaſt, and thoſe made in the green were of a middle bigneſs. For the fringes with which the ſhadow of a man's hair were bordered, being meaſured croſs the ſhadow, at the diſtance of ſix inches from the hair, the diſtance between the middle and moſt luminous part of the firſt or innermoſt fringe on one ſide of the ſhadow, and that of the like fringe on the other ſide of the ſhadow, was, in the full red light $\frac{1}{37\frac{1}{2}}$ of an inch, and in the full violet $\frac{1}{40}$. The like diſtance between the middle and moſt luminous parts of the ſecond fringes, on either ſide of the ſhadow, was in the full red light $\frac{1}{22\frac{1}{2}}$, and the violet $\frac{1}{25}$ of an inch; and theſe diſtances of the fringes held the ſame proportion at all diſtances from the hair, without any ſenſible variation.

From theſe obſervations it was evident, that the rays which made the fringes in the red light, paſſed by the hair at a greater diſtance than thoſe which made the like fringes in the violet; ſo that the hair, in cauſing theſe fringes, acted alike upon the red light or leaſt refrangible rays at a greater diſtance, and upon the violet or moſt refrangible rays at a leſs diſtance; and thereby occaſioned fringes of different ſizes, without any change in the colour of any ſort of light.

It may therefore be concluded, that when the hair in the firſt obſervation was held in the white beam of the ſun's light, and caſt a ſhadow which was bordered with three fringes of coloured light, thoſe colours aroſe not from any new modifications impreſſed upon the rays of light by the hair, but only from the various inflections whereby the ſeveral ſorts of rays were ſeparated from one another, which before ſeparation, by the mixture of all their colours, compoſed the white beam of the ſun's light; but, when ſeparated, compoſed lights of the ſeveral colours which they are originally diſpoſed to exhibit.

The perſon whoſe name we find firſt upon the liſt of thoſe who purſued any experiments ſimilar to thoſe of Newton on inflected light, is M. Maraldi; whoſe obſervations chiefly reſpect the inflection of light towards other bodies, whereby their ſhadows are partially illuminated; and many of the circumſtances which he noticed relating to it are well worthy of our attention, as the reader will be convinced from the following account of them.

He expoſed in the light of the ſun a cylinder of wood three feet long, and $6\frac{1}{2}$ lines in diameter; when its ſhadow, being received upon a paper held cloſe to it, was every where equally black and well defined, and continued to be ſo to the diſtance of 23 inches from it. At a greater diſtance the ſhadow appeared to be of two different denſities; for the two extremities of the ſhadow, in the direction of the length of the cylinder, were terminated by two dark ſtrokes, a little more than a line in breadth. Within theſe dark lines there was a faint light, equally diſperſed through the ſhadow, which formed an uniform penumbra, much lighter than the dark ſtrokes at the extremity, or than the ſhadow received near the cylinder. This appearance is repreſented in Pl. 5. fig. 3.

As the cylinder was removed to a greater diſtance from the paper, the two black lines continued to be nearly of the ſame breadth, and the ſame degree of obſcurity; but the penumbra in the middle grew lighter, and its breadth diminiſhed, ſo that the two dark lines at the extremity of the ſhadow approached one another, till, at the diſtance of 60 inches, they coincided, and the penumbra in the middle entirely vaniſhed. At a ſtill greater diſtance a faint penumbra was viſible; but it was ill defined, and grew broader as the cylinder was removed farther off, but was ſenſible at a very great diſtance.

Beſides the black and dark ſhadow, which the cylinder formed near the opaque body, a narrow and faint penumbra was ſeen on the outſide of the dark ſhadow: and on the outſide of this there was a tract more ſtrongly illuminated than the reſt of the paper.

The breadth of the external penumbra increaſed with the diſtance of the ſhadow from the cylinder, and the breadth of the tract of light on the outſide of it was alſo enlarged; but its ſplendor diminiſhed with the diſtance.

He repeated theſe experiments with three other cylinders of different dimenſions; and from them all he inferred, that every opaque cylindrical body, expoſed to the light of the ſun, makes a ſhadow which is black and dark to the diſtance of 38 to 45 diameters of the cylinder which forms it; and that, at a greater diſtance, the middle part begins to be illuminated in the manner deſcribed above.

In explaining theſe appearances, our author ſuppoſes that the light which diluted the middle part of the ſhadow was occaſioned by the inflection of the rays, which, bending inwards on their near approach to the body, did at a certain diſtance enlighten all the ſhadow, except the edges, which was left undiſturbed. At the ſame time other rays were deflected from the body, and formed a ſtrong light on the outſide of the ſhadow, and which might at the ſame time contribute to dilute the outer ſhadow, though he ſuppoſed that penumbra to be occaſioned principally by that part of the paper not being enlightened, except by a part of the ſun's diſk only, according to the known principles of optics.

The ſame experiments he made with globes of ſeveral diameters; but he found, that, whereas the ſhadows of the cylinders did not diſappear but at the diſtance of 41 of their diameters, thoſe of the globes were not viſible beyond 15 of their diameters; which he thought was owing to the light being inflected on every ſide of a globe, and conſequently in ſuch a quantity as to diſperſe the ſhadows ſooner than in the caſe of the cylinders.

In all theſe caſes, the penumbra occaſioned by the inflected light began to be viſible at a leſs diſtance from the body in the ſtronger light of the ſun than in a weaker, on account of the greater quantity of rays inflected in thoſe circumſtances.

Conſidering the analogy between theſe experiments and the phenomena of an eclipſe of the moon, immerſed in the ſhadow of the earth, he imagined, that part of the light by which ſhe is then viſible is inflected light, and not that which is refracted by the atmoſphere; though this may be ſo copious as to efface ſeveral of the above-mentioned appearances, occaſioned by inflected light only. But this gentleman ſhould have conſidered, that as no light is inflected but what paſſes exceedingly near to any body, perhaps ſo near as the diſtance of $\frac{1}{40}$ part of an inch, this cauſe muſt be altogether inadequate to the effect.

Being ſenſible that the above-mentioned phenomena of the ſhadows were cauſed by inflected light, he was induced to give more particular attention to this remarkable property; and, in order to it, to repeat the experiments of Grimaldi and Sir Iſaac Newton in a darkened room. In doing this, he preſently obſerved, that, beſides the enlarged ſhadow of a hair, a fine needle, &c. the bright gleam of light that bordered it, and the three coloured rings next to this enlightened part, when the ſhadow was at a conſiderable diſtance from the hair, the dark central ſhadow was divided in the middle by a mixture of light; and that it was not of the ſame denſity, except when it was very near the hair.

This new appearance will be ſeen to be exactly ſimilar to

what our philoſopher had obſerved with reſpect to the ſhadows in the open day-light above-mentioned; but the following obſervations, which he made with ſome variation of his apparatus, are much more curious and ſtriking, though they ariſe from the ſame cauſe.

Having placed a briſtle, which is thicker than a common hair, in the rays of the ſun, admitted into a dark chamber by a ſmall hole, at the diſtance of nine feet from the hole, it made a ſhadow, which, being received at five or ſix feet from the object, he obſerved to conſiſt of ſeveral ſtreaks of light and ſhade. The middle part was a faint ſhadow, or rather a kind of penumbra, bordered by a darker ſhadow, and after that by a narrower penumbra; next to which was a light ſtreak broader than the dark part; and next to the ſtreak of light, the red, violet, and blue colours were ſeen as in the ſhadow of the hair.

In the ſame manner he placed, in the ſame rays of the ſun, ſeveral needles of different ſizes; but the appearances were ſo exceedingly various, though ſufficiently ſingular, that he does not recite them particularly, but chooſes rather to give, at ſome length, the obſervations he made on the ſhadows of two plates, as by that means he could better explain the phenomena of the round bodies.

He expoſed in the rays of the ſun, admitted by a ſmall hole into a dark chamber, a plate that was two inches long, and a little more than half a line broad. This plate being fixed perpendicularly to the rays, at the diſtance of nine feet from the hole, a faint light was ſeen uniformly diſperſed over the ſhadow, when it was received perpendicularly to it, and very near. The ſhadow of the ſame plate being received at the diſtance of two feet and a half, was divided into four very narrow black ſtreaks, ſeparated by ſmall lighter intervals equal to them. The boundaries of this ſhadow on each ſide had a penumbra, which was terminated by a very ſtrong light, next to which were the coloured ſtreaks of red, violet, and blue, as before. This is repreſented in Pl. 5. fig. 4.

The ſhadow of the ſame plate, at $4\frac{1}{2}$ feet diſtance from it, was divided into two black ſtreaks only, the two outermoſt having diſappeared, as in fig. 5.; but theſe two black ſtreaks which remained were broader than before, and ſeparated by a lighter ſhade, twice as broad as one of the former black ſtreaks, when the ſhadow was taken at $2\frac{1}{3}$ feet. This penumbra in the middle had a tinge of red. After the two black ſtreaks there appeared a pretty ſtrong penumbra, terminated by the two ſtreaks of light, which were now broad and ſplendid, after which followed the coloured ſtreaks.

A ſecond plate, two inches long and a line broad, being placed, like the former, 14 feet from the hole by which the rays of the ſun were admitted, its ſhadow being received perpendicularly very near the plate, was illuminated by a faint light, equally diſperſed, as in the caſe of the preceding plate. But being received at the diſtance of 13 feet from the plate, ſix ſmall black ſtreaks began to be viſible, as in fig. 6. At 17 feet from the plate, the black ſtreaks were broader, more diſtinct, and more ſeparated from the ſtreaks that were leſs dark. At 42 feet from the plate, only two black ſtreaks were ſeen in the middle of the penumbra, as in fig. 7. This middle penumbra between the two black ſtreaks was tinged with red. Next to the black ſtreaks there always appeared the ſtreaks of light, which were broad, and the coloured ſtreaks next to them.

Receiving the ſhadow of the ſame plate at the diſtance of 72 feet, the appearances were the ſame as in the former ſituation, except that the two black ſtreaks were broader, and the interval between them, occupied by the penumbra, was broader alſo, and tinged with a deeper red.

In the ſame rays of the ſun he placed different plates, and larger than the former, one of them a line and a half, another two lines, another three lines broad, &c. but receiving their ſhadows upon paper, he could not perceive in them thoſe ſtreaks of faint light which he had obſerved in the ſhadows of the ſmall plates, though he received theſe ſhadows at the diſtance of 56 feet. Nothing was ſeen but a weak light, equally diffuſed, as in the ſhadows of the two ſmalleſt plates, received very near them. But had his dark chamber been large enough, he did not doubt, but that, at a proper diſtance, there would have been the ſame appearances in the ſhadows of the larger plates as in thoſe of the ſmalleſt. For the ſame reaſon, he ſuppoſed, that, if the ſhadows of the ſmall needles could have been diſtinctly viewed very near thoſe bodies, the different ſtreaks of light and ſhade would have been as viſible in them as in thoſe of the ſmall plates; and indeed he did obſerve the ſame appearances in the ſhadows of needles of a middling ſize.

The ſtreaks of light in theſe ſhadows our author aſcribed to the rays of light which are inflected at different diſtances from the bodies; and he imagined that their croſſing one another was ſufficient to account for the variations obſervable in them at different diſtances.

The extraordinary ſize of the ſhadows of theſe ſmall ſubſtances M. Maraldi thought to be occaſioned by the ſhadow from the enlightened part of the ſky, added to that which was made by the light of the ſun, and alſo to a vortex occaſioned by the circulation of the inflected light behind the object; but our readers will probably not think it neceſſary for us either to produce all his reaſons for this hypotheſis, or to enter into a refutation of them.

Our author having made the preceding experiments upon ſingle long ſubſtances, had the curioſity to place two of them ſo as to croſs one another in a beam of the ſun's light. The ſhadows of two hairs placed in this manner, and received at ſome diſtance from them, appeared to be painted reciprocally one upon the other, ſo that the obſcure part of one of them was viſible upon the obſcure part of the other. The ſtreaks of light alſo croſſed one another, and the coloured ſtreaks did the ſame.

Having placed a needle and a hair croſſing one another, their ſhadows, at the ſame diſtance, exhibited the ſame appearances as the ſhadows of the two hairs, though the ſhadow of the needle was the ſtronger.

He alſo placed in the rays of the ſun a briſtle and a plate of iron a line thick, ſo that they croſſed one another obliquely; and when their ſhadows were received at the ſame diſtance, the light and dark ſtreaks of the ſhadow of the briſtle were viſible ſo far as the middle of the ſhadow of the plate on the ſide of the acute angle, but not on the ſide of the obtuſe angle, whether the briſtle or the plate were placed next to the rays. The plate made a ſhadow ſufficiently dark, divided into ſix black ſtreaks; and theſe were again divided by as many light ones equal to them; and yet all the ſtreaks belonging to the ſhadow of the briſtle were viſible upon it, as in fig. 8. To explain this appearance, he ſuppoſed that the rays of the ſun glided a little along the briſtle, ſo as to enlighten part of that which was behind the plate. But this ſeems to be an arbitrary and improbable ſuppoſition.

Our philoſopher did not fail to expoſe ſeveral ſmall globes in the light of the ſun in his dark chamber, and to compare their ſhadows with thoſe of the long ſubſtances, as he had done in the day-light, and the appearances were ſtill ſimilar. It was particularly evident, that there was much more light in the ſhadows of the globes than in thoſe of the cylinders, not only when they were both of an equal diameter, but when that of the globe was larger than that of the cylinder, and the ſhadows of both the bodies were received at the ſame diſtance. He alſo obſerved, that he could perceive no difference of light in the ſhadows of the plates which were a little more than one line broad, though they were received at the diſtance of 72 feet;

but he could eaſily ſee a difference of ſhades in thoſe of the globes, taken at the ſame diſtance, though they were $2\frac{1}{4}$ lines in diameter.

In order to explain the colours at the edges of theſe ſhadows, he contrived to throw ſome of the ſhadows upon others; and the following obſervations, though they did not enable him to accompliſh what he intended, are curious and worth reciting.

Having thrown ſeveral of the ſimilar colours upon one another, and thereby produced a tinge more lively than before, he threw the gleam of light, which always intervened between the colours and the darker part of the ſhadow, upon different parts of other ſhadows; and obſerved, that, when it fell upon the exterior penumbra made by another needle, it produced a beautiful ſky-blue colour, almoſt like that which was produced by two blue colours thrown together. When the ſame gleam of light fell upon the deeper ſhadow in the middle, it produced a red colour; which ſeemed to prove, that the reddiſh colour in the middle of ſeveral of the ſhadows might come from the little light inflected into that place. But here our author ſeems to have been miſled by ſome falſe hypotheſis concerning colours.

He placed two plates of iron, each three or four lines broad, very near one another, but with a very ſmall interval between them: and having placed them in the rays of the ſun, and received their ſhadows at the diſtance of 15 or 20 feet from them, he ſaw no light between them, but a continued ſhadow, in the middle of which were ſome ſtreaks of a lively purple, parallel to one another, and ſeparated by other black ſtreaks; but between them there were other ſtreaks, both of a very faint green, and alſo of a pale yellow. He alſo informs us, that M. Deliſle had obſerved colours in the ſtreaks of light and ſhade, which are obſervable in ſhadows taken near the bodies.

Among thoſe who followed Sir Iſaac Newton in his obſervations on the inflection of light, we alſo find the ingenious M. Mairan: but, without attempting the diſcovery of new facts, he only endeavoured to explain the old ones, by the hypotheſis of an atmoſphere ſurrounding all bodies; and conſequently making two reflections and refractions of the light that impinges upon them, one at the ſurface of the atmoſphere, and the other at that of the body itſelf. This atmoſphere he ſuppoſed to be of a variable denſity and refractive power, like the air.

M. Mairan was ſucceeded by M. Du Tour, who thought the variable atmoſphere ſuperfluous, and imagined that he could account for all the phenomena by the help of an atmoſphere of an uniform denſity, and of a leſs refractive power than the air ſurrounding all bodies. But what we are moſt obliged to this gentleman for, is, not his ingenious *hypotheſis*, but the beautiful variety with which he has exhibited the *experiments*, which will render it much eaſier for any perſon to inveſtigate the true cauſes of them.

Before M. Du Tour gave his attention to this ſubject, only three fringes had been obſerved in the colours produced by the inflection of light; but he was accidentally led to obſerve a greater number of them, and adopted from Grimaldi the following ingenious method of making them all appear very diſtinct.

He took a circular board ABED (Plate 5, fig. 9.), 13 inches in diameter, the ſurface of which was black, except at the edge, where there was a ring of white paper about three lines broad, in order to trace the circumference of a circle, divided into 360 degrees, beginning at the point A, and reckoning 180 degrees on each hand to the point E; B and D being each of them placed at 90 degrees. A ſlip of parchment three inches broad, and diſpoſed in the form of a hoop, was faſtened round the board, and pierced at the point E with a ſquare hole, each ſide being four or five lines, in order to introduce a ray of the ſun's light. Laſtly, in the centre of the board C, and perpendicular to it, he fixed a pin about $\frac{1}{3}$ of a line in diameter.

This hoop being ſo diſpoſed, that a ray of light entering the dark chamber, through a vertical cleft of two lines and a half in length, and about as wide as the diameter of the pin, went through the hole at E, and, paſſing parallel to the plane of the board, projected the image of the ſun and the ſhadow of the pin at A. In theſe circumſtances he obſerved, 1. That quite round the concave ſurface of this hoop, there were a multitude of coloured ſtreaks; but that the ſpace *mAn*, of about 18 degrees, the middle of which was occupied by the image of the ſun, was covered with a faint light only. 2. The order of the colours in theſe ſtreaks was generally ſuch that the moſt refrangible rays were the neareſt to the incident ray ECA; ſo that, beginning from the point A, the violet was the firſt and the red the laſt colour in each of the ſtreaks. In ſome of them, however, the colours were diſpoſed in a contrary order. 3. The image of the ſun, projected on each ſide of the point A, was divided by the ſhadow of the pin, which was bordered by two luminous ſtreaks. 4. The coloured ſtreaks were narrower in ſome parts of the hoop than others, and generally decreaſed in breadth in receding from the point A. 5. Among theſe coloured ſtreaks, there were ſometimes others which were white, a line or a line and an half in breadth, which were always bordered on both ſides by a ſtreak of orange colour, at leaſt when the light of the ſun was intenſe, and the chamber ſufficiently dark.

From this experiment he thought it was evident, that the rays which paſſed beyond the pin were not the only ones that were decompoſed, for that thoſe which were reflected back from the pin were decompoſed alſo; from which he concluded, that they muſt have undergone ſome refraction. He alſo thought that thoſe which went beyond the pin ſuffered a reflection, ſo that they were all affected in a ſimilar manner.

In order to account for theſe facts, our author deſcribes the progreſs of a ray of light through an uniform atmoſphere, which he ſuppoſes to ſurround the pin; and ſhows, that the differently refrangible rays will be ſeparated at their emergence from it: but he refers to ſome experiments and obſervations in a future memoir, to demonſtrate that all the coloured ſtreaks are produced by rays that are both reflected and refracted.

To give ſome idea of his hypotheſis, he ſhows that the ray *a b*, fig. 10. after being refracted at *b*, reflected at *r* and *u*, and again refracted at *s* and *t*, will be divided into its proper colours; the leaſt refrangible or the red rays iſſuing at *x*, and the moſt refrangible or violet at *y*; which agrees with his obſervations. Thoſe ſtreaks in which the colours appear in a contrary order, he thinks, are to be aſcribed to inequalities in the ſurface of the pin. This might eaſily have been aſcertained by turning the pin round; in which caſe theſe differently-coloured ſtreaks would have changed their places.

If any perſon ſhould chooſe to repeat theſe experiments, he obſerves that it requires that the ſky be very clear and free from vapours, in order to exhibit the colours with the greateſt diſtinctneſs; ſince even the vapours that are imperceptible will diminiſh the luſtre of the colours on every part of the hoop, and even efface ſome of them, eſpecially thoſe which are on that part in which the beam of light enters, as at E, fig. 9. where the colours are always fainter than in any other place, and indeed can never be diſtinguiſhed except when the hole E is confined by black ſubſtances, ſo as to intercept a part of the light that might reach the pin; and unleſs alſo thoſe rays which go beyond the pin to form the image of the ſun at A be ſtopped, ſo that no rays are viſible except thoſe that are reflected towards the hole, and which make the faint ſtreaks.

The coloured ſtreaks that are next the ſhadow of the pin, he ſhows, are formed by thoſe rays which, entering the atmoſphere, do not fall upon the pin; and, without any reflection, are only refracted at their entering and leaving the atmoſphere, as at *a*

and *r u*, fig. 11. In this caſe, the red or leaſt refrangible rays will iſſue at *r*, and the violet at *u*.

To diſtinguiſh the rays which fell upon the hoop in any particular direction, from thoſe that came in any other, he made an opening in the hoop, as at P, fig. 9. by which means he could, with advantage, and at any diſtance from the centre, obſerve thoſe rays unmixed with any other.

To account for the coloured ſtreaks being larger next the ſhadow of the pin, and growing narrower to the place where the light was admitted, he ſhows, by fig. 12. that the rays *a b* are farther ſeparated by both the refractions than the rays *c d*.

Sometimes our author obſerved, that the broader ſtreaks were not diſpoſed in this regular order; but then he found, that by turning the pin they changed their places, ſo that this circumſtance muſt have been an irregularity depending upon the accidental ſurface of the pin.

The white ſtreaks intermixed with the coloured ones he aſcribes to ſmall cavities in the ſurface of the pin, or ſome other foreign circumſtance; for they alſo changed their places when the pin was made to turn upon its axis.

Other obſervations of our author ſeem to prove that the refracting atmoſpheres ſurrounding all kinds of bodies are of the ſame ſize; for when he placed a great variety of ſubſtances, and of different ſizes alſo, he always found the coloured ſtreaks of the ſame dimenſions.

M. Du Tour obſerves, that his hypotheſis contradicts an obſervation of Sir Iſaac Newton, that thoſe rays which paſs the neareſt to any body are the moſt inflected; but he thinks that Newton's obſervations were not ſufficiently accurate. Beſides, he obſerves, that Newton only ſaid that *he thought it to be ſo*, without aſſerting it poſitively.

Since the rays which formed theſe coloured ſtreaks are but little diverted out of their way, our author infers that this atmoſphere is of ſmall extent, and that its refractive power is not much leſs than that of air.

Expoſing two pieces of paper in the beam of light, ſo that part of it paſſed between two planes formed by them, M. Du Tour obſerved, that the edges of this light, received upon paper, were bordered with two orange-coloured ſtreaks, which Newton had not taken notice of in any of his experiments. To account for them, he ſuppoſes, that, in fig. 13. the more refrangible of the rays which enter at *b* are ſo refracted, that they do not reach the ſurface of the body itſelf at R: ſo that the red and orange-coloured light may be reflected from thence in the direction *d*M, where the orange-coloured ſtreaks will be formed; and, for the ſame reaſon, another ſtreak of orange will be formed at *m*, by the rays which enter the atmoſphere on the other ſide of the chink. In a ſimilar manner he accounts for the orange-coloured fringes at the borders of the white ſtreaks, in the experiment of the hoop.

The blue rays, which are not reflected at R, he ſuppoſes, paſs on to I; and that of theſe rays the blue tinge obſervable in the ſhadows of ſome bodies are formed.

We may here make a general obſervation, applicable to all the attempts of philoſophers to explain theſe phenomena by atmoſpheres. Theſe attempts give no explanation whatever of what is attempted, *i. e.* the phyſical cauſe of the phenomena. A phenomenon is ſome individual fact or event in nature. We are ſaid to explain it when we point out the *general fact* in which it is comprehended, and ſhow the manner in which it is ſo comprehended, or the particular modification of the general *fact*. Philoſophy reſembles natural hiſtory, having for its ſubject the *events* of nature; and its inveſtigations are nothing but the claſſification of theſe events, or the arrangement of them under the general facts of which they are individual inſtances. In the preſent inſtance there is no general *fact* referred to. The atmoſphere is a mere gratuitous ſuppoſition; and all that is done is to ſhow a reſemblance between the phenomena of inflection of light to what would be the phenomena were bodies ſurrounded with ſuch atmoſpheres; and even in this point of view, the diſcuſſions of Mairan and Du Tour are extremely deficient. They have been ſatisfied with very vague reſemblances to a fact obſerved in *one ſingle inſtance*, and not ſufficiently examined or deſcribed in that inſtance, namely, the refraction of light through the atmoſphere of this globe.

The attempt is to explain how light is turned out of its direction by paſſing near the ſurface of bodies. This indicates the action of forces in a direction tranſverſe to that of the light. Newton took the right road of inveſtigation, by taking the phenomenon in its original ſimplicity, and attending merely to this, that the rays *are* deflected from their former courſe; and the ſole aim of his inveſtigation was to diſcover the laws, *i. e.* the more general facts in this deflection. He deduced from the phenomena, that ſome rays are more deflected than others, and endeavoured to determine in what rays the deflections are moſt remarkable: and no experiment of M. Du Tour has ſhown that he was miſtaken in his modified aſſertion, that thoſe rays are moſt inflected which paſs neareſt to the body. We ſay *modified aſſertion*; for Newton points out with great ſagacity many inſtances of alternate fits of *inflection* and *deflection*; and takes it for granted, that the law of continuity is obſerved in theſe phenomena, and that the change of inflection into deflection is gradual.

But theſe analogical diſcuſſions are eminently deficient in another reſpect: they are *(prima facie)* held out as mechanical explanations of the changes of motion obſerved in rays of light. When it ſhall be ſhown that theſe are preciſely ſuch as are obſerved in refracting atmoſpheres, nothing is done towards deciding the original queſtion; for the action of refracting atmoſpheres preſents it in all its difficulties, and we muſt ſtill aſk, *how do theſe atmoſpheres produce this effect?* No advance whatever is gained in ſcience by thruſting in this hypothetical atmoſphere; and Newton did wiſely in attaching himſelf to the ſimple fact: and he thus gives us another ſtep in ſcience, by ſhowing us a fact unknown before, *viz.* that the action of bodies on light is not confined to tranſparent bodies. He added another general fact to our former ſtock, *that light as well as other matter is acted on at a diſtance*; and thus he made a very important deduction, *that reflection, refraction, and inflection, are probably brought about by the ſame forces.*

We would extend this obſervation to all attempts of philoſophers to explain the phenomena of nature by the *immediate* action of inviſible fluids, magnetical, electrical, nervous, æthers, &c. and we would add, that all of them are equally illogical. They are all attempts to explain changes of motion by impulſe; and proceed on the previous ſuppoſition, that the changes of motion by impulſe are perfectly underſtood; a ſuppoſition quite gratuitous, nay falſe. We may challenge any philoſopher to demonſtrate, from unexceptionable principles, and by juſt argument, what will be the effect of one particle of matter in motion meeting with another particle at reſt, theſe two particles conſtituting the whole of the univerſe. The queſtion is to this day undecided.

But this is not all—Changes of motion by impulſe are very familiar, and the general laws are pretty well known; ſo that when it can be ſhown that impulſe really operates in a phenomenon, we are ſatisfied with the explanation. When we ſee a glaſs ball hanging as a pendulum put in motion by the ſtroke of another equal ball ſimilarly ſuſpended, we think its motion is ſufficiently explained by the common laws of colliſion. But this is a very incomplete view of the matter. It remains to be proved, that the motion was really produced by impulſe, that

is, by the one ball's coming into contact with the other; and we ſhall find that *real* impulſe is far from being ſo familiar as we imagine.

When one object-glaſs of a very long teleſcope lies upon another, nothing is obſerved at the place of contact of the two ſpherical glaſſes, unleſs the weight of the upper one be conſiderable; in which caſe a greaſy-like ſpot is obſerved. If now the upper glaſs be preſſed on the other, the ſpot will increaſe in diameter, and have a coloured margin. By gradually increaſing the preſſure, the breadth of the coloured ſpot will increaſe, and it will be found to conſiſt of concentric arches of different colours, increaſing in number and breadth by an increaſe of preſſure. When this is ſufficiently great, a black or unreflecting ſpot appears in the middle, ſharply defined, with a ſilvery margin, and increaſing in breadth with the preſſure. No additional preſſure makes any change excepting in the diameters of the coloured rings. When the preſſure is gradually diminiſhed, the rings contract, the black ſpot diſappears, and all the colours vaniſh in the contrary order to that of their firſt appearance. When the preſſure is meaſured which is neceſſary for producing the black ſpot, it is found conſiderably to exceed 800 pounds for every ſquare inch of the black ſpot.

It is inconteſtably proved, that the coloured rings are produced by the reflection of light in thoſe parts where the glaſſes are at certain ſmall diſtances from each other, inſeparable by means of the diameters of the coloured rings and the diameter of the ſpheres, of which the adjoining ſurfaces of the glaſſes are portions; and the want of reflection in the middle ſeems to indicate the want of this neceſſary diſtance, and that the two glaſſes are there in contact, making but one, their ſurfaces being flattened by compreſſion. The glaſſes ſeem to be kept aſunder by mutual forces, which are overcome by external preſſure, and which again ſeparate them when the preſſure is removed.

When therefore the glaſs ball mentioned above puts the other in motion by ſtriking it, we are entitled to ſay, that unleſs the preſſure during the ſtroke has been equal to 800 pounds for every ſquare inch of contact, the motion has been produced without contact or real impulſe, by the action of repulſive forces exerted between the balls, in the ſame manner as would happen between two magnets floating on cork with their north poles fronting each other; in which caſe (if the motion has been ſufficiently ſlow) the ſtriking magnet will be brought to reſt, and the other move off, with its original velocity, in the ſame manner as happens to the glaſs balls. Many ſuch communications of motion happen, where we cannot ſay that the impulſive preſſure is greater than that now mentioned; and in ſuch caſes we are well entitled to ſay, that the motion has been produced without real impulſe, by repulſive forces acting at a diſtance. This evidently diminiſhes to a great degree the familiarity of the fact of impulſe.

But we conclude too haſtily, from the phenomena of the object glaſſes, that a preſſure exceeding 800 pounds on the ſquare inch will produce contact.

Blow a ſoap bubble, and let it fall on a piece of cloth, and cover it with a glaſs bell: after ſome time you will obſerve rings of colours on its upper part, which will increaſe in number and breadth, and be in every reſpect ſimilar to thoſe between the object-glaſſes. Theſe ariſe from the gradual ſhining of the upper part of the ſoap bubble; a certain thickneſs of this, as well as of the interval between the glaſſes, invariably reflecting a certain colour. At laſt a black ſpot appears a-top, which is ſharply defined, and increaſes in diameter. Soon after this the bubble burſts. Thus then there is a certain thickneſs neceſſary for enabling the plate of ſoap ſuds to reflect light ſo as to be very ſenſible. Analogy obliges us to extend this to the object-glaſſes, and to ſay, not that the glaſſes touch each other through the extent of the black ſpot, but that their diſtance is there too ſmall for the ſenſible reflection of light; and it remains undecided whether any preſſure, however great, can annihilate all diſtance between them. So far, therefore, from impulſe being a familiar fact, and its ſuppoſed laws being proper and logical principles of reaſoning and explanation, it appears extremely doubtful whether the fact has *ever* been obſerved; and it muſt therefore be againſt the rules of logic to adduce the laws of impulſe for the explanation of any abſtruſe phenomenon.

Æther and other fluid atmoſpheres have often been reſorted to by philoſophers puzzled for an explanation; and all this trouble has been taken to avoid the ſuppoſed difficulty of bodies acting at a diſtance. We now ſee that this is only putting the difficulty a ſtep farther off. We may here add, that in all theſe attempts the very thing is ſuppoſed which the philoſophers wiſh to avoid. Theſe æthers have been fitted for their taſks by ſuppoſing them of variable denſities. It is quite eaſy to ſhow, that ſuch a variation in denſity cannot be conceived without ſuppoſing the particles to act on particles not in contact with them, and to a diſtance as great as that to which the change of denſity extends. The very ſimpleſt form of an elaſtic fluid ſuppoſes this, either with reſpect to its own particles, or with reſpect to the particles of a ſtill more ſubtile fluid, from the interſperſion of which it derives its elaſticity. To get rid of one action at a diſtance, therefore, we introduce millions. Inſtead, therefore, of naturaliſts pluming themſelves on ſuch explanations, and having recourſe, in all their difficulties, to the *æther of Sir Iſaac Newton*, which they make a drudge, a *Mungo here, Mungo there, Mungo every where*; let us rather wonder how that great man, not more eminent for penetration and invention than for accuracy of conception and juſtneſs of reaſoning, ſhould ſo far forget himſelf, and deviate from that path of logical inveſtigation in which he had moſt ſucceſsfully advanced, and ſhould, in his fabrication of æther, and application of it to explain the more abſtruſe phenomena of nature, at once tranſgreſs *all* the rules of philoſophizing which he had preſcribed to himſelf and others. Let this ſlip, this mark of frail mortality, put us on our guard, leſt we alſo be ſeduced by the ſpecious offers of explanation which are held out to us by means of inviſible atmoſpheres of every kind.

M. Le Cat has well explainad a phenomenon of viſion depending upon the inflection of light, which ſhows, that, in ſome caſes, objects appear magnified by this means. Looking at a diſtant ſteeple, when a wire, of a leſs diameter than the pupil of his eye, was held pretty near to it, and drawing it ſeveral times betwixt his eye and that object, he was ſurpriſed to find, that, every time the wire paſſed before his pupil, the ſteeple ſeemed to change its place, and ſome hills beyond the ſteeple ſeemed to have the ſame motion, juſt as if a lens had been drawn betwixt his eye and them.

Examining this appearance more attentively, he found that there was a poſition of the wire, but very difficult to keep, in which the ſteeple ſeemed not to have any motion, when the wire was paſſed before his eye; and in this caſe the ſteeple appeared leſs diſtinctly, and ſeemed to be magnified. Theſe effects being ſimilar to thoſe of a lens, he attended to them more particularly; and placed his eye in ſuch a manner with reſpect to the ſteeple, that the rays of light by which he ſaw it muſt come very cloſe to the edge of a window, where he had placed himſelf to make his obſervations. Then paſſing the wire once more before his eye, he obſerved, that, when it was in the viſual axis, the ſteeple appeared nearer to the window, on whichever ſide the wire was made to approach. He repeated this experiment, and conſtantly with the ſame reſult, the object being always magnified, and nearly doubled, by this means.

This phenomenon is eaſily explained by fig. 14. Pl. 5. in which B repreſents the eye, A the ſteeple, and C the diameter of the wire. The black lines expreſs the cone of light by which the natural image of the ſteeple A is formed, and which is much narrower than the diameter of the wire C; but the doted lines include not only that cone of light, ſtopped and turned out of its courſe by the wire, but alſo more diſtant rays inflected by the wire, and thereby thrown more converging into the pupil; juſt as would have been the effect of the interpoſition of a lens between the eye and the object. The reſult of this experiment was the ſame, whatever ſubſtances he made uſe of in the place of the wire, provided they were of the ſame diameter.

§ 5. *Diſcoveries concerning Viſion.*

Maurolycus was the firſt who ſhowed the true theory of viſion, by demonſtrating that the cryſtalline humour of the eye is a lens which collects the light iſſuing from external objects, and throws them upon the retina, where is the focus of each pencil. He did not however find out, that, by means of this refraction of the rays, an image of every viſible object was formed upon the retina, though this ſeems hardly to have been a ſtep beyond the diſcovery he had already made. Montucla indeed conjectures, that he was prevented from mentioning this part of the diſcovery by the difficulty of accounting for the upright appearance of objects, as the image on the retina is always inverted. This diſcovery was made by Kepler; but he, too, was much difficulted with the inverted poſition of the image. The rectification of theſe images, he ſays, is the buſineſs of the mind; which, when it perceives an impreſſion on the lower part of the retina, conſiders it as made by rays proceeding from the higher parts of objects; tracing the rays back to the pupil, where they croſs one another. But this hypotheſis can ſcarcely be deemed ſatisfactory.—Kepler did not pretend to account for the manner in which the mind perceives the images upon the retina, and very much blames Vitellio for attempting prematurely to determine a queſtion of this nature, and which indeed, he ſays, does not belong to optics. He accounts, however, though not in a ſatisfactory manner, for the power we have of ſeeing diſtinctly at different diſtances.

The diſcovery concerning viſion was completed by Scheiner. For, in cutting away the coats of the back part of the eyes of ſheep and oxen, and preſenting ſeveral objects before them, within the uſual diſtance of viſion, he ſaw their images diſtinctly and beautifully painted upon the retina. He did the ſame thing with the human eye, and exhibited this curious experiment at Rome in 1625. He takes particular notice of the reſemblance between the eye and the camera obſcura, and explains a variety of methods to make the images of objects erect. As to the images of objects being inverted in the eye, he acquieſces in the reaſon given for it by Kepler. He knew that the pupil of the eye is enlarged in order to view remote objects, and that it is contracted while we are viewing thoſe that are near; and this he proved by experiment, and illuſtrated by figures.

Scheiner alſo took a good deal of pains to aſcertain the denſity and refractive power of all the humours of the eye, by comparing their magnifying power with that of water or glaſs in the ſame form and circumſtances. The reſult of his inquiries was, that the aqueous humour doth not differ much from water in this reſpect, nor the cryſtalline from glaſs; and that the vitreous humour is a medium between both. He alſo very accurately and minutely traces the progreſs of the rays of light through all the humours of the eye; and after diſcuſſing every poſſible hypotheſis concerning the proper ſeat of viſion, he demonſtrates that it is in the retina, and ſhows that this was the opinion of Alhazen, Vitellio, Kepler, and all the moſt eminent philoſophers. He produces many reaſons of his own for this hypotheſis; anſwers a great number of objections to it; and, by a variety of arguments, refutes the opinion of former times, that the ſeat of viſion is in the cryſtalline.

Deſcartes makes a good number of obſervations on the phenomena of viſion. He explains ſatisfactorily the natural methods of judging of the magnitudes, ſituations, and diſtances, of objects by the direction of the optic axes; comparing it to a blind man's judging of the ſize and diſtance of an object, by feeling at it with two ſticks of a known length, when the hands in which he holds them are at a known diſtance from each other. He alſo obſerves, that having been accuſtomed to judge of the ſituation of objects by their images falling on a particular part of the eye; if by any diſtortion of the eye they fall on a different place, we are apt to miſtake their ſituation, or imagine one object to be two; as, till we become accuſtomed to it, we imagine one ſtick to be two, when it is placed between two contiguous fingers laid acroſs one another. But he obſerves, that all the methods we have of judging of the diſtances of objects are very uncertain, and extend but to narrow limits. The direction of the optic axes, he ſays, will not ſerve us beyond 15 or 20 feet, and the change of form of the cryſtalline not more than three or four feet. For he imagined that the eye conforms itſelf to the view of near or diſtant objects by a change in the curvature of the cryſtalline, which he ſuppoſed to be a muſcle, the tendons of it being the proceſſus ciliares. In another place, he ſays, that the change in the conformation of the eye is of no uſe to us for the purpoſe of judging of diſtances beyond four or five feet, and the angle of the optic axes not more than 100 or 200 feet: for this reaſon, he ſays, that the ſun and moon are conceived to be much more nearly of the ſame ſize than they are in reality. White and luminous objects, he ſays, appear larger than others, and alſo the parts contiguous to thoſe on which the rays actually impinge; and for the ſame reaſon, if the objects be ſmall, and placed at a great diſtance, they will always appear round, the figure of the angles diſappearing.

The celebrated Berkeley biſhop of Cloyne publiſhed, in 1709, *An Eſſay towards a New Theory of Viſion*, which contains the ſolution of many difficulties. He does not admit that it is by means of thoſe lines and angles, which are extremely uſeful in explaining the theory of optics, that different diſtances are judged of by the ſenſe of ſight; neither does he think that the mere direction of the optic axes, or the greater or leſs divergency of the rays of light, are ſufficient for this purpoſe. "I appeal (ſays he) to any one's experience, whether, upon ſight of an *object*, he compute its diſtance by the bigneſs of the angle made by the meeting of the two *optic axes*? or whether he ever thinks of the greater or leſs divergency of the rays which arrive from any point to his pupil? Nay, whether it be not perfectly impoſſible for him to perceive, by ſenſe, the various angles wherewith the rays according to their greater or leſſer divergency fell upon his eye?" That there is a neceſſary connection between theſe various angles, &c. and different degrees of diſtance, and that this connection is known to every perſon ſkilled in optics, he readily acknowledges; but "in vain (ſays he) ſhall all the mathematicians in the world tell me, that I *perceive* certain *lines* and *angles*, which introduce into my mind the various notions of *diſtance*, ſo long as I am myſelf conſcious of no ſuch thing." Diſtance, magnitude, and even figure, he maintains to be the objects of immediate perception only by the ſenſe of touch; and that when we judge of them by ſight, it is from different ſenſations felt in the eye which experience has taught us to be the conſequence of viewing objects of greater or leſs magnitude, of different figures, and at different diſtances. Theſe various ſenſations, with the reſpective diſtances, figures, and magnitudes by which they are occaſioned, become ſo cloſely aſſociated in the mind long before the period of diſtinct recollection, that the preſence of the one inſtantly ſug-

geſts the other; and we attribute to the ſenſe of ſight thoſe notions which are acquired by the ſenſe of touch, and of which certain *viſual* ſenſations are merely the ſigns or ſymbols, juſt as words are the ſymbols of ideas. Upon theſe principles he accounts, in a manner worthy of the reader's attention, for ſingle viſion by both eyes, and for our perceiving objects erect by inverted images of them on the retina tunica. Subſequent writers have made great diſcoveries in the theory of viſion; and among them there is hardly any one to whom this branch of ſcience is ſo much indebted as to Dr. Reid. Their reaſonings, however, our limits will not permit us to detail, nor do they properly belong to this part of the article; they are connected with the deſcription of the eye itſelf, the various modes of viſion, and optical deceptions to which we are liable; and theſe will be conſidered in a ſucceeding part of this treatiſe.

§ 6. *Of Optical Inſtruments, and Diſcoveries concerning them.*

So little were the ancients acquainted with the ſcience of Optics, that they ſeem to have had no inſtruments of the optical kind, excepting the glaſs globes and ſpeculums formerly mentioned, which they uſed in ſome caſes for magnifying and burning. Alhazen, as we have ſeen, gave the firſt hint of the invention of ſpectacles, and it is probable that they were found out ſoon after his time. From the writings of Alhazen, together with the obſervations and experiments of Roger Bacon, it is not improbable that ſome monks gradually hit upon the conſtruction of ſpectacles; to which Bacon's leſſer ſegment, notwithſtanding his miſtake concerning it, was a nearer approach than Alhazen's larger one. Whoever they were that purſued the diſcoveries of Bacon, they probably obſerved, that a very ſmall convex glaſs, when held at a greater diſtance from the book, would magnify the letters more than when it was placed cloſe to them, in which poſition only Bacon ſeems to have uſed it. In the next place, they might try whether two of theſe ſmall ſegments of a ſphere placed together, or a glaſs convex on both ſides, would not magnify more than one of them. They would then find, that two of theſe glaſſes, one for each eye, would anſwer the purpoſe of reading better than one; and laſtly, they might find, that different degrees of convexity ſuited different perſons.

It is certain that ſpectacles were well known in the 13th century, and not long before. It is ſaid that Alexander Spina, a native of Piſa, who died in 1313, and who was very ingenious in executing whatever he ſaw or heard of as having been done by others, happened to ſee a pair of ſpectacles in the hands of a perſon who would not explain them to him; but that he ſucceeded in making a pair for himſelf, and immediately made the conſtruction public, for the good of others. It is alſo inſcribed on the tomb of Salvinus Armatus, a nobleman of Florence, who died 131-, that he was the inventor of ſpectacles.

The uſe of concave glaſſes, to help thoſe perſons who are ſhort-ſighted, was probably a diſcovery that followed not long after that of convex ones for the relief of thoſe whoſe ſight is defective in the contrary extreme, though we find no trace of this improvement. Whoever made this diſcovery, it was probably the reſult of nothing more than a random experiment. Perhaps a perſon who was ſhort-ſighted, finding that convex glaſſes did him more harm than good, had the curioſity to make trial of a contrary curvature of the glaſs.

From this time, though both convex and concave lenſes were ſufficiently common, yet no attempt was made to form a teleſcope by a combination of them, till the end of the 16th century. Deſcartes conſiders James Metius, a perſon who was no mathematician, though his father and brother had applied to thoſe ſciences, as the firſt conſtructor of a teleſcope; and ſays, that as he was amuſing himſelf with making mirrors and burning-glaſſes, he caſually thought of looking through two of his lenſes at a time; and that happening to take one that was convex and another that was concave, and happening alſo to hit upon a pretty good adjuſtment of them, he found, that, by looking through them, diſtant objects appeared very large and diſtinct. In fact, without knowing it, he had made a teleſcope.

Other perſons ſay, that this great diſcovery was firſt made by John Lipperſheim, a maker of ſpectacles at Middleburgh, or rather by his children; who, like Metius, were diverting themſelves with looking through two glaſſes at a time, and placing them at different diſtances from one another. But Borellus, the author of a book intitled *De vero teleſcopii inventore*, gives this honour to Zacharias Joannides, i. e. Janſen, another maker of ſpectacles at the ſame place, who made the firſt teleſcope in 1590; and it ſeems now to be the general opinion, that this account of Borellus is the moſt probable.

Indeed, Borellus's account of the diſcovery of teleſcopes is ſo circumſtantial, and ſo well authenticated, that it does not ſeem poſſible to call it in queſtion. It is not true, he ſays, that this great diſcovery was made by a perſon who was no philoſopher: for Zacharias Janſen was a diligent inquirer into nature; and being engaged in theſe purſuits, he was trying what uſes could be made of lenſes for thoſe purpoſes, when he fortunately hit upon the conſtruction.

This ingenious mechanic, or rather philoſopher, had no ſooner found the arrangement of glaſſes that produced the effect he deſired, than he incloſed them in a tube, and ran with his inſtrument to prince Maurice; who, immediately conceiving that it might be of uſe to him in his wars, deſired the author to keep it a ſecret. But this, though attempted for ſome time, was found to be impoſſible; and ſeveral perſons in that city immediately applied themſelves to the making and ſelling of teleſcopes. One of the moſt diſtinguiſhed of theſe was Hans Laprey, called *Lipperſheim* by Sirturus. By him ſome perſon in Holland being very early ſupplied with a teleſcope, he paſſed with many for the inventor; but both Metius above mentioned, and Cornelius Drebell of Alcmar, in Holland, applied to the inventor himſelf in 1620; as alſo did Galileo, and many others. The firſt teleſcope made by Janſen did not exceed 15 or 16 inches in length; but Sirturus, who ſays that he had ſeen it, and made uſe of it, thought it the beſt that he had ever examined.

Janſen, having a philoſophical turn, preſently applied his inſtrument to ſuch purpoſes as he had in view when he hit upon the conſtruction. Directing it towards celeſtial objects, he diſtinctly viewed the ſpots on the ſurface of the moon; and diſcovered many new ſtars, particularly ſeven pretty conſiderable ones in the Great Bear. His ſon Joannes Zacharias noted the lucid circle near the limb of the moon, from whence ſeveral bright rays ſeem to dart in different directions; and he ſays that the full moon, viewed through this inſtrument, did not appear flat, but was evidently ſpherical, the middle part being prominent. Jupiter alſo, he ſays, appeared round, and rather ſpherical; and ſometimes he perceived two, ſometimes three, and at the moſt four ſmall ſtars, a little above or below him; and, as far as he could obſerve, they performed revolutions round him; but this, he ſays, he leaves to the conſideration of aſtronomers. This, it is probable, was the firſt obſervation of the ſatellites of Jupiter, though the perſon who made it was not aware of the importance of his diſcovery.

One Francis Fontana, an Italian, alſo claims the invention; but as he did not pretend to have made it before the year 1608, and as it is well known that the inſtruments were made and ſold in Holland ſome time before, his pretenſions to a ſecond diſcovery are not much regarded.

There are ſome who ſay that Galileo was the inventor of teleſcopes; but he himſelf acknowledges, that he firſt heard of the

inſtrument from a German; but he ſays, that being informed of nothing more than the effects of it, firſt by common report, and a few days after by a French nobleman, J. Badovere, at Paris, he himſelf diſcovered the conſtruction, by conſidering the nature of refraction: and thus he had much more real merit than the inventor himſelf.

The account of what Galileo actually did in this buſineſs is ſo circumſtantially related by the author of his life, prefixed to the quarto edition of his works, printed at Venice in 1744, and it contains ſo many particulars, which cannot but be pleaſing to every perſon who is intereſted in the hiſtory of teleſcopes, that we ſhall abridge a part of it, intermixing circumſtances collected from other accounts.

About April or May, in 1609, it was reported at Venice, where Galileo (who was profeſſor of mathematics in the univerſity of Padua) then happened to be, that a Dutchman had preſented to Count Maurice of Naſſau a certain optical inſtrument, by means of which diſtant objects appeared as if they were near; but no farther account of the diſcovery had reached that place, though this was near 20 years after the firſt diſcovery. Struck, however, with this account, Galileo inſtantly returned to Padua, conſidering what kind of an inſtrument this muſt be. The night following, the conſtruction occurred to him; and the day after, putting the parts of the inſtrument together, as he had previouſly conceived of it, and notwithſtanding the imperfection of the glaſſes that he could then procure, the effect anſwered his expectations, as he preſently acquainted his friends at Venice, to which place he ſix days afterwards carried another, and a better inſtrument that he had made, and where, from ſeveral eminences, he ſhowed to ſome of the principal ſenators of that republic a variety of diſtant objects, to their very great aſtoniſhment. When he had made farther improvements in the inſtrument, he, with his uſual generoſity and frankneſs in communicating his diſcoveries, made a preſent of one of them to the Doge, Leonardo Donati, and at the ſame time to all the ſenate of Venice; giving along with the inſtrument a written paper, in which he explained the ſtructure and wonderful uſes that might be made of it both by land and at ſea. In return for ſo noble an entertainment, the republic, on the 25th of Auguſt, in the ſame year, more than tripled his ſalary as profeſſor.

Our philoſopher, having amuſed himſelf for ſome time with the view of terreſtrial objects, at length directed his tube towards the heavens; and, obſerving the moon, he found that the ſurface of it was diverſified with hills and valleys, like the earth. He found that the *via lactea* and *nebulæ* conſiſted of a collection of fixed ſtars, which, on account either of their vaſt diſtance, or extreme ſmallneſs, were inviſible to the naked eye. He alſo diſcovered innumerable fixed ſtars diſperſed over the face of the heavens, which had been unknown to all the ancients; and examining Jupiter, with a better inſtrument than any he had made before, he found that he was accompanied by four ſtars, which, in certain fixed periods, performed revolutions round him, and which, in honour of the houſe of Medici, he called *Medicean planets*.

This diſcovery he made in January 1610, new ſtyle; and continuing his obſervations the whole of February following, in the beginning of March next he publiſhed an account of all his diſcoveries, in his *Nuncius Sidereus*, printed at Venice, and dedicated to Coſmo great duke of Tuſcany, who, by a letter which he wrote to him on the 10th of July 1610, invited him to quit Padua, and aſſigned him an ample ſtipend, as primate and extraordinary profeſſor at Piſa, but without any obligation to read lectures, or to reſide.

The extraordinary diſcoveries contained in the Nuncius Sidereus, which was immediately reprinted both in Germany and France, were the cauſe of much ſpeculation and debate among the philoſophers and aſtronomers of that time; many of whom could not be brought to give any credit to Galileo's account, while others endeavoured to decry his diſcoveries as being nothing more than fictions or illuſions. Some could not be prevailed upon even to look through a teleſcope; ſo devoted were they to the ſyſtem of Ariſtotle, and ſo averſe to admit any other ſource of knowledge beſides his writings. When it was found to be in vain to oppoſe the evidence of ſenſe, ſome did not ſcruple to aſſert that the invention was taken from Ariſtotle; and producing a paſſage from his writings, in which he attempts to give a reaſon why ſtars are ſeen in the day-time from the bottom of a deep well, ſaid, that the well correſponded to the tube of the teleſcope, and that the vapours which aroſe from it gave the hint of putting glaſſes into it; and laſtly, that in both caſes the ſight is ſtrengthened by the tranſmiſſion of the rays through a thick and dark medium. Galileo himſelf tells this ſtory with a great deal of humour; comparing ſuch men to alchymiſts, who imagine that the art of making gold was known to the ancients, but lay concealed under the fables of the poets.

In the beginning of July of the ſame year, 1610, Galileo being ſtill at Padua, and getting an imperfect view of Saturn's ring, imagined that that planet conſiſted of three parts; and therefore, in the account which he gave of this diſcovery to his friends, he calls it *planetam tergeminam*.

Whilſt he was ſtill at Padua, which muſt have been either in the ſame month of July, or the beginning of Auguſt following, he obſerved ſome ſpots on the face of the ſun: but, contrary to his uſual cuſtom, he did not chooſe, at that time, to publiſh his diſcovery; partly for fear of incurring more of the hatred of many obſtinate peripatetics; and partly in order to make more exact obſervations on this remarkable phenomenon, and to form ſome conjecture concerning the probable cauſe of it. He therefore contented himſelf with communicating his obſervations to ſome of his friends at Padua and Venice, among whom we find the name of Father Paul. This delay, however, was the cauſe of this diſcovery being conteſted with him by the famous Scheiner, who likewiſe made the ſame obſervation in Oct. 1611, and we ſuppoſe had anticipated Galileo in the publication of it.

About the end of Auguſt, Galileo left Padua and went to Florence; and in November following he was ſatisfied, that, from the September preceding, Venus had been continually increaſing in bulk, and that ſhe changed her phaſes like the moon. About the end of March 1611, Galileo went to Rome, where he gratified the cardinals, and all the principal nobility, with a view of the new wonders he had diſcovered in the heavens, and among others the ſolar ſpots.

From theſe diſcoveries Galileo obtained the name of *Lynceus*, after one of the Argonauts, who was famous in antiquity for the acuteneſs of his ſight; and moreover, the marquis of Monticelli inſtituted an academy, with the title of *De' Lincei*, and made him a member of it. Twenty nine years Galileo enjoyed the uſe of his teleſcope, continually enriching aſtronomy with his obſervations: but by too cloſe an application to that inſtrument, and the detriment he received from the nocturnal air, his eyes grew gradually weaker, till in 1639 he became totally blind; a calamity which, however, neither broke his ſpirits, nor interrupted the courſe of his ſtudies.

The firſt teleſcope that Galileo conſtructed magnified only three times: but preſently after, he made another which magnified 18 times; and afterwards, with great trouble and expence, he conſtructed one that magnified 33 times; and with this it was that he diſcovered the ſatellites of Jupiter and the ſpots of the ſun.

Notwithſtanding Galileo muſt be allowed to have conſiderable merit with reſpect to teleſcopes, it was neither that of the perſon who firſt hit upon the conſtruction, nor that of him who

thoroughly explained the *rationale* of the inſtrument. This important ſervice to ſcience was performed by John Kepler, whoſe name is famous on many accounts in the annals of philoſophy, and eſpecially by his diſcovery of the great law of motion reſpecting the heavenly bodies; which is, that the ſquares of their periodical times are as the cubes of their diſtances from the body about which they revolve; a propoſition which, however, was not demonſtrated before Sir Iſaac Newton. Kepler was aſtronomer to ſeveral of the emperors of Germany; he was the aſſociate of the celebrated aſtronomer Tycho Brahe, and the maſter of Deſcartes.

Kepler made ſeveral diſcoveries relating to the nature of viſion; and not only explained the *rationale* of the teleſcope which he found in uſe, but alſo pointed out methods of conſtructing others of ſuperior powers and more commodious application.

It was Kepler who firſt gave a clear explication of the effects of lenſes, in making the rays of a pencil of light converge or diverge. He ſhowed, that a plano-convex lens makes rays that were parallel to its axis, to meet at the diſtance of the diameter of the ſphere of convexity; but that if both ſides of the lens be equally convex, the rays will have their focus at the diſtance of the radius of the circle, correſponding to that degree of convexity. But he did not inveſtigate any rule for the foci of lenſes unequally convex. He only ſays, in general, that they will fall ſomewhere in the medium, between the foci belonging to the two different degrees of convexity. It is to Cavallieri that we owe this inveſtigation. He laid down this rule: As the ſum of both the diameters is to one of them, ſo is the other to the diſtance of the focus. All theſe rules concerning convex lenſes are applicable to thoſe that are concave; with this difference, that the focus is on the contrary ſide of the glaſs, as will be particularly ſhown in the ſecond part of this treatiſe.

The principal effects of teleſcopes depend upon theſe plain maxims, *viz.* That objects appear larger in proportion to the angles which they ſubtend at the eye; and the effect is the ſame whether the pencils of rays, by which objects are viſible to us, come directly from the objects themſelves, or from any place nearer to the eye, where they may have been united ſo as to form an image of the object; becauſe they iſſue again from thoſe points where there is no real ſubſtance, in certain directions, in the ſame manner as they did from the correſponding points in the objects themſelves.

In fact, therefore, all that is effected by a teleſcope is, firſt to make ſuch an image of a diſtant object, by means of a lens or mirror; and then to give the eye ſome aſſiſtance for viewing that image as near as poſſible; ſo that the angle which it ſhall ſubtend at the eye, may be very large compared with the angle which the object itſelf would ſubtend in the ſame ſituation. This is done by means of an eye-glaſs, which ſo refracts the pencils of rays, as that they may afterwards be brought to their ſeveral foci by the natural humours of the eye. But if the eye was ſo formed as to be able to ſee the image with ſufficient diſtinctneſs at the ſame diſtance without any eye-glaſs, it would appear to him as much magnified as it does to another perſon who makes uſe of a glaſs for that purpoſe, though he would not in all caſes have ſo large a field of view.

If, inſtead of an eye-glaſs, an object, or the image of an object, be looked at through a ſmall hole in a thin plate or piece of paper, held cloſe to the eye, it may be viewed very near to the eye, and, at the ſame diſtance, the apparent magnitude of the object will be the ſame in both caſes. For if the hole be ſo ſmall as to admit but a ſingle ray from every diſtinct point of the object, theſe rays will fall upon the retina in as many other diſtinct points, and make a diſtinct image. They are only pencils or cones of rays, which have a ſenſible baſe, as the breadth of the pupil, that are capable, by their ſpreading on the retina, of producing an indiſtinct image. As very few rays, however, can be admitted through a ſmall hole, there will ſeldom be light ſufficient to view any object to advantage in this manner.

If no image be actually formed by the foci of the pencils without the eye, yet if, by the help of any eye-glaſs, the pencils of rays ſhall enter the pupil, juſt as they would have done from any place without the eye, the viſual angle will be the ſame as if an image had actually been formed in that place. Objects will not appear inverted through this teleſcope, becauſe the pencils which form the images of them, only croſs one another once, *viz.* at the object-glaſs, as in natural viſion they do in the pupil of the eye.

Such is the teleſcope that was firſt diſcovered and uſed by philoſophers; and it is remarkable that it ſhould be of a much more difficult conſtruction than ſome other kinds that have been invented ſince. The great inconvenience attending it is, that the field of view is exceedingly ſmall. For ſince the pencils of rays enter the eye very much diverging from one another, but few of them can be intercepted by the pupil, this inconvenience increaſes with the magnifying power of the teleſcope; ſo that philoſophers at this day cannot help wondering, that it was poſſible, with ſuch an inſtrument, for Galileo and others to have made the diſcoveries they did. It muſt have required incredible patience and addreſs. No other teleſcope, however, than this was ſo much as thought of for many years after the diſcovery. Deſcartes, who wrote 30 years after, mentions no others as actually conſtructed, though Kepler had ſuggeſted ſome.

It is to this great man that we are indebted for the conſtruction of what we now call the *aſtronomical teleſcope*, being the beſt adapted for the purpoſe of viewing the heavenly bodies. The *rationale* of this inſtrument is explained, and the advantages of it are clearly pointed out, by this philoſopher, in his Catoptrics; but, what is very ſurpriſing, he never actually reduced his excellent theory into practice. Montucla conjectures, that the reaſon why he did not make trial of his new conſtruction was, his not being aware of the great increaſe of the field of view; ſo that being engaged in other purſuits, he might not think it of much conſequence to take any pains about the conſtruction of an inſtrument, which could do little more than anſwer the ſame purpoſe with thoſe of which he was already poſſeſſed. He muſt alſo have foreſeen, that the length of this teleſcope muſt have been greater in proportion to its magnifying power; ſo that it might appear to him to be upon the whole not quite ſo good a conſtruction as the former.

It was not long, however, before Kepler's new ſcheme of a teleſcope was executed; and the firſt perſon who actually made an inſtrument of this conſtruction was Father Scheiner, who has given a deſcription of it in his *Roſa Urſina*, publiſhed in 1630. If, ſays he, you inſert two ſimilar lenſes (that is, both convex) in a tube, and place your eye at a convenient diſtance, you will ſee all terreſtrial objects inverted, indeed, but magnified and very diſtinct, with a conſiderable extent of view. He afterwards ſubjoins an account of a teleſcope of a different conſtruction, with two convex eye-glaſſes, which again reverſes the images, and makes them appear in their natural poſition. This diſpoſition of the lenſes had alſo been pointed out by Kepler, but had not been reduced to practice by him, any more than the former. This conſtruction, however, anſwered the end but very imperfectly; and Father Rheita preſently after hit upon a better conſtruction, uſing three eye-glaſſes inſtead of two. This got the name of the *terreſtrial teleſcope*, being chiefly uſed for terreſtrial objects.

The firſt and laſt of theſe conſtructions are thoſe which are now in common uſe. The proportion in which the firſt teleſcope magnifies, is as the focal length of the object-glaſs to that of the eye-glaſs.—The only difference between the Galilean

teleſcope and the other is, that the pencils by which the extremities of any object are ſeen in this caſe, enter the eye diverging; whereas, in the other, they enter it converging; but if the ſphere of concavity in the eye-glaſs of the Galilean teleſcope be equal to the ſphere of convexity in the eye-glaſs of another teleſcope, their magnifying power will be the ſame. The concave eye-glaſs, however, being placed between the object-glaſs and its focus, the Galilean teleſcope will be ſhorter than the other, by twice the focal length of the eye-glaſs. Conſequently, if the length of the teleſcopes be the ſame, the Galilean will have the greater magnifying power.

The invention of the teleſcope and microſcope having incited mathematicians to a more careful ſtudy of dioptrics, and this having ſoon become almoſt a perfect ſcience, by means of the diſcovery of Snellius, many different conſtructions were offered to the public. Huygens was particularly eminent for his ſyſtematic knowledge of the ſubject, and is the author of the chief improvements which have been made on all the dioptrical inſtruments till the time of Mr. Dollond's diſcovery. He was well acquainted with the theory of aberration ariſing from the ſpherical figure of the glaſſes, and has ſhowed ſeveral ingenious methods of diminiſhing them by proper conſtructions of the eye-pieces. He firſt ſhowed the advantages of two eye-glaſſes on the aſtronomical teleſcope and double microſcope, and gave rules for this conſtruction, which both enlargens the field and ſhortens the inſtrument. Mr. Dollond adapted his conſtruction to the terreſtrial teleſcope of De Rheita; and his five eye-glaſſes are nothing but the Huygenian eye-piece doubled. This conſtruction has been too haſtily given up by the artiſts of the preſent day for another, alſo of Mr. Dollond's, of four glaſſes.

Viſion is more diſtinct in the Galilean teleſcope than in the other, owing perhaps in part to there being no intermediate image between the eye and the object. Beſides, the eye-glaſs being very thin in the centre, the rays will be leſs liable to be diſtorted by irregularities in the ſubſtance of the glaſs. Whatever be the cauſe, we can ſometimes ſee Jupiter's ſatellites very clearly in a Galilean teleſcope not more than twenty inches or two feet long; when one of four or five feet, of the common ſort, will hardly make them viſible.

The ſame Father Rheita, to whom we are indebted for the uſeful conſtruction of a teleſcope for land-objects, invented a binocular teleſcope, which Father Cherubin, of Orleans, endeavoured to bring into uſe afterwards. It conſiſts of two teleſcopes faſtened together, and made to point to the ſame object. When this inſtrument is well fixed, the object appears larger, and nearer to the eye, when it is ſeen through both the teleſcopes, than through one of them only, though they have the very ſame magnifying power. But this is only an illuſion, occaſioned by the ſtronger impreſſion that two equal images, equally illuminated, make upon the eye. This advantage, however, is counterbalanced by the inconvenience attending the uſe of it.

The firſt who diſtinguiſhed themſelves in grinding teleſcopic glaſſes were two Italians, Euſtachio Divini at Rome, and Campani at Bologna, whoſe fame was much ſuperior to that of Divini, or that of any other perſon of his time; though Divini himſelf pretended, that, in all the trials that were made with their glaſſes, his, of a great focal diſtance, performed better than thoſe of Campani, and that his rival was not willing to try them fairly, *viz.* with equal eye-glaſſes. It is generally ſuppoſed, however, that Campani really excelled Divini, both in the goodneſs and the focal length of his object-glaſſes. It was with teleſcopes made by Campani that Caſſini diſcovered the neareſt ſatellites of Saturn. They were made by the expreſs order of Louis XIV. and were of 86, 100, and 136 Pariſian feet focal length.

Campani ſold his lenſes for a great price, and took every poſſible method to keep his art of making them a ſecret. His laboratory was inacceſſible to all the world, till after his death; when it was purchaſed by Pope Benedict XIV. who made a preſent of it to the academy called the *Inſtitute*, eſtabliſhed in that city; and by the account which M. Fougeroux has given of what he could diſcover from it, we learn, that (except a machine, which M. Campani conſtructed, to work the baſons on which he ground his glaſſes) the goodneſs of his lenſes depended upon the clearneſs of his glaſs, his Venetian tripoli, the paper with which he poliſhed his glaſſes, and his great ſkill and addreſs as a workman. It was alſo the general opinion at Bologna, that he owed a great part of his reputation to the ſecrecy and air of myſtery which he affected; and that he made a great number of object-glaſſes which he rejected, ſhowing only thoſe that were very good. He made few lenſes of a very great focal diſtance; and having the misfortune to break one of 14 feet in two pieces, he took incredible pains to join the two parts together, which he did at length effectually, ſo that it was uſed as if it had been entire; but it is not probable that he would have taken ſo much pains about it, if, as he pretended, he could very eaſily have made another as good.

Sir Paul Neille, Dr. Hooke ſays, made teleſcopes of 36 feet, pretty good, and one of 50, but not of proportional goodneſs. Afterwards Mr. Reive firſt, and then Mr. Cox, who were the moſt celebrated in England as grinders of optic glaſſes, made ſome good ones of 50 and 60 feet focal diſtance, and Mr. Cox made one of 100; but how good, Dr. Hooke could not aſſert.

Borelli alſo, in France, made object-glaſſes of a great focal length, one of which he preſented to the Royal Society; but we do not find any particular account of their goodneſs

With reſpect to the focal length of teleſcopes, theſe and all others were far exceeded by M. Auzout, who made one object-glaſs of 600 feet focus; but he was never able to manage it, ſo as to make any uſe of it. Hartſocker is even ſaid to have made ſome of a ſtill greater focal length; but this ingenious mechanic, finding it impoſſible to make uſe of object-glaſſes the focal diſtance of which was much leſs than this, when they were incloſed in a tube, contrived a method of uſing them without a tube, by fixing them at the top of a tree, a high wall, or the roof of a houſe.

Mr. Huygens, who was alſo an excellent mechanic, made conſiderable improvements in the method of uſing an object-glaſs without a tube. He placed it at the top of a very long pole, having previouſly incloſed it in a ſhort tube, which was made to turn in all directions by means of a ball and ſocket. The axis of this tube he could command with a fine ſilken ſtring, ſo as to bring it into a line with the axis of another ſhort tube, which he held in his hand, and which contained the eye-glaſs. In this method he could make uſe of object-glaſſes of the greateſt magnifying power, at whatever altitude his object was, and even in the zenith, provided his pole was as long as his teleſcope; and, to adapt it to the view of objects of different altitudes, he had a contrivance, by which he could raiſe or depreſs a ſtage that ſupported his object-glaſs at pleaſure.

M. De la Hire made ſome improvement in this method of managing the object-glaſs, fixing it in the centre of a board, and not in a tube; but as it is not probable that this method will ever be made uſe of, ſince the diſcovery of both reflecting and achromatic teleſcopes, which are now brought to great perfection, and have even micrometers adapted to them, we ſhall not deſcribe this apparatus minutely; but ſhall only give a drawing of Mr. Huygens's pole, which, with a very ſhort explanation, will be ſufficient for the purpoſe. In Pl. 6. fig. 1. *a* repreſents a pulley, by the help of which a ſtage, *c*, *d*, *e*, *f*, (that ſupports the object-glaſs *k*, and the apparatus belonging to it), may be raiſed higher or lower at pleaſure, the whole

being counterpoiſed by the weight *b*, faſtened to a ſtring *g. n*, Is a weight, by means of which the centre of gravity of the apparatus belonging to the object-glaſs is kept in the ball and ſocket, ſo that it may be eaſily managed by the ſtring *l*, *u*, and its axis brought into a line with the eye-glaſs at *o*. When it was very dark, Mr. Huygens was obliged to make his object-glaſs viſible by a lantern *y*, ſo conſtructed as to throw the rays of light in a parallel direction upon it.

The recollection of the incredible pains which philoſophers of the laſt age took in making obſervations, and the great expences they were obliged to be at for that purpoſe, ſhould make us ſenſible of the obligations we are under to ſuch men as Gregory, Newton, and Dollond, who have enabled us to get clearer and more ſatisfactory views of the remote parts of our ſyſtem, with much leſs labour and expence; and ſhould likewiſe make us more diligent and ſolicitous to derive all the advantages we poſſibly can from ſuch capital improvements.

The reaſon why it is neceſſary to make the common dioptric teleſcopes ſo very long, is, that the length of them muſt be increaſed in no leſs a proportion than the duplicate of the increaſe of their magnifying power; ſo that, in order to magnify twice as much as before, with the ſame light and diſtinctneſs, the teleſcope muſt be lengthened four times; and to magnify thrice as much, nine times; and ſo on.

Before we mention the *reflecting teleſcope*, it muſt be obſerved, that M. Auzout, in a paper delivered to the Royal Society, obſerved, that the apertures which the object-glaſſes of refracting teleſcopes can bear with diſtinctneſs, are in about a ſub-duplicate proportion to their lengths; and upon this ſuppoſition he drew up a table of the apertures proper for object-glaſſes of a great variety of focal lengths, from 4 inches to 400 feet. Upon this occaſion, however, Dr. Hooke obſerved, that the ſame glaſs will bear a greater or leſs aperture, according to the leſs or greater light of the object. If, for inſtance, he was viewing the Sun, or Venus, or any of the fixed ſtars, he uſed ſmaller apertures; but if he wanted to view the moon by day-light; or Saturn, Jupiter, or Mars, by night, he uſed a larger aperture.

But the merit of all theſe improvements was in a manner cancelled by the diſcovery of the much more commodious *reflecting teleſcope*. For a refracting teleſcope, even of 1000 feet focus, ſuppoſing it poſſible to be made uſe of, could not be made to magnify with diſtinctneſs more than 1000 times; whereas a reflecting teleſcope, not exceeding 9 or 10 feet, will magnify 1200 times.

"It muſt be acknowledged (ſays Dr. Smith in his *Complete Syſtem of Optics*), that Mr. James Gregory of Aberdeen was the firſt inventor of the reflecting teleſcope; but his conſtruction is quite different from Sir Iſaac Newton's, and not nearly ſo advantageous."

But according to Dr. Pringle, Merſennus was the man who entertained the firſt thought of a reflector. A teleſcope with ſpecula he certainly propoſed to the celebrated Deſcartes many years before Gregory's invention, though indeed in a manner ſo very unſatisfactory, that Deſcartes, who had given particular attention to the improvement of the teleſcope, was ſo far from approving the propoſal, that he endeavoured to convince Merſennus of its fallacy. Dr. Smith, it appears, had never peruſed the two letters of Deſcartes to Merſennus which briefly touch on that ſubject.

Again, as to his aſſertion, that Gregory's conſtruction was not nearly ſo advantageous as Newton's, it may be accounted for from his having ſet it down early in the compoſition of his work, and forgetting to qualify it afterwards, when, before the publication, he had received pretty ſure information to the contrary. Or perhaps he was influenced by the example of Dr. Bradley, who had been a moſt ſucceſsful obſerver, and yet had always preferred the Newtonian teleſcope to the other. But we muſt certainly adjudge the ſuperiority to the latter, as that is now, and has been for ſeveral years paſt, the only inſtrument of the kind in requeſt.

Gregory, a young man of an uncommon genius, was led to the invention, in ſeeking to correct two imperfections of the common teleſcope: the firſt was its too great length, which made it leſs manageable; the ſecond, the incorrectneſs of the image. Mathematicians had demonſtrated, that a pencil of rays could not be collected in a ſingle point by a ſpherical lens; and alſo, that the image tranſmitted by ſuch a lens would be in ſome degree incurvated. Theſe inconveniences he believed would be obviated by ſubſtituting for the object-glaſs a metallic ſpeculum, of a parabolic figure, to receive the image, and to reflect it towards a ſmall ſpeculum of the ſame metal: this again was to return the image to an eye-glaſs placed behind the great ſpeculum, which for that purpoſe was to be perforated in its centre. This conſtruction he publiſhed in 1663, in his *Optica Promota*. But as Gregory, by his own account, was endowed with no mechanical dexterity, nor could find any workman capable of realizing his invention, after ſome fruitleſs attempts in that way he was obliged to give up the purſuit; and probably, had not ſome new diſcoveries been made in light and colours, a reflecting teleſcope would never more have been thought of, conſidering the difficulty of the execution, and the ſmall advantages that could accrue from it, deducible from the principles of optics that were then known.

But Newton, whoſe genius for experimental knowledge was equal to that for geometry, happily interpoſed, and ſaved this noble invention from well nigh periſhing in its infant ſtate. He likewiſe at an early period of life had applied himſelf to the improvement of the teleſcope; but imagining that Gregory's ſpecula were neither very neceſſary, nor likely to be executed, he began with proſecuting the views of Deſcartes, who aimed at making a more perfect image of an object, by grinding lenſes, not to the figure of a ſphere, but to that of one of the conic ſections. Now, whilſt he was thus employed, three years after Gregory's publication, he happened to take the examination of the colours formed by a priſm, and having by the means of that ſimple inſtrument diſcovered the different refrangibility of the rays of light, he then perceived that the errors of teleſcopes, ariſing from that cauſe alone, were ſome hundred times greater than ſuch as were occaſioned by the ſpherical figure of lenſes. This circumſtance forced, as it were, Newton to fall into Gregory's track, and to turn his thoughts to reflectors. "The different refrangibility of the rays of light (ſays he, in a letter to Mr. Oldenburg, ſecretary to the Royal Society, dated in Feb. 1672) made me take reflections into conſideration; and finding them regular, ſo that the angle of reflection of all ſorts of rays was equal to the angle of incidence, I underſtood that by their mediation optic inſtruments might be brought to any degree of perfection imaginable, providing a reflecting ſubſtance could be found which would poliſh as finely as glaſs, and reflect as much light as glaſs tranſmits, and the art of communicating to it a parabolic figure be alſo obtained. Amidſt theſe thoughts I was forced from Cambridge by the intervening plague, and it was more than two years before I proceeded further."

It appears, then, that if Newton was not the firſt inventor of the reflecting teleſcope, he was the main and effectual inventor. By the force of his admirable genius, he fell upon this new property of light; and thereby found, that all lenſes, of whatever figure, would be affected more or leſs with ſuch priſmatic aberrations of the rays as would be an inſuperable obſtacle to the perfection of a dioptric teleſcope.

It was towards the end of 1668, or in the beginning of the following year, when Newton, being thus obliged to have recourſe to reflectors, and not relying on any artificer for making

his ſpecula, ſet about the work himſelf, and early in the year 1672 completed two ſmall reflecting teleſcopes. In theſe he ground the great ſpeculum into a ſpherical concave; not but that he approved of the parabolic form propoſed by Gregory, though he found himſelf unable to accompliſh it. In the letter that accompanied one of theſe inſtruments which he preſented to the Society, he writes, "that though he then deſpaired of performing that work (to wit, the paraboiic figure of the great ſpeculum) by geometrical rules, yet he doubted not but that the thing might in ſome meaſure be accompliſhed by mechanical devices."

Not leſs did the difficulty appear to find a metallic ſubſtance that would be of a proper hardneſs, have the feweſt pores, and receive the ſmootheſt poliſh: a difficulty in truth which he deemed almoſt unſurmountable, when he conſidered, that every irregularity in a reflecting ſurface would make the rays of light ſtray five or ſix times more out of their due courſe, than the like irregularities in a refracting one. In another letter, written ſoon after, he tells the ſecretary, "that he was very ſenſible that metal reflects leſs light than glaſs tranſmits; but as he had found ſome metallic ſubſtances to be more ſtrongly reflective than others, to poliſh better, and to be freer from tarniſhing than others, ſo he hoped that there might in time be found out ſome ſubſtances much freer from theſe inconveniences than any yet known." Newton therefore laboured till he found a compoſition that anſwered in ſome degree, and left it to thoſe who ſhould come after him to find a better, and preſented a reflecting teleſcope to the Royal Society; from whom he received ſuch thanks as were due to ſo curious and valuable a preſent. And Huygens, one of the greateſt geniuſes of the age, and himſelf a diſtinguiſhed improver of the refractor, no ſooner was informed by Mr. Oldenburg of the diſcovery, than he wrote in anſwer, "that it was an admirable teleſcope; and that Mr. Newton had well conſidered the advantage which a concave ſpeculum had above convex-glaſſes in collecting the parallel rays, which according to his own calculation was very great: hence that Mr. Newton could give a far greater aperture to that ſpeculum than to on object-glaſs of the ſame diſtance of focus, and conſequently much more magnify in his way than by an ordinary teleſcope: beſides, that by the reflector he avoided an inconvenience inſeparable from object-glaſſes, which was the obliquity of both their ſurfaces, which vitiated the refraction of the rays that paſs towards the ſides of the glaſs, and did more hurt than men were aware of: Again, that by the mere reflection of the metalline ſpeculum there were not ſo many rays loſt as in glaſſes, which reflected a conſiderable quantity by each of their ſurfaces, and beſides intercepted many of them by the obſcurity of their matter: that the main buſineſs would be, to find a matter for this ſpeculum that would bear as good and even a poliſh as glaſs. Laſtly, he believed that Mr. Newton had not been without conſidering the advantage which a parabolic ſpeculum would have over a ſpherical one in this conſtruction; but had deſpaired, as he himſelf had done, of working other ſurfaces than ſpherical ones with due exactneſs." Huygens was not ſatisfied with thus expreſſing to the ſociety his high approbation of the late invention; but drew up a favourable account of the new teleſcope, which he cauſed to be publiſhed in the *Journal des Sçavans* for the year 1672, and by that channel it was ſoon known over Europe.

But how excellent ſoever the contrivance was; how well ſoever ſupported and announced to the public; yet whether it was that the artiſts were deterred by the difficulty and labour of the work, or that the diſcoveries even of a Newton were not to be exempted from the general fatality attending great and uſeful inventions, *the making a ſlow and vexatious progreſs to the authors*; the fact is, that, excepting an unſucceſsful attempt which the ſociety made, by employing an artificer to imitate the Newtonian conſtruction, but upon a larger ſcale, and a diſguiſed Gregorian teleſcope, ſet up by Caſſegrain abroad as a rival to Newton's, and that in theory only (for it never was put in execution by the author), no reflector was heard of for nearly half a century after. But when that period was elapſed, a reflecting teleſcope was at laſt produced to the world of the Newtonian conſtruction by Dr. Hadley, which the author had the ſatisfaction to find executed in ſuch a manner as left no room to fear that the invention would any longer continue in obſcurity.

This memorable event was owing to the genius, dexterity, and application, of Mr. Hadley the inventor of the reflecting quadrant, another moſt valuable inſtrument. The two teleſcopes which Newton had made were but ſix inches long, were held in the hand for viewing objects, and in power were compared to a ſix-feet refractor; whereas Hadley's was above five feet long, was provided with a well-contrived apparatus for managing it, and equalled in performance the famous aerial teleſcope of Huygens of 123 feet in length. Excepting as to the manner of making the ſpecula, we have, in the Tranſactions of 1723, a complete deſcription, with a figure, of this teleſcope, together with that of the machine for moving it; but, by a ſtrange omiſſion, Newton's name is not once mentioned in that paper, ſo that any perſon not acquainted with the hiſtory of the invention, and reading that account only, might be apt to conclude that Hadley had been the ſole contriver of it.

The ſame celebrated artiſt, after finiſhing two teleſcopes of the Newtonian conſtruction, accompliſhed a third in the Gregorian way; but, it would ſeem, leſs ſucceſsfully, by Dr. Smith's declaring ſo ſtrongly in favour of the other. Mr. Hadley ſpared no pains to inſtruct Mr. Molyneux and the reverend Dr. Bradley; and when thoſe gentlemen had made a ſufficient proficiency in the art, being deſirous that theſe teleſcopes ſhould become more public, they liberally communicated to ſome of the principal inſtrument-makers of London the knowledge they had acquired from him. Now ſuch ſcholars, as it is eaſy to imagine, ſoon advanced beyond their maſters, and completed reflectors by other and better methods than what had been taught them.

Certain it is, at leaſt, that Mr. James Short, as early as the year 1734, had ſignaliſed himſelf at Edinburgh by his work of this kind. Mr. Maclaurin wrote that year to Dr. Jurin, "that Mr. Short, who had begun with making glaſs ſpecula, was then applying himſelf to improve the metallic; and that, by taking care of the figure, he was enabled to give them larger apertures than others had done; and that upon the whole they ſurpaſſed in perfection all that he had ſeen of other workmen." He added, "that Mr. Short's teleſcopes were all of the Gregorian conſtruction; and that he had much improved that excellent invention." This character of excellence Mr. Short maintained to the laſt; and with the more facility, as he had been well grounded both in the geometrical and philoſophical principles of optics, and upon the whole was a moſt intelligent perſon in whatever related to his profeſſion. It was ſuppoſed he had fallen upon a method of giving the parabolic figure to his great ſpeculum; a point of perfection that Gregory and Newton had wiſhed for, but deſpaired of attaining; and that Hadley had never, as far as we know, attempted, either in his Newtonian or Gregorian teleſcope. Mr. Short indeed ſaid he had acquired that faculty, but never would tell by what peculiar means he effected it; ſo that the ſecret of working that configuration, whatever it was, as far as it then appeared, died with that ingenious artiſt. Mr. Mudge, however, hath lately realiſed the expectation of Sir Iſaac Newton, who, above 100 years ago, preſaged that the public would one day poſſeſs a parabolic ſpeculum, not accompliſhed by mathematical rules, but by mechanical devices.

This was a *deſideratum*, but it was not the only want ſupplied by this gentleman: he has taught us likewiſe a better compoſition of metals for the ſpecula, how to grind them better, and how to give them a finer poliſh; and this laſt part, (namely, the poliſh), he remarks, was the moſt difficult and eſſential of the whole operation. "In a word (ſays Sir John Pringle), I am of opinion, there is no optician in this great city (which hath been ſo long and ſo juſtly renowned for ingenious and dexterous makers of every kind of mathematical inſtruments) ſo partial to his own abilities as not to acknowledge, that, however ſome parts of the mechanical proceſs now diſcloſed might have been known before by individuals of the profeſſion, yet that Mr. Mudge hath opened to them all ſome new and important lights, and upon the whole hath greatly improved the art of making reflecting teleſcopes.

The late reverend and ingenious John Edwards devoted much of his time to the improvement of reflecting teleſcopes, and brought them to ſuch perfection, that Dr. Maſkelyne, the aſtronomer royal, found teleſcopes conſtructed by him to ſurpaſs in brightneſs, and other eſſentials, thoſe of the ſame ſize made by the beſt artiſts in London. The chief excellence of his teleſcopes ariſes from the compoſition which, from various trials on metals and ſemimetals, he diſcovered for the ſpecula, and from the true parabolic figure, which, by long practice, he had found a method of giving them, preferable to any that was known before him. His directions for the compoſition of ſpecula, and for caſting, grinding, and poliſhing them, were publiſhed, by order of the commiſſioners of longitude, at the end of the Nautical Almanack for the year 1787. To the ſame almanack is alſo annexed his account of the cauſe and cure of the tremors which particularly affect reflecting teleſcopes more than refracting ones, together with remarks on the ſaid tremors by Dr. Maſkelyne. See TELESCOPE.

But in conſtructing reflecting teleſcopes of extraordinary magnifying powers, Dr. Herſchel has diſplayed ſkill and ingenuity ſurpaſſing all his predeceſſors in this department of mechanics. He has made them from 7, 10, 20, to even 40 feet in length; and with the inſtrument of theſe latter dimenſions he is now employed in making diſcoveries in aſtronomy. Of its conſtruction, magnifying powers, and the curious collection of machinery by which it is ſupported and moved from one part of the heavens to another, accounts will be given under the word TELESCOPE.

The greateſt improvement in *refracting* teleſcopes hitherto made public is that of Mr. Dollond, of which an account has already been given in a preceding ſection, wherein his diſcoveries in the ſcience of Optics were explained. But, beſides the obligation we are under to him for correcting the aberration of the rays of light in the focus of object-glaſſes, ariſing from their different refrangibility, he made another conſiderable improvement in teleſcopes, viz. by correcting, in a great meaſure, both this kind of aberration, and alſo that which ariſes from the ſpherical form of lenſes, by an expedient of a very different nature, viz. increaſing the number of eye-glaſſes.

If any perſon, ſays he, would have the viſual angle of a teleſcope to contain 20 degrees, the extreme pencils of the field muſt be bent or refracted in an angle of 10 degrees; which, if it be performed by one eye-glaſs, will cauſe an aberration from the figure, in proportion to the cube of that angle; but if two glaſſes are ſo proportioned and ſituated, as that the refraction may be equally divided between them, they will each of them produce a refraction equal to half the required angle; and therefore, the aberration being in proportion to the cube of half the angle taken twice over, will be but a fourth part of that which is in proportion to the cube of the whole angle; becauſe twice the cube of 1 is but $\frac{1}{4}$ of the cube of 2; ſo the aberration from the figure, where two eye-glaſſes are rightly proportioned, is but a fourth of what it muſt unavoidably be, where the whole is performed by a ſingle eye-glaſs. By the ſame way of reaſoning, when the refraction is divided between three glaſſes, the aberration will be found to be but the ninth part of what would be produced from a ſingle glaſs; becauſe three times the cube of 1 is but one-ninth of the cube of 3. Whence it appears, that by increaſing the number of eye-glaſſes, the indiſtinctneſs which is obſerved near the borders of the field of a teleſcope may be very much diminiſhed, though not entirely taken away.

The method of correcting the errors ariſing from the different refrangibility of light is of a different conſideration from the former. For, whereas the errors from the figure can only be diminiſhed in a certain proportion according to the number of glaſſes, in this they may be entirely corrected by the addition of only one glaſs; as we find in the aſtronomical teleſcope, that two eye-glaſſes, rightly proportioned, will cauſe the edges of objects to appear free from colours, quite to the borders of the field. Alſo in the day-teleſcope, where no more than two eye-glaſſes are abſolutely neceſſary for erecting the object, we find, that by the addition of a third, rightly ſituated, the colours, which would otherwiſe make the image confuſed, are entirely removed. This, however, is to be underſtood with ſome limitation: for though the different colours into which the extreme pencils muſt neceſſarily be divided by the edges of the eye-glaſſes, may in this manner be brought to the eye in a direction parallel to each other, ſo as, by the humours of the eye, to be made to converge to a point on the retina: yet, if the glaſſes exceed a certain length, the colours may be ſpread too wide to be capable of being admitted through the pupil or aperture of the eye; which is the reaſon, that in long teleſcopes, conſtructed in the common manner, with three eye-glaſſes, the field is always very much contracted.

Theſe conſiderations firſt ſet Mr. Dollond on contriving how to enlarge the field, by increaſing the number of eye-glaſſes without any hinderance to the diſtinctneſs or brightneſs of the image; and though others had been about the ſame work before, yet, obſerving that ſome five-glaſs teleſcopes which were then made would admit of farther improvement, he endeavoured to conſtruct one with the ſame number of glaſſes in a better manner; which ſo far anſwered his expectations, as to be allowed by the beſt judges to be a conſiderable improvement on the former.

Encouraged by this ſucceſs, he reſolved to try if he could not make ſome farther enlargement of the field, by the addition of another glaſs, and by placing and proportioning the glaſſes in ſuch a manner as to correct the abberrations as much as poſſible, without any detriment to the diſtinctneſs; and at laſt he obtained as large a field as is convenient or neceſſary, and that even in the longeſt teleſcopes that can be made.

Theſe teleſcopes with ſix glaſſes having been well received, and ſome of them being gone into foreign parts, it ſeemed a proper time to the author to ſettle the date of his invention; on which account he drew up a letter, which he addreſſed to Mr. Short, and which was read at the Royal Society, March 1, 1753.

Various other attempts were made about this time to ſhorten and otherwiſe improve teleſcopes. Among theſe we muſt juſt mention that of Mr. Caleb Smith, who, after giving much attention to the ſubject, thought that he had found it poſſible to rectify the errors which ariſe from the different degrees of refrangibility, on the principle that the ſines of refraction, or rays differently refrangible, are to one another in a given proportion, when their ſines of incidence are equal; and the method which he propoſed for this purpoſe was to make the ſpeculums of glaſs inſtead of metal, the two ſurfaces having different degrees of concavity. But we do not find that his ſcheme was

ever executed; nor is it probable, for reaſons which have been mentioned, that any advantage could be made of it.

To Mr. Short we are indebted for the excellent contrivance of an equatorial teleſcope, or, as he likewiſe called it, a *portable obſervatory*; for with it pretty accurate obſervations may be made with very little trouble, by thoſe who have no building adapted to the purpoſe. The inſtrument conſiſts of an ingenious piece of machinery, by the help of which a teleſcope mounted upon it may be directed to any degree of right aſcenſion or declination, ſo that, the place of any of the heavenly bodies being known, they may be found without any trouble, even in the day-time. Alſo, being made to turn parallel to the equator, any object is eaſily kept in view, or recovered, without moving the eye from its ſituation. By this inſtrument, Mr. Short informs us, that moſt of the ſtars of the firſt and ſecond magnitude have been ſeen even at mid-day, and the ſun ſhining bright; as alſo Mercury, Venus, and Jupiter. Saturn and Mars are not ſo eaſy to be ſeen, on account of the faintneſs of their light, except when the ſun is but a few hours above the horizon. This particular effect depends upon the teleſcope excluding almoſt all the light, except what comes from the object itſelf, and which might otherwiſe efface the impreſſion made by its weaker light upon the eye. Any teleſcope of the ſame magnifying power would have the ſame effect, could we be ſure of pointing it right. For the ſame reaſon, alſo, it is that ſtars are viſible in the day-time from the bottom of a deep pit. Mr. Ramſden has lately invented a *portable obſervatory* or *equatorial teleſcope*, which may perhaps ſuperſede the uſe of Mr. Short's. See ASTRONOMY.

In order to enable us to ſee the fixed ſtars in the day-time, it is neceſſary to exclude the extraneous light as much as poſſible. For this reaſon the greater magnifying power of any teleſcope is uſed, the more eaſily a fixed ſtar will be diſtinguiſhed in the day-time; the light of the ſtar remaining the ſame in all magnifying powers of the ſame teleſcope, but the ground upon which it is ſeen becoming darker by increaſing the magnifying power; and the viſibility of a ſtar depends very much upon the difference between its own light and that of the ground upon which it is ſeen. A fixed ſtar will be very nearly equally viſible with teleſcopes of very different apertures, provided the magnifying power remains the ſame.

If a comet, or any other heavenly body, be viewed through this equatorial teleſcope, properly rectified, it is ſeen immediately by the help of the ſame machinery what is its true place in the heavens. Other aſtronomical problems may alſo be ſolved by it, with great eaſe and certainty.

M. Æpinus propoſes to bend the tubes of long teleſcopes at right angles, fixing a plane mirror in the angle, in order to make them more commodious for viewing objects near the zenith of the obſerver; and he gives particular inſtructions how to make them in this form, eſpecially when they are furniſhed with micrometers. We are alſo informed that a little plane ſpeculum is ſometimes placed betwixt the laſt eye-glaſs and the eye in the reflecting teleſcopes, at an angle of 45°, for the ſame purpoſe.

The invention of MICROSCOPES was not much later than that of teleſcopes; and, according to Borellus, whoſe account we do not find to have been called in queſtion by any perſon, we are indebted for them to the ſame author, at leaſt to Z. Janſen in conjunction with his ſon; and for this latter favour we may, perhaps, be conſidered as under more obligation to them than for the former, the microſcope having more various and extenſive uſes, with reſpect to philoſophy, than the teleſcope. In our ideas, however, it appears ſomething greater, and more extraordinary, to be able to ſee objects too diſtant to be perceived by the naked eye, than thoſe that are too near to be ſeen by us; and therefore there is more of the ſublime in the teleſcope than the microſcope. Theſe two inſtruments, though different in their application, are notwithſtanding very ſimilar; as both of them aſſiſt us in the diſcovery of objects that we muſt otherwiſe have remained unacquainted with, by enlarging the angle which they ſubtend at the eye.

The Janſens, however, have not always enjoyed, undiſturbed, that ſhare of reputation to which they ſeem to be entitled, with reſpect either to the teleſcope or the microſcope. The diſcovery of the latter, in particular, has generally been conſidered as more uncertain than that of the former. All that many writers ſay we can depend upon is, that microſcopes were firſt uſed in Germany about the year 1621. Others ſay poſitively, that this inſtrument was the contrivance of Cornelius Drebell, no philoſopher, but a man of curioſity and ingenuity, who alſo invented the thermometer.

According to Borellus, Zacharias Janſen and his ſon preſented the firſt microſcopes they had conſtructed to prince Maurice and Albert archduke of Auſtria. William Borell, who gives this account in a letter to his brother Peter, ſays, that when he was ambaſſador in England, in 1619, Cornelius Drebell, with whom he was intimately acquainted, ſhowed him a microſcope, which he ſaid was the ſame the archduke had given him, and had been made by Janſen himſelf. This inſtrument was not ſo ſhort as they are generally made at preſent, but was ſix feet long, conſiſting of a tube of gilt copper, an inch in diameter, ſupported by three braſs pillars in the ſhape of dolphins, on a baſe of ebony, on which the ſmall objects were placed.

This microſcope was evidently a compound one, or rather ſomething betwixt a teleſcope and a microſcope, what we ſhould now, perhaps, chooſe to call a *megalaſcope*; ſo that it is poſſible that ſingle microſcopes might have been known, and in uſe, ſome time before: but perhaps nobody thought of giving that name to ſingle lenſes; though, from the firſt uſe of lenſes, they could not but have been uſed for the purpoſe of magnifying ſmall objects. In this ſenſe we have ſeen, that even the ancients were in poſſeſſion of microſcopes; and it appears from Jamblicus and Plutarch, quoted by Dr. Rogers, that they gave ſuch inſtruments as they uſed for this purpoſe the name of *dioptra*. As ſpectacles were certainly in uſe long before the invention of teleſcopes, one can hardly help concluding, that lenſes muſt have been made ſmaller, and more convex, for the purpoſe of magnifying minute objects; eſpecially as the application of this kind of microſcope was nearly the ſame with that of a ſpectacle-glaſs, both of them being held cloſe to the eye. At what time lenſes were made ſo ſmall as we now generally uſe them for magnifying in ſingle microſcopes; we have not found. But as this muſt neceſſarily have been done gradually, the only proper object of inquiry is the invention of the double or compound microſcope; and this is clearly given, by the evidence of Borellus above-mentioned, to Zacharias Janſen, the inventor of the teleſcope, or his ſon.

The invention of compound microſcopes is claimed by the ſame Fontana who claimed the diſcovery of teleſcopes; and though he did not publiſh any account of this invention till the year 1646 (notwithſtanding he pretended to have made the diſcovery in 1618), Montucla, not having attended perhaps to the teſtimony of Borellus, is willing to allow his claim, as he thought there was no other perſon who ſeemed to have any better right to it.

Euſtachio Divini made microſcopes with two common object-glaſſes, and two plano-convex eye-glaſſes joined together on their convex ſides ſo as to meet in a point. The tube in which they were incloſed was as big as a man's leg, and the eye-glaſſes almoſt as broad as the palm of a man's hand. Mr. Oldenburg, ſecretary to the royal ſociety, received an account

of this inſtrument from Rome, and read it at one of their meetings, Auguſt 6, 1668.

It was in this period that Hartſocker improved ſingle microſcopes, by uſing ſmall globules of glaſs, made by melting them in the flame of a candle, inſtead of the lenſes which had before been made uſe of for that purpoſe. By this means he firſt diſcovered the *animalcula in ſemine maſculino*, which gave riſe to a new ſyſtem of generation. A microſcope of this kind, conſiſting of a globule of $\frac{1}{100}$ of an inch in diameter, M. Huygens demonſtrated to magnify 100 times; and ſince it is eaſy to make them of leſs than half a line in diameter, they may be made to magnify 300 times. Were it not for the difficulty of applying objects to theſe magnifiers, the want of light, and the ſmall field of diſtinct viſion, they would certainly have been the moſt perfect of all microſcopes.

But no man diſtinguiſhed himſelf ſo much by microſcopical diſcoveries as the famous M. Leeuwenhoek, though he uſed only ſingle lenſes with ſhort foci, preferring diſtinctneſs of viſion to a large magnifying power.

M. Leeuwenhoek's microſcopes were all ſingle ones, each of them conſiſting of a ſmall double convex-glaſs, ſet in a ſocket between two ſilver plates riveted together, and pierced with a ſmall hole; and the object was put upon the point of a needle, ſo contrived as to be placed at any diſtance from the lens. If the objects were ſolid, he faſtened them with glue; and if they were fluid, or on other accounts required to be ſpread upon glaſs, he placed them on a ſmall piece of Muſcovy talc, or glaſs blown very thin; which he afterwards glued to his needle. He had, however, a different apparatus for viewing the circulation of the blood, which he could fix to the ſame microſcopes.

The greateſt part of his microſcopes M. Leeuwenhoek bequeathed to the Royal Society. They were contained in a ſmall Indian cabinet, in the drawers of which were 13 little boxes, or caſes, in each of which were two microſcopes, neatly fitted up in ſilver; and both the glaſs and the apparatus were made with his own hands.

The glaſs of all theſe lenſes is exceedingly clear, but none of them magnifies ſo much as thoſe globules which are frequently uſed in other microſcopes: but Mr. Folkes, who examined them, thought that they ſhowed objects with much greater diſtinctneſs, which M. Leeuwenhoek principally valued. His diſcoveries, however, are to be aſcribed not ſo much to the goodneſs of his glaſſes, as to his great judgment, acquired by long experience, in uſing them. He alſo particularly excelled in his manner of preparing objects for being viewed to the moſt advantage.

Mr. Baker, who alſo examined M. Leeuwenhoek's microſcopes, and made a report concerning them to the Royal Society, found that the greateſt magnifier among them enlarged the diameter of an object about 160 times, but that all the reſt fell much ſhort of that power; ſo he concluded that M. Leeuwenhoek muſt have had other microſcopes of a much greater magnifying power for many of his diſcoveries. And it appears, he ſays, by many circumſtances, that he had ſuch microſcopes.

It appears from M. Leeuwenhoek's writings, that he was not unacquainted with the method of viewing opaque objects by means of a ſmall concave reflecting mirror, which was afterwards improved by M. Lieberkuhn. For, after deſcribing his apparatus for viewing eels in glaſs tubes, he adds, that he had an inſtrument to which he ſcrewed a microſcope ſet in braſs, upon which microſcope he faſtened a little diſh of braſs, probably that his eye might be thereby aſſiſted to ſee objects better; for he ſays he had filed the braſs which was round his microſcope as bright as he could, that the light, while he was viewing objects, might be reflected from it as much as poſſible. This microſcope, with its diſh, is conſtructed upon principles ſo ſimilar to thoſe which are the foundation of our ſingle microſcope by reflection (ſee MICROSCOPE), that it may well be ſuppoſed to have given the hint to the ingenious inventor of it, provided he ever attended to it.

In 1702 Mr. Wilſon made ſeveral ingenious improvements in the method of uſing ſingle magnifiers, for the purpoſe of viewing tranſparent objects; and his microſcope, which is alſo a neceſſary part of the ſolar microſcope, is in very general uſe at this day. (See MICROSCOPE).

In 1710 Mr. Adams gave to the Royal Society the following account of his method of making ſmall globules for large magnifiers. He took a piece of fine window-glaſs, and cut it with a diamond into as many lengths as he thought proper, not exceeding $\frac{1}{8}$ of an inch in breadth; then, holding one of them between the fore-finger and thumb of each hand over a very fine flame, till the glaſs began to ſoften, he drew it out till it was as fine as a hair, and broke; then putting each of the ends into the pureſt part of the flame, he had two globules preſently, which he could make larger or leſs at pleaſure. If they were held a long time in the flame, they would have ſpots in them, ſo that he drew them out preſently after they became round. The ſtem he broke off as near to the globule as he could, and lodging the remainder between the plates, in which holes were drilled exactly round, the microſcope, he ſays, performed to admiration. Through theſe magnifiers he ſays that the ſame thread of very fine muſlin appeared three or four times bigger than it did in the largeſt of Mr. Wilſon's magnifiers.

The ingenious Mr. Grey hit upon a very eaſy expedient to make very good temporary microſcopes at a very little expence. They conſiſt of nothing but very ſmall drops of water, taken up with a point of a pin, and put into a ſmall hole made in a piece of metal. Thoſe globules of water do not, indeed, magnify ſo much as thoſe which are made of glaſs of the ſame ſize, becauſe the refractive power of water is not ſo great; but the ſame purpoſe will be anſwered nearly as well by making them ſomewhat ſmaller.

The ſame ingenious perſon, obſerving that ſmall heterogeneous particles incloſed in the glaſs of which microſcopes are made, were much magnified when thoſe glaſſes were looked through, thought of making his microſcopes of water that contained living animalcula, to ſee how they would look in this new ſituation; and he found his ſcheme to anſwer even beyond his utmoſt expectation, ſo that he could not even account for their being magnified ſo much as they were: for it was much more than they would have been magnified if they had been placed beyond the globule, in the proper place for viewing objects. But Montucla obſerves, that, when any object is incloſed within this ſmall tranſparent globule, the hinder-part of it acts like a concave mirror, provided they be ſituated between that ſurface and the focus; and that, by this means, they are magnified above $3\frac{1}{2}$ times more than they would have been in the uſual way.

After the happy execution of the reflecting teleſcope, it was natural to expect that attempts would alſo be made to render a ſimilar ſervice to microſcopes. Accordingly we find two plans of this kind. The firſt was that of Dr. Robert Barker. His inſtrument differs in nothing from the reflecting teleſcope, excepting the diſtance of the two ſpeculums, in order to adapt it to thoſe pencils of rays which enter the microſcope diverging; whereas they come to the teleſcope from very diſtant objects nearly parallel to each other.

This microſcope is not ſo eaſy to manage as the common ſort. For viſion by reflection, as it is much more perfect, ſo it is far more difficult than that by refraction. Nor is this microſcope ſo uſeful for any but very ſmall or tranſparent objects. For the object, being between the ſpeculum and the image,

would, if it were large and opaque, prevent a due reflection.

Dr. Smith invented a double reflecting microſcope, of which a theoretical and practical account is given in the remarks on the ſecond volume of his Syſtem of Optics. Through ſome of thoſe incidents to which the conducting of a work ſo multifarious as ours is always liable, this inſtrument was omitted under the article MICROSCOPE. As it is conſtructed on principles eſſentially different from all others, and, in the opinion of the ableſt judges whom we have conſulted, incomparably ſuperior to them all, the reader will not be ill pleaſed with the following practical deſcription, though it appears not perhaps in its moſt proper place.

Fig. 2. in Pl. 6, is a ſection of this microſcope, where ABC and *abc* are two ſpecula, the former concave, and the latter convex, incloſed within the tube DEFG. The ſpeculum ABC is perforated like the ſpeculum of a Gregorian teleſcope; and the object to be magnified is ſo placed between the centre and principal focus of that ſpeculum, that the rays flowing from it to ABC are reflected towards an image *pq*. But before they are united in that image, they are received by the convex ſpeculum *abc*, and thence reflected through the hole BC in the vertex of the concave to a ſecond image *πκ*, to be viewed through an eye-glaſs *l*. The object may either be ſituated between the two ſpecula, or, which is perhaps better, between the principal focus and vertex *c* of the convex ſpeculum *abc*, a ſmall hole being made in its vertex for the incident rays to paſs through. When the microſcope is uſed, let the object be included between two little round plates of Moſcovy-glaſs, fixed in a hole of an oblong braſs plate *πn*, intended to ſlide cloſe to the back ſide of the convex ſpeculum; which muſt therefore be ground flat on that ſide, and ſo thin that the object may come preciſely to its computed diſtance from the vertex of the ſpeculum. The ſlider muſt be kept tight to the back of the metal by a gentle ſpring. The diſtance of the object being thus determined once for all, diſtinct viſion to different eyes, and through different eye-glaſſes, muſt be procured by a gentle motion of the little tubes that contain theſe glaſſes. Theſe tubes muſt be made in the uſual form of thoſe that belong to Sir Iſaac Newton's reflecting teleſcope, (ſee TELESCOPE,) having a ſmall hole in the middle of each plate, at the ends of the tube, ſituated exactly in each focus of the glaſs: the uſe of theſe holes and plates is to limit the viſible area, and hinder any ſtraggling rays from entering the eye. To the tube of the eye-glaſs is faſtened the arm *g*, on which the adjuſting ſcrew turns. A ſimilar arm *u* is attached to the fixed tube X, in which the neck of the ſcrew turns; and by turning the button *y*, the eye-tube is moved farther from or nearer to the object, by which means different ſorts of eyes obtain diſtinct viſion.

The rays which flow from the object directly through the hole in the concave ſpeculum and through the eye-glaſs, by mixing with the reflected rays, would dilute the image on the retina, and therefore muſt be intercepted. This is done by a very ſimple contrivance. The little hole in the convex ſpeculum is ground conical as in the figure; and a conical ſolid P, of which the baſe is larger than the orifice in the back of the convex ſpeculum, ſupported on the ſlender pillar FQ, is ſo placed as to intercept all the *direct* rays from the eye-glaſs. All the tubes are ſtrongly blacked on their inſides, and ſo is the conical ſolid, to hinder all reflection of rays from theſe objects upon the convex ſpeculum. The little baſe, too, of the ſolid ſhould be made concave, that whatever light it may ſtill reflect, may be thrown back upon the object; and its back-ſide being conical and blacked all over, will either abſorb or laterally diſperſe any ſtraggling rays which the concave ſpeculum may ſcatter upon it, and ſo prevent their coming to the eye-glaſs.

Notwithſtanding the interpoſition of this conical ſolid, yet when the eye-glaſs is taken out, diſtant objects may be diſtinctly ſeen through the microſcope, by rays reflected from the metals, and diverging upon the eye from an image behind the convex ſpeculum. But this mixture of foreign rays with thoſe of the object, which is common to all kinds of microſcopes in viewing tranſparent objects, is uſually prevented by placing before the object a thick double convex lens L, to collect the ſky-light exactly upon the object. This lens ſhould be juſt ſo broad as to ſubtend the oppoſite angle to that which the concave ſpeculum ſubtends at the object. The annular frame of the lens muſt be very narrow, and connected to the microſcope by two or three ſlender wires or blades, whoſe planes produced may paſs through the object, and intercept from it as little ſky-light as poſſible.

This is not the place for explaining the principles of this microſcope, or demonſtrating its ſuperiority over moſt others; nor are ſuch explanation and demonſtration neceſſary. Its excellence, as well as the principles upon which it is conſtructed, will be perceived by the reader, when he has made himſelf maſter of the laws of refraction and reflection as laid down in the enſuing part of this article.

In 1738, or 1739, M. Lieberkuhn made two capital improvements in microſcopes, by the invention of the *ſolar microſcope*, and the *microſcope for opaque objects*. When he was in England in the winter of 1739, he ſhowed an apparatus of his own making, for each of theſe purpoſes, to ſeveral gentlemen of the Royal Society, as well as to ſome opticians, particularly Mr. Cuff in Fleet-ſtreet, who took great pains to improve them.

The microſcope for opaque objects remedies the inconvenience of having the dark ſide of an object next the eye. For by means of a concave ſpeculum of ſilver, highly poliſhed, in the centre of which a magnifying lens is placed, the object is ſo ſtrongly illuminated that it may be examined with all imaginable eaſe and pleaſure. A convenient apparatus of this kind, with four different ſpeculums and magnifiers of different powers, was brought to perfection by Mr. Cuff.

M. Lieberkuhn made conſiderable improvements in his ſolar microſcope, particularly in adapting it to the view of opaque objects; but in what manner this end was effected, M. Æpinus, who was highly entertained with the performance, and who mentions the fact, was not able to recollect; and the death of the ingenious inventor prevented his publiſhing any account of it himſelf. M. Æpinus invited thoſe perſons who came into the poſſeſſion of M. Lieberkuhn's apparatus to publiſh an account of this inſtrument; but it doth not appear that his method was ever publiſhed.

This improvement of M. Lieberkuhn's induced M. Æpinus himſelf to attend to the ſubject; and by this means he produced a very valuable improvement in this inſtrument. For by throwing the light upon the foreſide of any object by means of a mirror, before it is tranſmitted through the object-lens, all kinds of objects are equally well repreſented by it.

M. Euler propoſed a ſcheme to introduce viſion by reflected light into the magic lantern and ſolar microſcope, by which many inconveniences to which thoſe inſtruments are ſubject might be avoided. For this purpoſe, he ſays that nothing is neceſſary but a large concave mirror, perforated as for a teleſcope; and that the light be ſo ſituated, that none of it may paſs directly through the perforation, ſo as to fall on the images of the objects upon the ſcreen. He propoſes to have four different machines, for objects of different ſizes; the firſt for thoſe of ſix feet long, the ſecond for thoſe of one foot, the third for thoſe of two inches, and the fourth for thoſe of two lines; but it is needleſs to be particular in the deſcription of theſe, as more perfect inſtruments are deſcribed under the article MICROSCOPE.

Several improvements were made in the apparatus to the ſolar microſcope, as adapted to view opaque objects, by M. Zeiher, who made one conſtruction for the larger kind of objects, and another for the ſmall ones.

Mr. Martin having conſtructed a ſolar microſcope of a larger ſize than common, for his own uſe, the illuminating lens being 4½ inches in diameter, and all the other parts of the inſtrument in proportion, found, that by the help of an additional part, which he does not deſcribe, he could ſee even opaque objects very well. If he had made the lens any larger, he was aware that the heat produced at the focus would have been too great for the generality of objects to bear. The expence of this inſtrument, he ſays, does not much exceed the price of the common ſolar microſcope.

The ſmalleſt globules, and conſequently the greateſt magnifiers, for microſcopes, that have yet been executed, were made by T. Di Torre of Naples, who, in 1765, ſent four of them to the Royal Society. The largeſt of them was only two Paris points in diameter, and it was ſaid to magnify the diameter of an object 640 times. The ſecond was the ſize of one Paris point, and the third was no more than half of a Paris point, or the 144th part of an inch in diameter, and was ſaid to magnify the diameter of an object 2560 times. One of theſe globules was wanting when they came into the hands of Mr. Baker, to whoſe examination they were referred by the Royal Society. This gentleman, ſo famous for his ſkill in microſcopes, and his extraordinary expertneſs in managing them, was not able to make any uſe of theſe. With that which magnifies the leaſt, he was not able to ſee any object with ſatisfaction; and he concludes his account with expreſſing his hopes only, that, as his eyes had been much uſed to microſcopes, they were not injured by the attention he had given to them, though he believed there were few perſons who would not have been blinded by it.

The conſtruction of a teleſcope with ſix eye-glaſſes led M. Euler to a ſimilar conſtruction of microſcopes, by introducing into them ſix lenſes, one of which admits of ſo ſmall an aperture, as to ſerve, inſtead of a diaphragm, to exclude all foreign light, though, as he ſays, it neither leſſens the field of view, nor the brightneſs of objects.

The improvement of all dioptric inſtruments is greatly impeded by inequalities in the ſubſtance of the glaſs of which they are made; but though many attempts have been made to make glaſs without that imperfection, none of them have been hitherto quite effectual. M. A. D. Merklein, having found ſome glaſs which had been melted when a building was on fire, and which proved to make excellent object-glaſſes for teleſcopes, concluded that its peculiar goodneſs aroſe from its not having been diſturbed when it was in a fluid ſtate; and therefore he propoſed to take the metal out of the furnace in iron veſſels, of the ſame form that was wanted for the glaſs; and after it had been perfectly fluid in thoſe veſſels, to let it ſtand to cool, without any diſturbance. But this is not always found to anſwer.

PART I. THEORY OF OPTICS.

THIS part of the ſcience contains all that hath been diſcovered concerning the various motions of the rays of light, either through different mediums, or when reflected from different ſubſtances in the ſame medium. It contains alſo the *rationale* of every thing which hath been diſcovered with regard to viſion; the optical deceptions to which we are liable; and, in ſhort, ought to give the reaſon of all the known optical phenomena.—The ſcience is commonly divided into three parts, viz. dioptrics, which contains the laws of refraction, and the phenomena depending upon them; catoptrics, which contains the laws of reflection, and the phenomena which depend on them; and laſtly, chromatics, which treat of the phenomena of colour. But this definition is of no uſe in a Treatiſe of Optics, as moſt of the phenomena depend both on refraction and reflection, colour itſelf not excepted. For this reaſon, though we have given detached articles under the words DIOPTRICS, CATOPTRICS, and CHROMATICS; we have reſerved to this place the explanation of the laws of reflection and refraction, by which all optical phenomena may be accounted for.

SECT. I. *Of the Properties of Light in general.*

UNDER the article LIGHT we have given ſome account of the controverſies concerning its nature. The opinions of philoſophers may, in general, be arranged under theſe two: 1. That the phenomena of viſion and illumination are produced by the undulations of an elaſtic fluid, much in the ſame manner as ſound is produced by the undulations of air. This opinion was firſt offered to the public by Des Cartes, and afterwards by Mr. Huygens, and has lately been revived by Mr. Euler, who has endeavoured to explain the phenomena upon mechanical principles.—2d, That the phenomena of viſion are produced by the motion and action of matter emitted from the ſhining body with immenſe velocity, moving uniformly in ſtraight lines, and acted on by other bodies; ſo as to be reflected, refracted, or inflected, in various ways, by means of forces which act on it in the ſame manner as on other inert matter. Sir Iſaac Newton has ſhown, in the moſt incontrovertible manner, the total diſſimilarity between the phenomena of viſion and the legitimate conſequences of the undulations of an elaſtic fluid. All Mr. Euler's ingenious and laborious diſcuſſions have not removed Newton's objections in the ſmalleſt degree. Sir Iſaac adopts the vulgar opinion, therefore, making light of the difficulties objected to it, becauſe none of them are inconſiſtent with the eſtabliſhed principles of mechanics, and are merely difficulties of conception to limited faculties like ours. We need not deſpair of being able to decide, by experiment, which of theſe opinions is neareſt to the truth; becauſe there are phenomena where the reſult ſhould be ſenſibly different in the two hypotheſes. At preſent, we ſhall content ourſelves with giving ſome account of the legitimate conſequences of the vulgar opinion as modified by Sir Iſaac Newton, viz. that light conſiſts of ſmall particles emitted with very great velocity, and attracted or repelled by other bodies at very ſmall diſtances.

Every viſible body emits or reflects inconceivably ſmall particles of matter from each point of its ſurface, which iſſue from it continually (not unlike ſparks from a coal) in ſtraight lines and in all directions. Theſe particles entering the eye, and ſtriking upon the retina (a nerve expanded on the back part of the eye to receive their impulſes), excite in our minds the idea of light. And as they differ in ſubſtance, denſity, velocity, or magnitude, they produce in us the ideas of different colours; as will be explained in its proper place.

That the particles which conſtitute light are exceedingly ſmall, appears from hence, viz. that if a hole be made through a piece of paper with a needle, rays of light from every object on the farther ſide of it are capable of paſſing through it at once without the leaſt confuſion; for any one of thoſe objects may as clearly be ſeen through it, as if no rays paſſed through it from any of the reſt. Further, if a candle is lighted, and there be no obſtacle in the way to obſtruct the progreſs of its rays, it

will fill all the ſpace within two miles of it every way with luminous particles, before it has loſt the leaſt ſenſible part of its ſubſtance thereby.

That theſe particles proceed from every point of the ſurface of a viſible body, and in all directions, is clear from hence, viz. becauſe wherever a ſpectator is placed with regard to the body, every point of that part of the ſurface which is turned towards him is viſible to him. That they proceed from the body in right lines, we are aſſured, becauſe juſt ſo many and no more will be intercepted in their paſſage to any place by an interpoſed object, as that object ought to intercept, ſuppoſing them to come in ſuch lines.

The velocity with which they proceed from the ſurface of the viſible body is no leſs ſurpriſing than their minuteneſs: the method whereby philoſophers eſtimate their ſwiftneſs, is by obſervations made on the eclipſes of Jupiter's ſatellites; which eclipſes to us appear about ſeven minutes ſooner than they ought to do by calculation, when the earth is placed between the ſun and him, that is, when we are neareſt to him; and as much later, when the ſun is between him and us, at which time we are fartheſt from him: from whence it is concluded, that they require about ſeven minutes to paſs over a ſpace equal to the diſtance between the ſun and us, which is about 95,000,000 of miles.

A ſtream of theſe particles iſſuing from the ſurface of a viſible body in one and the ſame direction, is called a *ray of light*.

As rays proceed from a viſible body in all directions, they neceſſarily become thinner and thinner, continually ſpreading themſelves as they paſs along into a larger ſpace, and that in proportion to the ſquares of their diſtances from the body; that is, at the diſtance of two ſpaces they are four times thinner than they are at one; at the diſtance of three ſpaces, nine times thinner, and ſo on: the reaſon of which is, becauſe they ſpread themſelves in a twofold manner, viz. upwards and downwards, as well as ſidewiſe.

The particles of light are ſubject to the laws of attraction of coheſion, like other ſmall bodies; for if a ray of light be made to paſs by the edge of a knife, it will be diverted from its natural courſe, and be inflected towards the edge of the knife. The like inflection happens to a ray when it enters obliquely into a denſer or rarer ſubſtance than that in which it was before, in which caſe it is ſaid to be refracted; the laws of which refraction are the ſubject of the following ſection.

Sect. II. *Of Refraction.*

Light, when proceeding from a luminous body, without being reflected from any opaque ſubſtance, or inflected by paſſing very near one, is invariably found to proceed in ſtraight lines, without the leaſt deviation. But if it happens to paſs obliquely from one medium to another, it always leaves the direction it had before, and aſſumes a new one; and this change of courſe is called its *refraction*. After having taken this new direction, it then proceeds invariably in a ſtraight line till it meets with a different medium, when it is again turned out of its courſe. It muſt be obſerved, however, that though by this means we may cauſe the rays of light to make any number of angles in their courſe, it is impoſſible for us to make them deſcribe a curve, except in one ſingle caſe, namely, where they paſs through a medium, the denſity of which uniformly either increaſes or decreaſes. This is the caſe with the light of the celeſtial bodies, which paſſes downwards through our atmoſphere, and likewiſe with that which is reflected upwards through it by terreſtrial objects. In both theſe caſes, it deſcribes a curve of the hyperbolic kind; but at all other times it proceeds in ſtraight lines, or in what may be taken for ſtraight lines without any ſenſible error.

§ 1. The cauſe of Refraction, and the law by which it is performed.

The phenomena of refraction are explained by an attractive power in the medium through which light paſſes, in the following manner: all bodies being endowed with an attractive force, which is extended to ſome diſtance beyond their ſurfaces; when a ray of light paſſes out of a rarer into a denſer medium (if this latter has a greater attractive force than the former, as is commonly the caſe), the ray, juſt before its entrance, will begin to be attracted towards the denſer medium; and this attraction will continue to act upon it, till ſome time after it has entered the medium; and therefore, if a ray approaches a denſer medium in a direction perpendicular to its ſurface, its velocity will be continually accelerated during its paſſage through the ſpace in which that attraction exerts itſelf; and therefore, after it has paſſed that ſpace, it will move on, till it arrives at the oppoſite ſide of the medium, with a greater degree of velocity than it had before it entered. So that in this caſe its velocity only will be altered. Whereas, if a ray enters a denſer medium obliquely, it will not only have its velocity augmented thereby, but its direction will become leſs oblique to the ſurface. Juſt as when a ſtone is thrown downwards obliquely from a precipice, it falls to the ſurface of the ground in a direction nearer to a perpendicular one, than that with which it was thrown from the hand. From hence we ſee a ray of light, in paſſing out of a rarer into a denſer medium, is refracted towards the perpendicular; that is, ſuppoſing a line drawn perpendicularly to the ſurface of the medium, through the point where the ray enters, and extended both ways, the ray in paſſing through the ſurface is refracted or bent towards the perpendicular line; or, which is the ſame thing, the line which it deſcribes by its motion after it has paſſed through the ſurface, makes a leſs angle with the perpendicular, than the line it deſcribed before. All which may be illuſtrated in the following manner:

Let us ſuppoſe firſt, that the ray paſſes out of a vacuum into the denſer medium ABCD (fig. 3.), and that the attractive force of each particle in the medium is extended from its reſpective centre to a diſtance equal to that which is between the lines AB and EF, or AB and GH; and let KL be the path deſcribed by a ray of light in its progreſs towards the denſer medium. This ray, when it arrives at L, will enter the attractive forces of thoſe particles which lie in AB the ſurface of the denſer medium, and will therefore ceaſe to proceed any longer in the right line KLM, but will be diverted from its courſe by being attracted towards the line AB, and will begin to deſcribe the curve LN, paſſing through the ſurface AB in ſome new direction, as OQ; thereby making a leſs angle with a line, as PR, drawn perpendicularly through the point N, than it would have done had it proceeded in its firſt direction KLM.

Farther: whereas, we have ſuppoſed the attractive force of each particle to be extended through a ſpace equal to the diſtance between AB and EF, it is evident that the ray, after it has entered the ſurface, will ſtill be attracted downwards, till it has arrived at the line EF; for, till that time, there will not be ſo many particles above it which will attract it upwards, as below, that will attract it downwards. So that after it has entered the ſurface at N, in the direction OQ, it will not proceed in that direction, but will continue to deſcribe a curve, as NS; after which it will proceed ſtraight on towards the oppoſite ſide of the medium, being attracted equally every way; and therefore will at laſt proceed in the direction XST, ſtill nearer the perpendicular PR than before.

Now if we ſuppoſe ABZY not to be a vacuum, but a rarer medium than the other, the caſe will ſtill be the ſame; but the ray will not be ſo much refracted from its rectilineal courſe,

becauſe the attraction of the particles of the upper medium being in a contrary direction to that of the attraction of thoſe in the lower one, the attraction of the denſer medium will in ſome meaſure be deſtroyed by that of the rarer.

On the contrary, when a ray paſſes out of a denſer into a rarer medium, if its direction be perpendicular to the ſurface of the medium, it will only loſe ſomewhat of its velocity, in paſſing through the ſpaces of attraction of that medium (that is, the ſpace wherein it is attracted more one way than it is another). If its direction be oblique, it will continually recede from the perpendicular during its paſſage, and by that means have its obliquity increaſed, juſt as a ſtone thrown up obliquely from the ſurface of the earth increaſes its obliquity all the time it riſes. Thus, ſuppoſing the ray TS paſſing out of the denſer medium ABCD into the rarer ABZY, when it arrives at S it will begin to be attracted downwards, and ſo will deſcribe the curve SNL, and then proceed in the right line LK; making a larger angle with the perpendicular PR, than the line TSX in which it proceeded during its paſſage through the other medium.

We may here make a general obſervation on the forces which produce this deviation of the rays of light from their original path. They ariſe from the joint action of all the particles of the body which are ſufficiently near the particle of light; that is, whoſe diſtance from it is not greater than the line AE or GA; and therefore the whole force which acts on a particle in its different ſituations between the planes GH and EF, follows a very different law from the force exerted by one particle of the medium.

The ſpace through which the attraction of coheſion of the particles of matter is extended is ſo very ſmall, that in conſidering the progreſs of a ray of light out of one medium into another, the curvature it deſcribes in paſſing through the ſpace of attraction is generally neglected; and its path is ſuppoſed to be bent, or, in the uſual terms, the ray is ſuppoſed to be refracted only in the point where it enters the denſer medium.

Now the line which a ray deſcribes before it enters a denſer or a rarer medium, is called the *incident ray*: that which it deſcribes after it has entered, is the *refracted ray*.

The angle comprehended between the incident ray and the perpendicular, is the *angle of incidence*; and that between the refracted ray and the perpendicular, is the *angle of refraction*.

There is a certain and immutable law or rule, by which refraction is always performed; and that is this: whatever inclination a ray of light has to the ſurface of any medium before it enters it, the degree of refraction will always be ſuch, that the proportion between the ſine of the angle of its incidence, and that of the angle of its refraction, will always be the ſame in that medium.

To illuſtrate this: let us ſuppoſe ABCD (Pl. 6. fig. 4.) to repreſent a rarer, and ABEF a denſer medium: let GH be a ray of light paſſing through the firſt and entering the ſecond at H, and let HI be the refracted ray: then ſuppoſing the perpendicular PR drawn through the point H, on the centre H, and with any radius deſcribe the circle APBR; and from G and I, where the incident and refracted rays cut the circle, let fall the lines GK and IL perpendicularly upon the line PR; the former of theſe will be the ſine of the angle of incidence, the latter of refraction. Now if in this caſe the ray GH is ſo refracted at H, that GK is double or triple, &c. of IL, then, whatever other inclination the ray GH might have had, the ſine of its angle of incidence would have been double or triple, &c. to that of its angle of refraction. For inſtance, had the ray paſſed in the line MH before refraction, it would have paſſed in ſome line as HN afterwards, ſo ſituated that MO ſhould have been double or triple, &c. of NQ.

When a ray paſſes out of a vacuum into air, the ſine of the angle of incidence is found to be to that of refraction as 100036 to 100000. When it paſſes out of air into water, as about 4 to 3. When out of air into glaſs, as about 17 to 11. When out of air into a diamond, as about 5 to 2.

This relation of the ſine of the angle of incidence to that of refraction, which is a propoſition of the moſt extenſive uſe in explaining the optical phenomena on phyſical or mechanical principles, may be demonſtrated in the following eaſy and familiar manner.

Lemma 1. The augmentations or diminutions of the ſquares of the velocities produced by the uniform action of accelerating or retarding forces, are proportional to the forces, and to the ſpaces along which they act, jointly, or are proportional to the products of the forces multiplied by the ſpaces.

Let two bodies be uniformly accelerated from a ſtate of reſt in the points A *a*, along the ſpaces AB, *a b*, fig. 5. by the accelerating forces F*f*, and let AC, *a c*, be ſpaces deſcribed in equal times; it is evident, from what has been ſaid under the articles GRAVITY and ACCELERATION, that becauſe theſe ſpaces are deſcribed with motions uniformly accelerated, AC and *ac* are reſpectively the halves of the ſpaces which would be uniformly deſcribed during the ſame time with the velocities acquired at C and *c*, and are therefore meaſures of theſe velocities. And as theſe velocities are uniformly acquired in equal times, they are meaſures of the accelerating forces. Therefore $AC : ac = F : f$. Alſo, from the nature of uniformly accelerated motion, the ſpaces are proportional to the ſquares of the acquired velocities. Therefore, (uſing the ſymbols $\surd^2 C$, $\surd^2 c$, &c. to expreſs the ſquares of the velocities at C *c*, &c.) we have

$$\surd^2 B : \surd^2 C = AB : AC$$
$$\surd^2 C : \surd^2 c = AC^2 : ac^2$$
$$\surd^2 c : \surd^2 b = ac : ab$$

Therefore, by equality of compound ratios

$$\surd^2 B : \surd^2 b = AB \times AC : ab \times ac, = AB \times F : ab \times f.$$

And in like manner $\surd^2 D : \surd^2 d = AD \times F : ad \times f$; and $\surd^2 B - \surd^2 D : \surd^2 b - \surd^2 d = BD \times F : bd \times f$. Q. E. D.

Corol. If the forces are as the ſpaces inverſely, the augmentations or diminutions of the ſquares of the velocities are equal.

Remark. If DB, *db*, be taken extremely ſmall, the products $BD \times F$ and $bd \times f$ may be called the momentary actions of the forces, or the momentary increments of the ſquares of the velocities. It is uſually expreſſed, by the writers on the higher mechanics, by the ſymbol $f\dot{s}$, or $f\,ds$, where f means the accelerating force, and $\dot{s}$ or ds means the indefinitely ſmall ſpace along which it is uniformly exerted. And the propoſition is expreſſed by the fluxionary equation $f\dot{s} = v\dot{v}$, becauſe $v\dot{v}$ is half the increment of v^2, as is well known.

Lemma 2. (being the 39th propoſition of the firſt book of Newton's Principia.) If a particle of matter, moving with any velocity along the line AC, (Pl. 6. fig. 6.) be impelled by an accelerating or retarding force, acting in the ſame or in the oppoſite direction, and if the intenſity of the force in the different points B, F, H, C, &c. be as the ordinates BD, FG, &c. to the line DGE, the areas BFGD, BHKD, &c. will be as the changes made on the ſquare of the velocity at B, when the particle arrives at the points F, H, &c.

For let BC be divided into innumerable ſmall portions, of which let FH be one, and let the force be ſuppoſed to act uniformly, or to be of invariable intenſity during the motion along FH; draw GI perpendicular to HK: It is evident that the rectangle FHIG will be as the product of the accelerating force by the ſpace along which it acts, and will therefore expreſs the momentary increment of the ſquare of the velocity. (Lemma 1.) The ſame may be ſaid of every ſuch rectangle.

And if the number of the portions, ſuch as FH, be increaſed, and their magnitude diminiſhed without end, the rectangles will ultimately occupy the whole curvilineal area, and the force will be continually varying in its intenſity. The curvilineal areas will therefore be as the finite changes made on the ſquare of the velocity, and the propoſition is demonſtrated.

Corol. The whole change made on the ſquare of the velocity is equal to the ſquare of that velocity which the accelerating force would communicate to the particle by impelling it along BC from a ſtate of reſt in B. For the area BCED will ſtill expreſs the ſquare of this velocity, and it equally expreſſes the change made on the ſquare of *any* velocity wherewith the particle may paſs through the point B, and is independent on the magnitude of that velocity.

Remark. The figure is adapted to the caſe where the forces all conſpire with the initial motion of the particle, or all oppoſe it, and the area expreſſes an augmentation or a diminution of the ſquare of the initial velocity. But the reaſoning would have been the ſame, although, in ſome parts of the line BC, the forces had conſpired with the initial motion, and in other parts had oppoſed it. In ſuch a caſe, the ordinates which expreſs the intenſity of the forces muſt lie on different ſides of the abſciſſa BC, and that part of the area which lies on one ſide muſt be conſidered as negative with reſpect to the other, and be ſubtracted from it. Thus, if the forces are repreſented by the ordinates of the dotted curve line DH*e*, which croſſes the abſciſſa in H, the figure will correſpond to the motion of a particle, which, after moving uniformly along AB, is ſubjected to the action of a variable accelerating force during its motion along BH, and the ſquare of its initial velocity is increaſed by the quantity BHD; after which it is retarded during its motion along HC, and the ſquare of its velocity in H is diminiſhed by a quantity HC*e*. Therefore the ſquare of the initial velocity is changed by a quantity BHD—HC*e*, or HC*e*—BHD.

This propoſition is perhaps the moſt important in the whole ſcience of mechanics, being the foundation of every application of mechanical theory to the explanation of natural phenomena. No traces of it are to be found in the writings of philoſophers before the publication of Newton's Principia, although it is aſſumed by John Bernoulli and other detractors from Newton's greatneſs as an elementary truth, without any acknowledgment of their obligations to its author. It is uſually expreſſed by the equation $f\dot{s}=v\dot{v}$ and $ff\dot{s}=v^2$, *i. e.* the ſum of the momentary actions is equal to the whole or finite increment of the ſquare of the velocity.

PROPOSITION.

When light paſſes obliquely into or out of a tranſparent ſubſtance, it is refracted ſo that the ſine of the angle of incidence is to the ſine of the angle of refraction in the conſtant ratio of the velocity of the refracted light to that of the incident light.

Let ST, KR (fig. 7.), repreſent two planes (parallel to, and equidiſtant from, the refracting ſurface XY) which bound the ſpace in which the light, during its paſſage, is acted on by the refracting forces, as before explained. The intenſity of the refracting forces being ſuppoſed equal at equal diſtances from the bounding planes, though any how different at different diſtances from them, may be repreſented by the ordinates T*a*, *nq*, *pr*, *c*R, &c. of the curve *abnpc*, of which the form muſt be determined from obſervation, and may remain for ever unknown. The phenomena of inflected light ſhow us that it is attracted by the refracting ſubſtance at ſome diſtances, and repelled at others.

Let the light, moving uniformly in the direction AB, enter the refracting ſtratum at B. It will not proceed in that direction, but its path will be incurvated upwards, while acted on by a repulſive force, and downwards, while impelled by an attractive force. It will deſcribe ſome curvilineal path B*do*, CDE, which AB touches in B, and will finally emerge from the refracting ſtratum at E, and move uniformly in a ſtraight line EF, which touches the curve in E. If, through *b*, the interſection of the curve of forces with its abſciſſa, we draw *b o*, cutting the path of the light in *o*, it is evident that this path will be concave upwards between B and *o*, and concave downwards between *o* and E. Alſo, if the initial velocity of the light has been ſufficiently ſmall, its path may be ſo much bent upwards, that in ſome point *d* its direction may be parallel to the bounding planes. In this caſe it is evident, that being under the influence of a repulſive force, it will be more bent upwards, and it will deſcribe *d f*, equal and ſimilar to *d* B, and emerge in an angle *g f s* equal to ABG. In this caſe it is reflected, making the angle of reflection equal to that of incidence. By which it appears how reflection, refraction, and inflection, are produced by the ſame forces and performed by the ſame laws.

But let the velocity be ſuppoſed ſufficiently great to enable the light to penetrate through the refracting ſtratum, and emerge from it in the direction EF; let AB and EF be ſuppoſed to be deſcribed in equal times: they will be proportional to the initial and final velocities of the light. Now, becauſe the refracting forces *muſt* act in a direction perpendicular to the refracting ſurface (ſince they ariſe from the joint action of all the particles of a homogeneous ſubſtance which are within the ſphere of mutual action), they cannot affect the motion of the light eſtimated in the direction of the refracting ſurface. If, therefore, AG be drawn perpendicular to ST, and FK to KR, the lines GB, EK, muſt be equal, becauſe they are the motions AB, EF, eſtimated in the direction of the planes. Draw now EL parallel to AB. It is alſo equal to it. Therefore EL, EF, are as the initial and final velocities of the light. But EF is to EL as the ſine of the angle ELK to the ſine of the angle EFK; that is, as the ſine of the angle ABH to the ſine of the angle FEI; that is, as the ſine of the angle of incidence to the ſine of the angle of refraction.

By the ſame reaſoning it will appear that light, moving in the direction and with the velocity FE, will deſcribe the path EDB, and will emerge in the direction and with the velocity BA.

Let another ray enter the refracting ſtratum perpendicularly at B, and emerge at Q. Take two points N, P, in the line BQ, extremely near to each other, ſo that the refracting forces may be ſuppoſed to act uniformly along the ſpace NP: draw NC, PD, parallel to ST, CM perpendicular to DP, and MO perpendicular to CD, which may be taken for a ſtraight line. Then, becauſe the forces at C and N are equal, by ſuppoſition they may be repreſented by the equal lines CM and NP. The force NP is wholly employed in accelerating the light along NP; but the force CM being tranſverſe to the motion BD, is but partly ſo employed, and may be conceived as ariſing from the joint action of the forces CO, OM, of which CO only is employed in accelerating the motion of the light, while OM is employed in incurvating its path. Now it is evident, from the ſimilarity of the triangles DCM, MCO, that DC : CM = CM : CO, and that $DC\times CO=CM\times CM=NP\times NP$. But $DC\times CO$ and $NP\times NP$ are as the products of the ſpaces by the accelerating forces, and expreſs the momentary increments of the ſquares of the velocities at C and N. (Lemma 1.) Theſe increments, therefore, are equal. And as this muſt be ſaid of every portion of the paths BCE and BNQ, it follows that the whole increment of the ſquare of the initial velocity produced in the motion along BCE, is equal to the increment

produced in the motion along BNQ. And, becauſe the initial velocities were equal in both paths, their ſquares were equal. Therefore the ſquares of the final velocities are alſo equal in both paths, and the final velocities themſelves are equal. The initial and final velocities are therefore in a conſtant ratio, whatever are the directions; and the ratio of the ſines of the angles of incidence and refraction being the ratio of the velocities of the refracted and incident light, by the former caſe of of prop. 1. is alſo conſtant.

Remark. The augmentation of the ſquare of the initial velocity is equal to the ſquare of the velocity which a particle of light would have acquired, if impelled from a ſtate of reſt at B along the line BQ, (Corol. of the Lemma 2.), and is therefore independent on the initial velocity. As this augmentation is expreſſed by the curvilineal area *a* T *bnpc* R, it depends both on the intenſity of the refracting forces, expreſſed by the ordinates, and on the ſpace through which they act, viz. TR. Theſe circumſtances ariſe from the nature of the tranſparent ſubſtance, and are characteriſtic of that ſubſtance. Therefore, to abbreviate language, we ſhall call this the *ſpecific velocity*.

This ſpecific velocity is eaſily determined for any ſubſtance in which the refraction is obſerved, by drawing L*i* perpendicular to EL, meeting in *i* the circle deſcribed with the radius EF. For E*i* being equal to EF, will repreſent the velocity of the refracted light, and EL repreſent the velocity of the incident light, and $Ei^2 = EL^2 + Li^2$, and therefore Li^2 is the augmentation of the ſquare of the initial velocity, and L*i* is the ſpecific velocity.

It will now be proper to deduce ſome corollaries from theſe propoſitions, tending to explain the chief phenomena of refraction.

1. When light is refracted towards the perpendicular to the refracting ſurface, it is accelerated; and it is retarded when it is refracted from the perpendicular. In the firſt caſe, therefore, it muſt be conſidered as having been acted on by forces conſpiring (in part at leaſt) with its motion, and *vice verſa*. Therefore, becauſe we ſee that it is always refracted towards the perpendicular, when paſſing from a void into any tranſparent ſubſtance, we muſt conclude that it is, on the whole, attracted by that ſubſtance. We muſt draw the ſame concluſion from obſerving, that it is refracted from the perpendicular in its paſſage out of any tranſparent ſubſtance whatever into a void. It has been attracted backwards by that ſubſtance.

This acceleration of light in refraction is contrary to the opinion of thoſe philoſophers who maintain, that illumination is produced by the undulation of an elaſtic medium. Euler attempts to prove, by mechanical laws, that the velocities of the incident and refracted light are proportional to the ſines of incidence and refraction, while our principles make them in this ratio inverſely. Boſcovich propoſed a fine experiment for deciding this queſtion. The aberration of the fixed ſtars ariſes from the combination of the motion of light with the motion of the teleſcope by which it is obſerved. Therefore this aberration ſhould be greater or leſs when obſerved by means of a teleſcope filled with water, according as light moves ſlower or ſwifter through water than through air. He was miſtaken in the manner in which the concluſion ſhould be drawn from the obſervation made in the form preſcribed by him: and the experiment has not yet been made in a convincing manner; becauſe no fluid has been found of ſufficient tranſparency to admit of the neceſſary magnifying power. It is an experiment of the greateſt importance to optical ſcience.

2. If the light be moving within the tranſparent ſubſtance, and if its velocity (eſtimated in a direction perpendicular to the ſurface) do not exceed the ſpecific velocity of that ſubſtance, it will not emerge from it, but will be reflected backwards in an angle equal to that of its incidence. For it muſt be obſerved, that in the figure of laſt propoſition, the exceſs of the ſquare of EF above the ſquare of EL is the ſame with the exceſs of the ſquare of KF above the ſquare of KL. Therefore the ſquare of the ſpecific velocity is equal to the augmentation or diminution of the ſquare of the perpendicular velocity. If therefore the initial perpendicular velocity FK (Pl. 6. fig. 8.) be preciſely equal to the ſpecific velocity, the light will juſt reach the farther ſide of the attracting ſtratum, as at B, where its perpendicular velocity will be completely extinguiſhed, and its motion will be in the direction BT. But it is here under the influence of forces tending towards the plane KR, and its motion will therefore be ſtill incurvated towards it; and it will deſcribe a curve BD equal and ſimilar to EB, and finally emerge back from the refracting ſtratum into the tranſparent ſubſtance in an angle RDA equal to KEF.

If the direction of the light be ſtill more oblique, ſo that its perpendicular velocity is leſs than the ſpecific velocity, it will not reach the plane ST, but be reflected as ſoon as it has penetrated ſo far that the ſpecific velocity of the part penetrated (eſtimated by the compounding part of the area of forces) is equal to its perpendicular velocity. Thus the ray *f*E will deſcribe the path E*d*D*a* penetrating to *bd*, ſo that the correſponding area of forces *abce* is equal to the ſquare of *fk*, its perpendicular velocity.

The extreme brilliancy of dew-drops and of jewels had often excited the attention of philoſophers, and it always appeared a difficulty how light was reflected at all from the poſterior ſurface of tranſparent bodies. It afforded Sir Iſaac Newton his ſtrongeſt argument againſt the uſual theory of reflection, viz. that it was produced by impact on ſolid elaſtic matter. He was the firſt who took notice of the total reflection in great obliquities; and very properly aſked how it can be ſaid that there is any impact in this caſe, or that the reflecting impact ſhould ceaſe at a particular obliquity?

It muſt be acknowleged that it is a very curious circumſtance, that a body which is perfectly tranſparent ſhould ceaſe to be ſo at a certain obliquity; that a great obliquity ſhould not hinder light from paſſing from a void into a piece of glaſs; but that the ſame obliquity ſhould prevent it from paſſing from the glaſs into a void. The fineſt experiment for illuſtrating the fact is, to take two pieces of mirror-glaſs, not ſilvered, and put them together with a piece of paper between them, forming a narrow margin all round to keep them apart. Plunge this apparatus into water. When it is held nearly parallel to the ſurface of the water, every thing at the bottom of the veſſel will be ſeen clearly through the glaſſes; but when they are turned ſo as to be inclined about 50 degrees, they will intercept the light as much as if they were plates of iron. It will be proper to ſoak the paper in varniſh, to prevent water from getting between the glaſſes.

What is called the brilliant cut in diamonds, is ſuch a diſpoſition of the poſterior facets of the diamond, that the light is made to fall upon them ſo obliquely that none of it can go through, but all is reflected. To produce this effect in the greateſt poſſible degree, is a matter of calculation, and merits the attention of the lapidary. When diamonds are too thin to admit of this form, they are cut in what is called the roſe-faſhion. This has a plain back, and the facets are all on the front, and ſo diſpoſed as to refract the rays into ſufficient obliquities, to be ſtrongly reflected from the poſterior plane. Doublets are made by cutting one thin diamond roſe-faſhion, and another ſimilar one is put behind it, with their plane ſurfaces joined. Or, more frequently, the outſide diamond has the anterior facets of the brilliant, and the inner has the form of the inner part of a brilliant. If they be joined with very pure and ſtrongly refracting varniſh, little light is reflected from the

ſeparating plane, and their brilliancy is very conſiderable, though ſtill inferior to a true and deep brilliant. If no varniſh be uſed, much of the light is reflected from the flat ſide, and the effect of the poſterior facets is much diminiſhed. But doublets might be conſtructed, by making the touching ſurfaces of a ſpherical form (of which the curvature ſhould have a due proportion to the ſize of the ſtone), that would produce an effect nearly equal to that of the moſt perfect brilliant.

3. Since the change made on the ſquare of the velocity of the incident light is a conſtant quantity, it follows, that the refraction will diminiſh as the velocity of the incident light increaſes. For if L*i* in fig. 7. be a conſtant quantity, and EL be increaſed, it is evident that the ratio of E*i*, or its equal EF, to EL will be diminiſhed, and the angle LEF, which conſtitutes the refraction, will be diminiſhed. The phyſical cauſe of this is eaſily ſeen: when the velocity of the incident light is increaſed, it employs leſs time in paſſing through the refracting ſtratum or ſpace between the planes ST and KR, and is therefore leſs influenced by the refracting forces. A ſimilar effect would follow if the tranſparent body were moving with great velocity towards the luminous body.

Some naturaliſts have accounted for the different refrangibility of the differently coloured rays, by ſuppoſing that the red rays move with the greateſt rapidity, and they have determined the difference of original velocity which would produce the obſerved difference of refraction, But this difference would be obſerved in the eclipſes of Jupiter's ſatellites. They ſhould be ruddy at their emerſions, and be ſome ſeconds before they attain their pure whiteneſs; and they ſhould become blueiſh immediately before they vaniſh in immerſions. This is not obſerved. Beſides, the difference in refrangibility is much greater in flint-glaſs than in crown-glaſs, and this would require a proportionally greater difference in the original velocities. This explanation therefore muſt be given up.

It ſhould follow, that the refraction of a ſtar which is in our meridian at ſix o'clock in the evening ſhould be greater than that of a ſtar which comes on the meridian at ſix in the morning; becauſe we are moving away from the firſt, and approaching to the laſt. But the difference is but $\frac{1}{2000}$ of the whole, and cannot be obſerved with ſufficient accuracy in any way yet practiſed. A form of obſervation has been propoſed by Dr. Blair, profeſſor of practical aſtronomy in the univerſity of Edinburgh, which promiſes a very ſenſible difference of refraction. It is alſo to be expected, that a difference will be obſerved in the refraction of the light from the eaſt and weſtern ends of Saturn's ring. Its diameter is about 26 times that of the earth, and it revolves in 10h. 32′; ſo that the velocity of its edge is about $\frac{1}{20000}$ of the velocity of the ſun's light. If therefore the light be reflected from it according to the laws of perfect elaſticity, or in the manner here explained, that which comes to us from the weſtern extremity will move more ſlowly than that which comes from the eaſtern extremity in the proportion of 2500 to 2501. And if Saturn can be ſeen diſtinctly after a refraction of 30° through a priſm, the diameter of the ring will be increaſed one half in one poſition of the teleſcope, and will be as much diminiſhed by turning the teleſcope half round its axis; and an intermediate poſition will exhibit the ring of a diſtorted ſhape. This experiment is one of the moſt intereſting to optical ſcience, as its reſult will be a ſevere touchſtone of the theories which have been attempted for explaining the phenomena on mechanical principles.

If the tail of a comet be impelled by the rays of the ſun, as is with great probability ſuppoſed by Euler and others, the light by which its extreme parts are ſeen by us muſt have its velocity greatly diminiſhed, being reflected by particles which are moving away from the ſun with immenſe rapidity. This may perhaps be diſcovered by its greater aberration and refrangibility.

As common day-light is nothing but the ſun's light reflected from terreſtrial bodies, it is reaſonable to expect that it will ſuffer the ſame refraction. But nothing but obſervation could aſſure us that this would be the caſe with the light of the ſtars; and it is rather ſurpriſing that the velocity of their light is the ſame with that of the ſun's light. It is a circumſtance of connection between the ſolar ſyſtem and the reſt of the univerſe. It was as little to be looked for on the light of terreſtrial luminaries. If light be conceived as ſmall particles of matter emitted from bodies by the action of accelerating forces of any kind, the vaſt diverſity which we obſerve in the conſtitution of ſublunary bodies ſhould make us expect differences in this particular. Yet it is found, that the light of a candle, of a glow-worm, &c. ſuffers the ſame refraction, and conſiſts of the ſame colours. This circumſtance is adduced as an argument againſt the theory of emiſſion. It is thought more probable that this ſameneſs of velocity is owing to the nature of the medium, which determines the frequency of its undulations and the velocity of their propagation.

4. When two tranſparent bodies are contiguous, the light in its paſſage out of the one into the other will be refracted towards or from the perpendicular, according as the refracting forces of the ſecond are greater or leſs than thoſe of the firſt, or rather according as the area expreſſing the ſquare of the ſpecific velocity is greater or leſs. And as the difference of theſe areas is a determined quantity, the difference between the velocity in the medium of incidence and the velocity in the medium of refraction will alſo be a determined quantity. Therefore the ſine of the angle of incidence will be in a conſtant ratio to the ſine of the angle of refraction; and this ratio will be compounded of the ratio of the ſine of incidence in the firſt medium to the ſine of refraction in a void; and the ratio of the ſine of incidence in a void to the ſine of refraction in the ſecond medium. If therefore a ray of light, moving through a void in any direction, ſhall paſs through any number of media bounded by parallel planes, its direction in the laſt medium will be the ſame as if it had come into it from a void.

5. It alſo follows from theſe propoſitions, that if the obliquity of incidence on the poſterior ſurface of a tranſparent body be ſuch that the light ſhould be reflected back again, the placing a maſs of the ſame or of another medium in contact with this ſurface will cauſe it to be tranſmitted, and this the more completely, as the added medium is more denſe or more refractive; and the reflection from the ſeparating ſurface will be the more vivid in proportion as the poſterior ſubſtance is leſs denſe or of a ſmaller refractive power. It is not even neceſſary that the other body be in contact; it is enough if it be ſo near that thoſe parts of the refracting ſtrata which are beyond the bodies interfere with or coincide with each other.

All theſe conſequences are agreeable to experience. The brilliant reflection from a dew-drop ceaſes when it touches the leaf on which it reſts: the brilliancy of a diamond is greatly damaged by moiſture getting behind it: the opacity of the combined mirror plates, mentioned in the ſecond corollary, is removed by letting water get between them: a piece of glaſs is diſtinctly or clearly ſeen in air, more faintly when immerſed in water, ſtill more faintly amidſt oil of olives, and it is hardly perceived in ſpirits of turpentine. Theſe phenomena are incompatible with the notion that reflection is occaſioned by impact on ſolid matter, whether of the tranſparent body, or of any æther or other fancied fluid behind it; and their perfect coincidence with the legitimate conſequences of the aſſumed principles, is a ſtrong argument in favour of the truth of thoſe principles.

It is worth while to mention here a fact taken notice of by Mr. Beguelin, and propoſed as a great difficulty in the Newtonian theory of refraction. In order to get the greateſt poſſible refraction, and the ſimpleſt meaſure of the refracting power at the anterior ſurface of any tranſparent ſubſtance, Sir Iſaac Newton enjoins us to employ a ray of light falling on the ſurface *quam obliquiſſime*. But Mr. Beguelin found, that when the obliquity of incidence in glaſs was about 89° 50′, no light was refracted, but that it was wholly reflected. He alſo obſerved, that when he gradually increaſed the obliquity of incidence on the poſterior ſurface of the glaſs, the light which emerged laſt of all did not ſkim along the ſurface, making an angle of 90° with the perpendicular, as it ſhould do by the Newtonian theory, but made an angle of more than ten minutes with the poſterior ſurface. Alſo, when he began with very great obliquities, ſo that all the light was reflected back into the glaſs, and gradually diminiſhed the obliquity of incidence, the firſt ray of light which emerged did not ſkim along the ſurface, but was raiſed about 10 or 15 minutes.

But all theſe phenomena are neceſſary conſequences of our principles, combined with what obſervation teaches us concerning the forces which bodies exert on the rays of light. It is evident, from the experiments of Grimaldi and Newton, that light is both attracted and repelled by ſolid bodies. Newton's ſagacious analyſis of theſe experiments diſcovered ſeveral alternations of actual inflection and deflection; and he gives us the preciſe diſtance from the body when ſome of theſe attractions end and repulſion commences; and the moſt remote action to be obſerved in his experiments is repulſion. Let us ſuppoſe this to be the caſe, although it be not abſolutely neceſſary. Let us ſuppoſe that the forces are repreſented by the ordinates of a curve *a b n p c* (ſee pl. 6, fig. 7.) which croſſes the abſciſſa in *b*. Draw *b o* parallel to the refracting ſurface. When the obliquity of incidence of the ray A B has become ſo great, that its path in the glaſs, or in the refracting ſtratum, does not cut, but only touches the line *o b*, it can penetrate no further, but is totally reflected; and this muſt happen in all greater obliquities. On the other hand, when the ray L E, moving within the glaſs, has but a very ſmall perpendicular velocity, it will penetrate the refracting ſtratum no further than till this perpendicular velocity is extinguiſhed, and its path becomes parallel to the ſurface, and it will be reflected back. As the perpendicular velocity increaſes by diminiſhing the obliquity of incidence, it will penetrate farther; and the laſt reflection will happen when it penetrates ſo far that its path touches the line *o b*. Now diminiſh the obliquity by a ſingle ſecond; the light will get over the line *o b*, will deſcribe an arch *o d* B concave upwards, and will emerge in a direction B A, which does not ſkim the ſurface, but is ſenſibly raiſed above it. And thus the facts obſerved by M. Beguelin, inſtead of being an objection againſt this theory, afford an argument in its favour.

7. Thoſe philoſophers who maintain the theory of undulation, are under the neceſſity of connecting the diſperſive powers of bodies with their mean refractive powers. Mr. Euler has attempted to deduce a neceſſary difference in the velocity of the rays of different colours from the different frequency of the undulations, which he aſſigns as the cauſe of their different colorific powers. His reaſoning on this ſubject is of the moſt delicate nature, and unintelligible to ſuch as are not completely maſter of the infiniteſimal calculus of partial differences, and is unſatisfactory to ſuch as are able to go through its intricacies. It is contradicted by fact. He ſays, and indeed to be conſiſtent he muſt ſay it, that muſical ſounds which differ greatly in acuteneſs are propagated through the air with different velocities: but one of the ſmalleſt bells in the chimes of St. Giles's church in Edinburgh was ſtruck againſt the rim of the very deep-toned bell on which the hours are ſtruck. When the ſound was liſtened to by a nice obſerver at the diſtance of more than two miles, no interval whatever could be obſerved. A ſimilar experiment was exhibited to Mr. Euler himſelf, by means of a curious muſical inſtrument (if it can be ſo called) uſed at St. Peterſburgh, and which may be heard at three or four miles diſtance. But the experiment with the bells is unexceptionable, as the two ſounds were produced in the very ſame inſtant. This connection between the refrangibility in general and the velocity muſt be admitted, in its full extent, in every attempt to explain refraction by undulation; and Euler was forced by it to adopt a certain conſequence which made a neceſſary connection between the mean refraction and the diſperſion of heterogeneous rays. Confident of his analyſis, he gave a deaf ear to all that was told him of Mr. Dollond's improvements on teleſcopes, and aſſerted, that they could not be ſuch as were related; for an increaſe of mean refraction muſt always be accompanied with a *determined* increaſe of diſperſion. Newton had ſaid the ſame thing, being miſled by a limited view of his own principles; but the diſperſion aſſigned by him was different from that aſſigned by Euler. The diſpute between Euler and Dollond was confined to the deciſion of this queſtion only; and when ſome glaſſes made by a German chemiſt at St. Peterſburgh convinced Euler that his determination was erroneous, he had not the candour to give up the principle which had forced him to this determination of the diſperſion, but immediately introduced a new theory of the achromatic teleſcopes of Dollond; a theory which took the artiſts out of the track marked out by mathematicians, and in which they had made conſiderable advances, and led them into another path, propoſing *maxims* of conſtruction hitherto untried, and inconſiſtent with real improvements which they had already made. The leading principle in this theory is to arrange the different ultimate images of a point which ariſe either from the errors of a ſpherical figure or different refrangibility, in a ſtraight line paſſing through the centre of the eye. The theory itſelf is ſpecious; and it requires great mathematical ſkill to accompliſh this point, and hardly leſs to decide on the propriety of the conſtruction which it recommends. It is therefore but little known. But that it is a falſe theory, is evident from one ſimple conſideration. In the moſt indiſtinct viſion ariſing from the worſt conſtruction, this rectilineal arrangement of the images obtains completely in that pencil which is ſituated in the axis, and yet the viſion is indiſtinct. But, what is to our preſent purpoſe, this new theory is purely mathematical, ſuiting any obſerved diſperſive power, and has no connection with the phyſical theory of undulations, or indeed with any mechanical principles whatever. But, by admitting any diſperſive power, whatever may be the mean refraction, all the phyſical doctrines in his *Nova Theoria Lucis et Colorum* are overlooked, and therefore never once mentioned, although the effects of Mr. Zeiher's glaſs are taken notice of as inconſiſtent with that mechanical propoſition of Newton's which occaſioned the whole diſpute between Euler and Dollond.

They are indeed inconſiſtent with the univerſality of that propoſition. Newton advances it in his Optics merely as a mathematical propoſition highly probable, but ſays that it will be corrected if *he ſhall find it* falſe. The ground on which he *ſeems* (for he does not expreſsly ſay ſo) to reſt its probability is a limited view of his own principle, the action of bodies on light. He (not knowing any cauſe to the contrary) ſuppoſed that the action of all bodies was ſimilar on the different kinds of light, that is, that the ſpecific velocities of the differently coloured rays had a determined proportion to each other. This was gratuitous; and it might have been doubted by him who had obſerved the analogy between the chemical actions of bodies by electrive attractions and repulſions, and the ſimilar actions on light. Not only have different menſtrua unequal actions on their ſolids, but the order of their affinities is alſo different. In

like manner, we might expect not only that ſome bodies would attract light in general more than others, but alſo might differ in the proportion of their actions on the different kinds of light, and this ſo much that ſome might even attract the red more than the violet. The late diſcoveries in chemiſtry ſhow us ſome very diſtinct proofs, that light is not exempted from the laws of chemical action, and that it is ſuſceptible of chemical combination. The changes produced by the ſun's light on vegetable colours, ſhows the neceſſity of illumination to produce the green fecula; and the aromatic oils of plants, the irritability of their leaves by the action of light, the curious effects of it on the mineral acids, on manganeſe, and the calces of biſmuth and lead, and the imbibition and ſubſequent emiſſion of it by phoſphoreſcent bodies, are ſtrong proofs of its chemical affinities, and are quite inexplicable on the theory of undulations.

All theſe conſiderations taken together, had they been known to Sir Iſaac Newton, would have made him expect differences quite anomalous in the diſperſive powers of different tranſparent bodies; at the ſame time that they would have afforded to his ſagacious mind the ſtrongeſt arguments for the actual emiſſion of light from the luminous body.

HAVING in this manner eſtabliſhed the obſerved law of refraction on mechanical principles, ſhowing it to be a neceſſary conſequence of the known action of bodies on light, we proceed to trace its mathematical conſequences through the various caſes in which it may be exhibited to our obſervation. Theſe conſtitute that part of the mathematical branch of optical ſcience which is called DIOPTRICS.

We are quite unacquainted with the law of action of bodies on light, that is, with the variation of the intenſity of the attractions and repulſions exerted at different diſtances. All that we can ſay is, that from the experiments and obſervations of Grimaldi, Newton, and others, light is deflected towards a body, or is attracted by it, at ſome diſtances, and repelled at others, and this with a variable intenſity. The action may be extremely different, both in extent and force, in different bodies, and change by a very different law with the ſame change of diſtance. But, amidſt all this variety, there is a certain ſimilarity ariſing from the joint action of many particles, which ſhould be noticed, becauſe it tends both to explain the ſimilarity obſerved in the refractions of light, and alſo its connection with the phenomena of reflection.

The law of variation in the joint action of many particles adjoining to the ſurface of a refracting medium, is extremely different from that of a ſingle particle; but when this laſt is known, the other may be found out. We ſhall illuſtrate this matter by a very ſimple caſe. Let DE (pl. 6. fig. 9.) be the ſurface of a medium, and let us ſuppoſe that the action of a particle of the medium on a particle of light extends to the diſtance EA, and that it is proportional to the ordinates ED, F*f*, G*g*, H*b*, &c. of the line A*b* C*g f* D; that is, that the action of the particle E of the medium on a particle of light in F, is to its action on a particle in H as F*f* to H*b*, and that it is attracted at F but repelled at H, as expreſſed by the ſituation of the ordinates with reſpect to the abſciſſa. In the line AE produced to B, make EB, Eχ, E$\varkappa$, Eγ, Eφ, &c. reſpectively equal to Eα, EH, EC, EG, EF, &c.

It is evident that a particle of the medium at B will exert no action on the particle of light in E, and that the particles of the medium in $\varkappa\gamma\varphi$ E, will exert on it actions proportional to H*b*, G*g*, F*f*, ED. Therefore, ſuppoſing the matter of the medium continuous, the whole action exerted by the row of particles EB will be repreſented by the area A*b*DE; and the action of the particles between B and φ will be repreſented by the area A*b*C*f*F, and that of the particles between E and φ by the area F*f*DE.

Now let the particle of light be in F, and take F*o*=AE. It is no leſs evident that the particle of light in F will be acted on by the particles in E*o* alone, and that it will be acted on in the ſame manner as a particle in E is acted on by the particles in φB. Therefore the action of the whole row of particles EB on a particle in F will be repreſented by the area A*b*C*f*F. And thus the action on a particle of light in any point of AE will be repreſented by the area which lies beyond it.

But let us ſuppoſe the particles of light to be within the medium, as at φ, and make φd=AE. It is again evident that it is acted on by the particles of the medium between φ and *d* with a force repreſented by the area A*b*CDE, and in the oppoſite direction by the particles in Eφ with a force repreſented by the area F*f* DE. This balances an equal quantity of action, and there remains an action expreſſed by the area A*b*C*f*F. Therefore, if an equal and ſimilar line to A*b*CDE be deſcribed on the abſciſſa EB, the action of the medium on a particle of light in φ will be repreſented by the area φf*k b*B, lying beyond it.

If we now draw a line AKLMRNPB whoſe ordinates CK, FQ, φR, &c. are as the areas of the other curve, eſtimated from A and B; theſe ordinates will repreſent the whole forces which are exerted by the particles in EB, on a particle of light moving from A to B. This curve will cut the axis in points L N ſuch that the ordinates drawn through them intercept areas of the firſt curve, which are equal on each ſide of the axis; and in theſe points the particle of light ſuſtains no action from the medium. Theſe points are very different from the ſimilar points of the curve expreſſing the action of a ſingle particle. Theſe laſt are in the very places where the light ſuſtains the greateſt repulſive action of the whole row of particles. In the ſame manner may a curve be conſtructed, whoſe ordinates expreſs the united action of the whole medium.

From theſe obſervations we learn in general, that a particle of light within the ſpace of action is acted on with equal forces, and in the ſame direction, when at equal diſtances on each ſide of the ſurface of the medium.

Of the Focal Diſtance of Rays refracted by paſſing out of one Medium into another of different Denſity and through a plane Surface.

Lemma. The indefinitely ſmall variation of the angle of incidence is to the ſimultaneous variation of the angle of refraction as the tangent of incidence is to the tangent of refraction; or, the cotemporaneous variations of the angles of incidence and refraction are proportional to the tangents of theſe angles.

Let RVF, *r*V*f* (pl. 6. fig. 10.) be the progreſs of the rays refracted at V (the angle *r*VR being conſidered in its naſcent or evaneſcent ſtate), and VC perpendicular to the refracting ſurface VA. From C draw CD, Cβ perpendicular to the incident and refracted rays RV, VF, cutting *r*V, V*f* in δ and β, and let C*d*, C*b* be perpendicular to *r*V, V*f*.

Becauſe the ſines of incidence and refraction are in a conſtant ratio, their ſimultaneous variations are in the ſame conſtant ratio. Now the angle RV*r* is to the angle FV*f* in the ratio of $\frac{B\beta}{BV}$ to $\frac{D\delta}{DV}$; that is, of $\frac{BC}{BV}$ to $\frac{DC}{DV}$; that is, of $\frac{\text{ſin. incid.}}{\text{coſ. incid.}}$ to $\frac{\text{ſin. refr.}}{\text{coſ. refr.}}$; that is, of *tan. incid.* to *tan refr.*

Corollary. The difference of theſe variations is to the greateſt or leaſt of them as the difference of the tangents to the greateſt or leaſt tangent.

PROBLEM.

Let two rays RV, RP diverge from, or converge to, a point R (pl. 7. fig. 1, 2, 3, 4.), and paſs through the plane ſurface PV ſeparating two refracting mediums AB, of which let B be

the moſt refracting, and let RV be perpendicular to the ſurface. It is required to determine the point of diſperſion or convergence, F, of the refracted rays VD, PE.

Make VR to VG as the ſine of refraction to the ſine of incidence, and draw GIK parallel to the ſurface, cutting the incident ray in I. About the centre P, with the radius PI, deſcribe an arch of a circle IF, cutting VR in F; draw PE tending from or towards F. We ſay PE is the refracted ray, and F the point of diſperſion or convergence of the rays RV, RP, or the conjugate focus to R.

For ſince GI and PV are parallel, and PF equal to PI, we have PF : PR = PI : PR, = VG : VR, = ſin. incid. : ſin. refr. But PF : PR = ſin. PRV : ſin. PFV, and RRV is equal to the angle of incidence at P; therefore PFV is the correſponding angle of refraction, FPE is the refracted ray, and F the conjugate focus to R.

Corol. 1. If diverging or converging rays fall on the ſurface of a more refracting medium, they will diverge or converge leſs after refraction, F being farther from the ſurface than R. The contrary muſt happen when the diverging or converging rays fall on the ſurface of a leſs refracting medium, becauſe, in this caſe, F is nearer to the ſurface than R.

Corol. 2. Let R*p* be another ray, more oblique than RP, the refracting point *p* being farther from V, and let *ſpe* be the refracted ray, determined by the ſame conſtruction. Becauſe the arches FI, *fi*, are perpendicular to their radii, it is evident that they will converge to ſome point within the angle RIK, and therefore will not croſs each other between F and I: therefore R*f* will be greater than RF, as RF is greater than RG, for ſimilar reaſons. Hence it follows, that all the rays which tended from or towards R, and were incident on the whole of VP*p*, will not diverge from or converge to F, but will be diffuſed over the line GF*f*. This diffuſion is called aberration from the focus, and is ſo much greater as the rays are more oblique. No rays flowing from or towards R will have point of concourſe with RV nearer to R than F is: But if the obliquity be inconſiderable, ſo that the ratio of RP to FP does not differ ſenſibly from that of RV to FV, the point of concourſe will not be ſenſibly removed from G. G is therefore uſually called the *conjugate focus* to R. It is the conjugate focus of an indefinitely ſlender pencil of rays falling perpendicularly on the ſurface. The conjugate focus of an oblique pencil, or even of two oblique rays, whoſe diſperſion on the ſurface is conſiderable, is of more difficult inveſtigation. See *Graveſand's Natural Philoſophy* for a very neat and elementary determination.

In a work of this kind, it is enough to have pointed out, in an eaſy and familiar manner, the nature of optical aberration. But as this is the chief cauſe of the imperfection of optical inſtruments, and as the only method of removing this imperfection is to diminiſh this aberration, or correct it by a ſubſequent aberration in the oppoſite direction, we ſhall here give a fundamental and very ſimple propoſition, which will (with obvious alterations) apply to all important caſes. This is the determination of the focus of an infinitely ſlender pencil of oblique rays RP, R*p*.

"Retaining the former conſtruction for the ray PF. (fig. 1.) ſuppoſe the other ray R*p* infinitely near to RP. Draw PS perpendicular to PV, and R*r* perpendicular to RP, and make P*r* : PS = VR : VF. On P*r* deſcribe the ſemicircle *r*RP, and on PS the ſemicircle SφP, cutting the refracted ray PF in φ, draw *pr*, *p*S, *p*φ." It follows from the lemma, that if φ be the focus of refracted rays, the variation Pφp of the angle of refraction is to the correſponding variation PR*p* of the angle of incidence as the tangent of the angle of refraction VFP to the tangent of the angle of incidence VRP. Now P*p* may be conſidered as coinciding with the arch of the ſemicircles. Therefore the angles PR*p*, P*rp* are equal, as alſo the angles Pφp, PS*p*. But PS*p* is to P*rp* as P*r* to PS; that is, as VR to VF; that is, as the cotangent of the angle of incidence to the cotangent of the angle of refraction; that is, as the tangent of the angle of refraction to the tangent of the angle of incidence. Therefore the point φ is the focus.

Of Refraction by Spherical Surfaces.

General Problem.

To find the focus of refracted rays, the focus of incident rays being given.

Let PVπ (Pl. 7. fig. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,) be a ſpherical ſurface whoſe centre is C, and let the incident light diverge from or converge to R.

Solution. Draw the ray RC through the centre, cutting the ſurface in the point V, which we ſhall denominate the *vertex*, while RC is called the *axis*. This ray paſſes on without refraction, becauſe it coincides with the perpendicular to the ſurface. Let RP be another incident ray, which is refracted at P; draw the radius PC. In RP make RE to RP as the ſine of incidence *m* to the ſine of refraction *n*; and about the centre R, with the diſtance RE, deſcribe the circle EK, cutting PC in K; draw RK and PF parallel to it, cutting the axis in F. PF is the refracted ray, and F is the focus.

For the triangles PCF, KCR are ſimilar, and the angles at P and K are equal. Alſo RK is equal to RE, and RPD is the angle of incidence. Now *m* : *n* = RK : RP, = ſin. DPR : ſin. RKP, = ſin. DPR : ſin. CPF. Therefore CPF is the angle of refraction correſponding to the angle of incidence RPD, and PF is the refracted ray, and F the focus. Q. E. D.

Cor. 1. CK : CP = CR : CF, and $CF = \frac{CP \times CR}{CK}$. Now CP × CR is a conſtant quantity; and therefore CF is reciprocally as CK, which evidently varies with a variation of the arch VP. Hence it follows, that all the rays flowing from R are not collected at the conjugate focus F. The ultimate ſituation of the point F, as the point P gradually approaches to, and at laſt coincides with, V, is called the *conjugate focus of central rays*, and the diſtance between this focus and the focus of a lateral ray is called *the aberration* of that ray, ariſing from the ſpherical figure.

There are, however, two ſituations of the point R ſuch that all the rays which flow from it are made to diverge from one point. One of thoſe is C (fig. 5.), becauſe they all paſs through without refraction, and therefore ſtill diverge from C; the other is when rays in the rare medium with a convex ſurface flow from a point R, ſo ſituated beyond the centre that CV is to CR as the ſine of incidence in the rare medium is to the ſine of refraction in the denſer, or when rays in the rare medium fall on the convex ſurface of the denſer, converging to F, ſo ſituated that CF : CV = *m* : *n*. In this caſe they will all be diſperſed from F, ſo ſituated that CV : CF = *n* : *m*, = CR : CV for ſine RPC : ſine RKC = *n* : *m*, = CR : CP, = ſine RPC : ſine PRC. Therefore the angle PRC is equal to RKC, or to FPC (by conſtruction of the problem), and the angle C is common to the triangles PRC, FPC; they are therefore ſimilar, and the angles PRC, FPC are equal, and *n* : *m* = CP : CF, = CK : CR, = CR : CP; therefore CP : CK = CP^2 : CR^2 : but CP and CR are conſtant quantities, and therefore CK is a conſtant quantity, and (by the corollary) CF is a conſtant quantity, and all the rays flowing from R are diſperſed from F by refraction. In like manner rays converging to F will by refraction converge to R. This was firſt obſerved by Huygens.

2. If the incident ray R'P (fig. 5.) is parallel to the axis RC, we have PO to CO as the ſine of incidence to the ſine of

refraction. For the triangles R'PK' PCO are ſimilar, and PO : CO = R'K' : R'P, = m : n.

3. In this caſe, too, we have the focal diſtance of central parallel rays reckoned from the vertex $= \frac{m}{m-n} \times$ VC. For ſince PO is ultimately VO, we have $m : n =$ VO : CO, and $m-n : m =$ VO—CO : VO, = VC : VO, and VO $= \frac{m}{m-n} \times$ VC. This is called the principal focal diſtance, or focal diſtance of parallel rays. Alſo CO, the principal focal diſtance reckoned from the centre, $= \frac{n}{m-n} \times$ VC.

N. B. When m is leſs than n, $m-n$ is a negative quantity. —Alſo obſerve, that in applying ſymbols to this computation of the focal diſtances, thoſe lines are to be accounted poſitive which lie from their beginnings, that is, from the vertex, or the centre, or the radiant point, in the direction of the incident rays. Thus when rays diverge from R on the convex ſurface of a medium, VR is accounted negative and VC poſitive. If the light paſſes out of air into glaſs, m is greater than n; but if it paſſes out of glaſs into air, m is leſs than n. If, therefore, parallel rays fall on the convex ſurface of glaſs out of air, in which caſe $m : n = 3 : 2$ very nearly, we have for the principal focal diſtance $\frac{3}{3-2}$VC, or $+3$VC. But if it paſs out of glaſs into the convex ſurface of air, we have VO $= \frac{2}{2-3}$VC, or -2VC; that is, the focus O will be in the ſame ſide of the ſurface with the incident light. In like manner, we ſhall have for theſe two caſes CO $= +2$VC and -3VC.

4. By conſtruction we have RK : RP = m : n
by ſimilarity of triangles PF : RK = CF : CR
therefore PF : PR = mCF : nCR
and mPR × CF = nCR × PF
therefore mPR : nCR = PF : CF
and mPR—nCR : mPR = PF—CF : PF
ultimately mVR—nCR : mVR = VC : VF

This is a very general optical theorem, and affords an eaſy method for computing the focal diſtance of refracted rays.

For this purpoſe let VR, the diſtance of the radiant point, be expreſſed by the ſymbol r, the diſtance of the focus of refracted rays by the ſymbol f, and the radius of the ſpherical ſurface by a; we have

$$mr-nr-a : mr = a : f, \text{ and}$$
$$f = \frac{mar}{mr-nr-a} = \frac{mar}{m-nr+nd}$$

In its application due attention muſt be paid to the qualities of r and a, whether they be poſitive or negative, according to the conditions of laſt corollary.

5. If Q (Pl. 7. fig. 8.) be the focus of parallel rays coming from the oppoſite ſide, we ſhall have RQ : QC = RV : VF. For draw Cq parallel to PF, cutting RP in q; then Rq : qC = RP : PF. Now q is the focus of the parallel rays FP, Cq. And when the point P ultimately coincides with the point V, q muſt coincide with Q, and we have RQ : QC = RV : VF.

This is the moſt general optical theorem, and is equally applicable to lenſes, or even to a combination of them, as to ſimple ſurfaces. It is alſo applicable to reflections, with this difference, that Q is to be aſſumed the focus of parallel rays coming the *ſame* way with the incident rays. It affords us the moſt compendious methods of computing ſymbolically and arithmetically the focal diſtances in all caſes.

6. We have alſo Rq : RP = RV : RF, and ultimately for central rays RQ : RV = RV : RF, and RF $= \frac{RV^2}{RQ}$.

7. Alſo Rq : RC = RP : RF, and ultimately RQ : RV = RC : RF, and RF $= \frac{RV \times RC}{RQ}$. *N. B.* Theſe four points Q, V, C, F, either lie all one way from R, or two of them forward and two backward.

8. Alſo, making O the principal focus of rays coming the ſame way, we have Rq : qC = Co : oF, and ultimately RQ : Qc = cO : OF, and OF $= \frac{QC \times CO}{RQ}$, and therefore reciprocally proportional to RQ, becauſe QC × co is a conſtant quantity.

Theſe corollaries or theorems give us a variety of methods for finding the focus of refracted rays, or the other points related to them; and each formula contains four points, of which any three being given the fourth may be found. Perhaps the laſt is the moſt ſimple, as the quantity $oc \times c$Q is always negative, becauſe o and Q are on different ſides.

9. From this conſtruction we may alſo derive a very eaſy and expeditious method of drawing many refracted rays. Draw through the centre C (fig. 15. 16.) a line to the point of incidence P, and a line CA parallel to the incident ray KP. Take VO to VC as the ſine of incidence to the ſine of refraction; and about A, with the radius VO, deſcribe an arch of a circle cutting PC produced in B. Join AB; and PF parallel to AB is the refracted ray. When the incident light is parallel to RC, the point A coincides with V, and a circle deſcribed round V with the diſtance VO will cut the lines PC, pC, &c. in the points *Bb*. The demonſtration is evident.

Having thus determined the focal diſtance of refracted rays, it will be proper to point out a little more particularly its relation to its conjugate focus of incident rays. We ſhall conſider the four caſes of light incident on the convex or concave ſurface of a denſer or a rarer medium.

1. Let light moving in air fall on the convex ſurface of glaſs (fig 5. to fig. 14). Let us ſuppoſe it tending to a point beyond the glaſs infinitely diſtant. It will be collected to its principal focus o beyond the vertex V. Now let the incident light converge a little, ſo that R is at a great diſtance beyond the ſurface. The focus of refracted rays F will be a little within O or nearer to V. As the incident rays are made to converge more and more, the point R comes nearer to V, and the point F alſo approaches it, but with a much ſlower motion, being always ſituated between O and C till it is overtaken by R at the centre C, when the incident light is perpendicular to the ſurface in every point, and therefore ſuffers no refraction. As R has overtaken F at C, it now paſſes it, and is again overtaken by it at V. Now the point R is on the ſide from which the light comes, that is, the rays diverge from R. After refraction they will diverge from F a little without R; and as R recedes farther from V, F recedes ſtill farther, and with an accelerated motion, till, when R comes to Q, F has gone to an infinite diſtance, or the refracted rays are parallel. When R ſtill recedes, F now appears on the other ſide, or beyond V; and as R recedes back to an infinite diſtance, F has come to O: and this completes the ſeries of variations, the motion of F during the whole changes of ſituation being in the ſame direction with the motion of R.

2. Let the light moving in air fall on the concave ſurface of glaſs; and let us begin with parallel incident rays, conceiving, as before, R to lie beyond the glaſs at an infinite diſtance. The refracted rays will move as if they came from the principal focus O, lying on that ſide of the glaſs from which the light comes. As the incident rays are made gradually more converging, and the point of convergence R comes toward the glaſs, the conjugate focus F moves backward from O; the refracted rays growing leſs and leſs diverging, till the point R comes to Q, the principal focus on the other ſide. The refracted rays are now parallel; or F has retreated to an infinite diſtance. The

incident light converging ſtill more, or R coming between Q and V, F will appear on the other ſide, or beyond the ſurface, or within the glaſs, and will approach it with a retarded motion, and finally overtake R at the ſurface of the glaſs. Let R continue its motion backwards (for it has all the while been moving backwards, or in a direction contrary to that of the light); that is, let R now be a radiant point, moving backwards from the ſurface of the glaſs. F will at firſt be without it, but will be overtaken by it at the centre C, when the rays will ſuffer no refraction. R ſtill receding, will get without F; and while R recedes to an infinite diſtance, F will recede to O, and the ſeries will be completed.

3. Let the light moving in glaſs fall on the convex ſurface of air; that is, let it come out of the concave ſurface of glaſs, and let the incident rays be parallel, or tending to R, infinitely diſtant: they will be diſperſed by refraction from the principal focus O within the glaſs. As they are made more converging, R comes nearer, and F retreats backward, till R comes to Q, the principal focus without the glaſs; when F is now at an infinite diſtance within the glaſs, and the refracted rays are parallel. R ſtill coming nearer, F now appears before the glaſs, overtakes R at the centre C, and is again overtaken by it at V. R now becoming a radiant point within the glaſs, F follows it backwards, and arrives at O, when R has receded to an infinite diſtance, and the ſeries is completed.

4. Let the incident light, moving in glaſs, fall on the concave ſurface of air, or come out of the convex ſurface of glaſs. Let it tend to a point R at an infinite diſtance without the glaſs. The refracted rays will converge to O, the principal focus without the glaſs. As the incident light is made more converging, R comes towards the glaſs, while F, ſetting out from *v*, alſo approaches the glaſs, and R overtakes it at the ſurface V. R now becomes a radiant point within the glaſs, receding backwards from the ſurface. F recedes ſlower at firſt, but overtakes R at the centre C, and paſſes it with an accelerated motion to an infinite diſtance; while R retreats to Q, the principal focus within the glaſs. R ſtill retreating, F appears before the glaſs; and while R retreats to an infinite diſtance, F comes to V, and the ſeries is completed.

§ 2. *Of Glaſſes.*

GLASS for optical purpoſes may be ground into nine different ſhapes. Glaſſes cut into five of thoſe ſhapes are called *lenſes*, which together with their axes are deſcribed in vol. 3. page 18. (See DIOPTRICS). The other four are,

1. A *plane-glaſs*, which is flat on both ſides, and of equal thickneſs in all its parts, as EF, fig. 1. in Pl. 8.

2. A *flat plano-convex*, whoſe convex ſide is ground into ſeveral little flat ſurfaces, as A fig. 2.

3. A *priſm*, which has three flat ſides, and when viewed endwiſe appears like an equilateral triangle, as B.

4. A *concavo-convex* glaſs, as C, which has hitherto received no name, and is ſeldom, if ever, made uſe of in optical inſtruments.

A ray of light G*b* (fig. 1.) falling perpendicularly on a plane glaſs EF, will paſs through the glaſs in the ſame direction *bi*, and go out of it into the air in the ſame ſtraight line *i* H.

A ray of light AB falling obliquely on a plane glaſs, will go out of the glaſs in the ſame direction, but not in the ſame ſtraight line: for in touching the glaſs, it will be refracted in the line BC; and in leaving the glaſs, it will be refracted in the line C D.

Lemma. There is a certain point E (fig. 3. to 6.) within every double convex or double concave lens, through which every ray that paſſes will have its incident and emergent parts QA, *aq* parallel to each other: but in a plano-convex or plano-concave lens, that point E is removed to the vertex of the concave or convex ſurface; and in a meniſcus, and in that other concavo-convex lens, it is removed a little way out of them, and lies next to the ſurface which has the greateſt curvature.

For let RE*r* be the axis of the lens joining the centres R, *r* of its ſurfaces A, *a*. Draw any two of their ſemidiameters RA, *ra* parallel to each other, and join the points A, *a*, and the line A*a* will cut the axis in the point E above deſcribed. For the triangles REA, *r*E*a* being equiangular, RE will be to E*r* in the given ratio of the ſemidiameters RA, *ra*; and conſequently the point E is invariable in the ſame lens. Now ſuppoſing a ray to paſs both ways along the line A*a*, it being equally inclined to the perpendiculars to the ſurfaces, will be equally bent, and contrarywiſe in going out of the lens; ſo that its emergent parts AQ, *aq* will be parallel. Now any of theſe lenſes will become plano-convex or plano-concave, by conceiving one of the ſemidiameters RA, *ra* to become infinite, and conſequently to become parallel to the axis of the lens, and then the other ſemidiameter will coincide with the axis; and ſo the points A, E or *a*, E will coincide. Q. E. D.

Corol. Hence when a pencil of rays falls almoſt perpendicularly upon any lens whoſe thickneſs is inconſiderable, the courſe of the ray which paſſes through E, above deſcribed, may be taken for a ſtraight line paſſing through the centre of the lens, without ſenſible error in ſenſible things. For it is manifeſt from the length of A*a* and from the quantity of the refractions at its extremities, that the perpendicular diſtance of AQ, *aq* when produced, will be diminiſhed both as the thickneſs of the lens and the obliquity of the ray is diminiſhed.

PROPOSITION I.

To find the focus of parallel rays falling almoſt perpendicularly upon any given lens.

Let E (fig. 7. to 12.) be the centre of the lens, R and *r* the centres of its ſurfaces, R*r* its axis, *g*EG a line parallel to the incident rays upon the ſurface B, whoſe centre is R. Parallel to *g*E draw a ſemidiameter BR, in which produced let V be the focus of the rays after their firſt refraction at the ſurface B, and joining V*r*, let it cut *g*E produced in G, and G will be the focus of the rays that emerge from the lens.

For ſince V is alſo the focus of the rays incident upon the ſecond ſurface A, the emergent rays muſt have their focus in ſome point of that ray which paſſes ſtraight through this ſurface; that is, in the line V*r*, drawn through its centre *r*: and ſince the whole courſe of another ray is reckoned a ſtraight line *g*EG, its interſection G with V*r* determines the focus of them all. Q. E. D.

Corol. 1. When the incident rays are parallel to the axis *r*R, the ſocal diſtance EF is equal to EG. For let the incident rays that were parallel to *g*E be gradually more inclined to the axis till they become parallel to it; and their firſt and ſecond focuſes V and G will deſcribe circular arches VT and GF whoſe centres are R and E. For the line RV is invariable; being in proportion to RB in a given ratio of the leſſer of the ſines of incidence and refraction to their difference; conſequently the line EG is alſo invariable, being in proportion to the given line RV in the given ratio of *r*E to *r*R, becauſe the triangles EG*r*, RV*r* are equiangular.

Corol. 2. The laſt proportion gives the following rule for finding the focal diſtance of any thin lens. As R*r*, the interval between the centres of the ſurfaces, is to *r*E, the ſemidiameter of the ſecond ſurface, ſo is RV or RT, the continuation of the firſt ſemidiameter to the firſt focus, to EG or EF, the focal diſtance of the lens; which, according as the lens is thicker or thinner in the middle than at its edges, muſt lie on the ſame ſide as the emergent rays, or on the oppoſite ſide.

Corol. 3. Hence, when rays fall parallel on both ſides of any lens, the focal diſtances EF, E*f*, are equal. For let *rt* be the continuation of the ſemidiameter E*r* to the firſt focus *t* of rays

falling parallel upon the ſurface A; and the ſame rule that gave *r*R to *r*E as RT to EF, gives alſo *r*R to RE as *rt* to E*f*. Whence E*f* and EF are equal, becauſe the rectangles under *r*E, RT and alſo under RE. *rt* are equal. For *r*E is to *rt* and alſo RE to RT in the ſame given ratio.

Corol. 4. Hence in particular in a double-convex or double-concave lens made of glaſs, it is as the ſum of their ſemidiameters (or in a meniſcus as their difference) to either of them, ſo is double the other, to the focal diſtance of the glaſs. For the continuations RT, *rt* are ſeverally double their ſemidiameters: becauſe in glaſs ET is to TR and alſo E*t* to *tr* as 3 to 2.

Corol. 5. Hence if the ſemidiameters of the ſurfaces of the glaſs be equal, its focal diſtance is equal to one of them; and is equal to the focal diſtance of a plano-convex or plano-concave glaſs whoſe ſemidiameter is as ſhort again. For conſidering the plane ſurface as having an infinite ſemidiameter, the firſt ratio of the laſt mentioned proportion may be reckoned a ratio of equality.

PROPOSITION II.

THE focus of incident rays upon a ſingle ſurface, ſphere, or lens being given, it is required to find the focus of the emergent rays.

Let any point Q (Pl. 9. fig. 1. to 6.) be the focus of incident rays upon a ſpherical ſurface, lens, or ſphere, whoſe centre is E; and let other rays come parallel to the line QE*q* the contrary way to the given rays, and after refraction let them belong to a focus F; then taking E*f* equal to EF in the lens or ſphere, but equal to FC in the ſingle ſurface, ſay as QP to FE ſo E*f* to *fq*; and placing *fq* the contrary way from *f* to that of FQ from F, the point *q* will be the focus of the refracted rays, without ſenſible error; provided the point Q be not ſo remote from the axis, nor the ſurfaces ſo broad, as to cauſe any of the rays to fall too obliquely upon them.

For with the centre E and ſemidiameters EF and E*f* deſcribe two arches FG, *fg* cutting any ray QA*aq* in G and *g*, and draw EG and E*g*. Then ſuppoſing G to be a focus of incident rays (as GA), the emergent rays (as *agq*) will be parallel to GE (by Corol. from former Prop.); and on the other hand ſuppoſing *g* another focus of incident rays (as *ga*), the emergent rays (as AGQ) will be parallel to *g*E. Therefore the triangles QGE, E*gq* are equiangular, and conſequently QG is to GE as E*g* to *gq*; that is, when the ray QA*aq* is the neareſt to QE*q*, QF is to FE as E*f* to *fg*. Now when Q accedes to F and coincides with it, the emergent rays become parallel, that is *q* recedes to an infinite diſtance: and conſequently when Q paſſes to the other ſide of F, the focus *q* will alſo paſs through an infinite ſpace from one ſide of *f* to the other ſide of it. Q. E. D.

Corol. 1. In a ſphere or lens the focus *q* may be found by this rule: As QF to QE ſo QE to Q*q*, to be placed the ſame way from Q as QF lies from Q. For let the incident and emergent ray QA, *qa* be produced till they meet in *e*; and the triangles QGE, Q*eq* being equiangular, we have QG to QE as Q*e* to Q*q*; and when the angles of theſe triangles are vaniſhing, the point *e* will coincide with E; becauſe in the ſphere the triangle A*ea* is equiangular at the baſe A*a*, and conſequently A*e* and *ae* will at laſt become ſemidiameters of the ſphere. In a lens the thickneſs A*a* is inconſiderable.

The focus may alſo be found by this rule;—QF : FE :: QE : E*q*, for QG : GE :: QA : A*q*. And then the rule formerly demonſtrated for ſingle ſurfaces holds good for the lenſes.

Corol. 2. In all caſes the diſtance *fq* varies reciprocally as FQ does; and they lie contrarywiſe from *f* and F; becauſe the rectangle or the ſquare under EF and E*f*, the middle terms in the foregoing proportions, is invariable.

The principal focal diſtance of a lens may not only be found by collecting the rays coming from the ſun, conſidered as parallel, but alſo (by means of this propoſition) it may be found by the light of a candle or window. For, becauſe Q*q* : *q*A :: QE : EG, we have (when A coincides with E) Q*q* : *q*E = QE : EF; that is, the diſtance obſerved between the radiant object and its picture in the focus is to the diſtance of the lens from the focus as the diſtance of the lens from the radiant is to its principal focal diſtance. Multiply therefore the diſtances of the lens from the radiant and focus, and divide the product by their ſum.

Corol. 3. Convex lenſes of different ſhapes that have equal focal diſtances, when put into each others places, have equal powers upon any pencil of rays to refract them to the ſame focus. Becauſe the rules above-mentioned depend only upon the focal diſtance of the lens, and not upon the proportion of the ſemidiameters of its ſurfaces.

Corol. 4. The rule that was given for a ſphere of an uniform denſity, will ſerve alſo for finding the focus of a pencil of rays refracted through any number of concentric ſurfaces, which intercede uniform mediums of any different denſities. For when rays come parallel to any line drawn through the common centre of theſe mediums, and are refracted through them all, the diſtance of their focus from that centre is invariable, as in an uniform ſphere.

Corol. 5. When the foculeſ Q, *q* lie on the ſame ſide of the refracting ſurfaces, if the incident rays flow from Q, the refracted rays will alſo flow from *q*; and if the incident rays flow towards Q, the refracted will alſo flow towards *q*: and the contrary will happen when Q and *q* are on contrary ſides of the refracting ſurfaces. Becauſe the rays are continually going forwards.

From this propoſition we alſo derive an eaſy method of drawing the progreſs of rays through any number of lenſes ranged on a common axis.

Let A, B, C, (fig. 7.) be the lenſes, and RA a ray incident on the firſt of them. Let α, β, $\varkappa$, be their foci for parallel rays coming in the oppoſite direction; draw the perpendicular *a d*, cutting the incident ray in *d*, and draw *d a* through the centre of the lens: AB parallel to *d a* will be the ray refracted by the firſt lens. Through the focus of the ſecond lens draw the perpendicular βe, cutting AB in *e*; and draw *e b* through the centre of the ſecond lens. BD parallel to *b e* will be the next refracted ray. Through the focus $\varkappa$ of the third lens draw the perpendicular $\varkappa f$, cutting BD in *f*, and draw *fc* through the centre of the third lens. CE parallel to *fc* will be the refracted ray; and ſo on.

§ 3. *Of Viſion.*

HAVING deſcribed how the rays of light, flowing from objects, and paſſing through convex-glaſſes, are collected into points, and form the images of the objects; it will be eaſy to underſtand how the rays are affected by paſſing through the humours of the eye, and are thereby collected into innumerable points on the bottom of the eye, and thereon form the images of the objects which they flow from. For, the different humours of the eye, and particularly the cryſtalline humour, are to be conſidered as a convex glaſs; and the rays in paſſing through them to be affected in the ſame manner as in paſſing through a convex glaſs. A deſcription of the coats and humours, &c. has been given at large in ANATOMY: but for the reader's convenience in this place, we ſhall repeat in a few words as much of the deſcription as will be ſufficient for our preſent purpoſe.

The eye is nearly globular. It conſiſts of three coats and three humours. The part DHHG (Pl. 9. fig. 8.), of the outer coat, is called the *ſclerotica*; the reſt, DEFG, the *cornea*. Next within this coat is that called the *choroides*, which ſerves as it were for a lining to the other, and joins with the iris, *m n*, *m n*. The iris is compoſed of two ſets of muſcular fibres;

the one of a circular form, which contracts the hole in the middle called the *pupil*, when the light would otherwiſe be too ſtrong for the eye; and the other of radical fibres, tending every where from the circumference of the iris towards the middle of the pupil; which fibres, by their contraction, dilate and enlarge the pupil when the light is weak, in order to let in the more of its rays. The third coat is only a fine expanſion of the optic nerve L, which ſpreads like net-work all over the inſide of the choroides, and is therefore called the *retina*; upon which are painted (as it were) the images of all viſible objects, by the rays of light which either ſlow or are reflected from them.

Under the cornea is a fine tranſparent fluid like water, which is therefore called the *aqueous humour*. It gives a protuberant figure to the cornea, fills the two cavities *mm* and *nn*, which communicate by the pupil P; and has the ſame limpidity, ſpecific gravity, and refractive power, as water. At the back of this lies the cryſtalline humour II, which is ſhaped like a double convex glaſs; and is a little more convex on the back than the fore-part. It converges the rays, which paſs through it from every viſible object to its focus at the bottom of the eye. This humour is tranſparent like cryſtal, is much of the conſiſtence of hard jelly, and exceeds the ſpecific gravity of water in the proportion of 11 to 10. It is incloſed in a fine tranſparent membrane, from which proceed radial fibres *o o*, called the *ligamentum ciliare*, all around its edge; and join to the circumference of the iris.

At the back of the cryſtalline, lies the vitreous humour KK, which is tranſparent like glaſs, and is largeſt of all in quantity, filling the whole orb of the eye, and giving it a globular ſhape. It is much of a conſiſtence with the white of an egg, and very little exceeds the ſpecific gravity and refractive power of water.

As every point of an object ABC, (*ibid.*) ſends out rays in all directions, ſome rays, from every point on the ſide next the eye, will fall upon the cornea between E and F; and by paſſing on through the humours and pupil of the eye, they will be converged to as many points on the retina or bottom of the eye, and will thereon form a diſtinct inverted picture *c b a* of the object. Thus, the pencil of rays *q r s* that flows from the point A of the object, will be converged to the point *a* on the retina; thoſe from the point B will be converged to the point *b*; thoſe from the point C will be converged to the point *c*; and ſo of all the intermediate points: by which means the whole image *a b c* is formed, and the object made viſible. Although it muſt be owned that the method by which this ſenſation is carried from the eye by the optic nerve to the common ſenſory in the brain, and there diſcerned, is above the reach of our comprehenſion.

But that viſion is effected in this manner, may be demonſtrated experimentally. Take a bullock's eye while it is freſh; and having cut off the three coats from the back-part, quite to the vitreous humour, put a piece of white paper over that part, and hold the eye towards any bright object, and you will ſee an inverted picture of the object upon the paper.

Since the image is inverted, many have wondered why the object appears upright. But we are to conſider, 1. That *inverted* is only a relative term: and, 2. That there is a very great difference between the real object and the means or image by which we perceive it. When all the parts of a diſtant proſpect are painted upon the retina, they are all right with reſpect to one another, as well as the parts of the proſpect itſelf; and we can only judge of an objects being inverted, when it is turned reverſe to its natural poſition with reſpect to other objects which we ſee and compare it with.—If we lay hold of an upright ſtick in the dark, we can tell which is the upper or lower part of it, by moving our hand downward or upward; and know very well that we cannot feel the upper end by moving our hand downward. Juſt ſo we find by experience, that upon directing our eyes towards a tall object, we cannot ſee its top by turning our eyes downward, nor its foot by turning our eyes upward; but muſt trace the object the ſame way by the eye to ſee it from head to foot, as we do by the hand to feel it: and as the judgment is informed by the motion of the hand in one caſe, ſo it is alſo by the motion of the eye in the other.

In fig. 9. is exhibited the manner of ſeeing the ſame object ABC, by both the eyes D and E at once.

When any part of the image *c b a* falls upon the optic nerve L, the correſponding part of the object becomes inviſible. On which account, nature has wiſely placed the optic nerve of each eye, not in the middle of the bottom of the eye, but towards the ſide next the noſe; ſo that whatever part of the image falls upon the optic nerve of one eye, may not fall upon the optic nerve of the other. Thus the point *a* of the image *c b a* falls upon the optic nerve of the eye D, but not of the eye E; and the point *c* falls upon the optic nerve of the eye E, but not of the eye D: and therefore, to both eyes taken together, the whole object ABC is viſible.

The nearer that any object is to the eye, the larger is the angle under which it is ſeen, and the magnitude under which it appears. Thus to the eye D, (Pl. 10. fig. 1.) the object ABC is ſeen under the angle APC; and its image *c b a* is very large upon the retina; but to the eye E, at a double diſtance, the ſame object is ſeen under the angle A*p*C, which is equal only to half the angle APC, as is evident by the figure. The image *c b a* is likewiſe twice as large in the eye D, as the other image *c b a* is in the eye E. In both theſe repreſentations, a part of the image falls on the optic nerve, and the object in the correſponding part is inviſible.

As the ſenſe of ſeeing is allowed to be occaſioned by the impulſe of the rays from the viſible object upon the retina of the eye, and forming the image of the object thereon, and that the retina is only the expanſion of the optic nerve all over the choroides; it ſhould ſeem ſurpriſing, that the part of the image which falls on the optic nerve ſhould render the like part of the object inviſible; eſpecially as that nerve is allowed to be the inſtrument by which the impulſe and image are conveyed to the common ſenſory in the brain.

That the part of the image which falls upon the middle of the optic nerve is loſt, and conſequently the correſponding part of the object is rendered inviſible, is plain by experiment. For if a perſon fixes three patches, A, B, C, (fig. 2.) upon a white wall, at the height of the eye, and at the diſtance of about a foot from each other, and places himſelf before them, ſhutting the right eye, and directing the left towards the patch C, he will ſee the patches A and C, but the middle patch B will diſappear. Or, if he ſhuts his left eye, and directs the right towards A, he will ſee both A and C, but B will diſappear; and if he directs his eye towards B, he will ſee both B and A, but not C. For whatever patch is directly oppoſite to the optic nerve N, vaniſhes. This requires a little practice; after which he will find it eaſy to direct his eye ſo as to loſe the ſight of whichever patch he pleaſes.

This experiment, firſt tried by M. Marriotte, occaſioned a new hypotheſis concerning the ſeat of viſion, which he ſuppoſed not to be in the retina, but in the choroides. An improvement was afterwards made upon it by M. Picard, who contrived that an object ſhould diſappear when both the eyes were kept open. He faſtened upon a wall a round white paper, an inch or two in diameter; and by the ſide of it he fixed two marks, one on the right hand, and the other on the left, each at about 2 feet diſtance from the paper, and ſomewhat higher. He then placed himſelf directly before the paper, at the diſ-

tance of 9 or 10 feet, and putting the end of his finger over againſt both his eyes, ſo that the left-hand mark might be hid from the right eye, and the right-hand mark from the left eye. Remaining firm in this poſture and looking ſteadily, with both eyes, on the end of his finger, the paper which was not at all covered by it would totally diſappear. This, he ſays, is the more ſurpriſing, becauſe, without this particular encounter of the optic nerves, where no viſion is made, the paper will appear double, as is the caſe when the finger is not rightly placed.

M. Marriotte obſerves, that this improvement on his experiment, by M. Picard, is ingenious, but difficult to execute, ſince the eyes muſt be conſiderably ſtrained in looking at any object ſo near to them as four inches; and propoſes another not leſs ſurpriſing, and more eaſy. Place, ſays he, on a dark ground, two round pieces of white paper, at the ſame height, and three feet from one another; then place yourſelf oppoſite to them, at the diſtance of 12 or 13 feet, and hold your thumb before your eyes, at the diſtance of about eight inches, ſo that it may conceal from the right eye the paper that is to the left hand, and from the left eye the paper to the right hand. Then, if you look at your thumb ſteadily with both eyes, you will loſe ſight of both the papers; the eyes being ſo diſpoſed, that each of them receives the image of one of the papers upon the baſe of the optic nerve, while the other is intercepted by the thumb.

M. Le Cat purſued this curious experiment a little farther than M. Marriotte had done. In the place of the ſecond paper, he fixed a large white board, and obſerved, that at a proper diſtance he loſt ſight of a circular ſpace in the centre of it. He alſo obſerved the ſize of the paper which is thus concealed from the ſight, correſponding to ſeveral diſtances, which enabled him to aſcertain ſeveral circumſtances relating to this part of the ſtructure of the eye more exactly than had been done before.

The manner in which this curious experiment is now generally made, and which is both the eaſieſt with reſpect to the eye, and the moſt indiſputable with reſpect to the fact, is the following. Let three pieces of paper be faſtened upon the ſide of a room, about two feet aſunder; and let a perſon place himſelf oppoſite to the middle paper, and, beginning near to it, retire gradually backwards, all the while keeping one of his eyes ſhut, and the other turned obliquely towards that outſide paper which is towards the covered eye, and he will find a ſituation (which is generally at about five times the diſtance at which the papers are placed from one another), where the middle paper will entirely diſappear, while the two outermoſt continue plainly viſible; becauſe the rays which come from the middle paper will fall upon the retina where the optic nerve is inſerted.

It will not ſurpriſe any perſon, even thoſe who are the ſtrongeſt advocates for the retina being the place at which the pencils of rays are terminated, and conſequently the proper ſeat of viſion, that M. Marriotte was led by this remarkable obſervation to ſuſpect the contrary. He not only did ſo; but, in conſequence of attentively conſidering the ſubject, a variety of other arguments in favour of the choroides occurred to him, particularly his obſervation, that the retina is tranſparent, as well as the cryſtalline and other humours of the eye, which he thought could only enable it to tranſmit the rays farther; and he could not perſuade himſelf that any ſubſtance could be conſidered as being the termination of the pencils, and the proper ſeat of viſion, at which the rays are not ſtopped in their progreſs.

He was farther confirmed in his opinion of the ſmall degree of ſenſibility in the retina, and of the greater ſenſibility of the choroides, by obſerving that the pupil dilates itſelf in the ſhade, and contracts itſelf in a great light; which involuntary motion, he thought, was a clear proof that the fibres of the iris are extremely ſenſible to the action of light; and this part of the eye is only a continuation of the choroides. He alſo thought that the dark colour of the choroides was intended to make it more ſuſceptible of the impreſſion of light.

M. Pecquet, in anſwer to M. Marriotte's obſervation concerning the tranſparency of the retina, ſays, that it is very imperfectly ſo, reſembling only oiled paper, or the horn that is uſed for lanterns; and beſides, that its whiteneſs demonſtrates it to be ſufficiently opaque for ſtopping the rays of light, as much as is neceſſary for the purpoſe of viſion; whereas, if viſion be performed by means of thoſe rays which are tranſmitted through ſuch a ſubſtance as the retina, it muſt be very indiſtinct.

As to the blackneſs of the choroides, which M. Marriotte thought to be neceſſary for the purpoſe of viſion, M. Pecquet obſerves, that it is not the ſame in all eyes, and that there are very different ſhades of it among the individuals of mankind, as alſo among birds, and ſome other animals, whoſe choroides is generally black; and that in the eyes of lions, camels, bears, oxen, ſtags, ſheep, dogs, cats, and many other animals, that part of the choroides which is the moſt expoſed to light, very often exhibits colours as vivid as thoſe of mother-of-pearl, or of the iris *. He admits that there is a defect of viſion at the inſertion of the optic nerve; but he thought that it was owing to the blood-veſſels of the retina, the trunks of which are ſo large in that place as to obſtruct all viſion.

To M. Pecquet's objection, founded on the opacity or the retina, M. Marriotte obſerves, that there muſt be a great difference betwixt the ſtate of that ſubſtance in living and dead ſubjects; and as a farther proof of the tranſparency of the retina, and the power of the choroides beyond it to reflect light, he ſays, that if a lighted candle be held near to a perſon's eyes, and a dog, at the diſtance of eight or ten ſteps, be made to look at him, he would ſee a bright light in the dog's eyes, which he thought to proceed from the reflection of the light of the candle from the choroides of the dog, ſince the ſame appearance cannot be produced in the eyes of men, or other animals, whoſe choroides is black.

To M. Pecquet's remark concerning the blood-veſſels of the retina, M. Marriotte obſerves, that they are not large enough to prevent viſion in every part of the baſe of the nerve, ſince the diameter of each of the two veſſels occupy no more than $\frac{1}{5}$th part of it. Beſides, if this were the cauſe of this want of viſion, it would vaniſh gradually, and the ſpace to which it is confined would not be ſo exactly terminated as it appears to be.

We muſt add, that M. Pecquet alſo obſerved, that notwithſtanding the inſenſibility of the retina at the inſertion of the optic nerve when the light is only moderate; yet that luminous objects, ſuch as a bright candle placed at the diſtance of four or five paces, do not abſolutely diſappear, in the ſame circumſtances in which a white paper would; for that this ſtrong light may be perceived though the picture fall on the baſe of the nerve. "I cannot help ſuſpecting, however (ſays Dr. Prieſtley), that M. Pecquet did not make this obſervation with ſufficient care. A large candle makes no impreſſion on that part of my eye, though it is by no means able to bear a ſtrong light."

The common opinion was alſo favoured by the anatomical deſcription of ſeveral animals by the members of the French academy, and particularly their account of the ſea-calf and porcupine; in both of which the optic nerve is inſerted in the very axis of the eye, exactly oppoſite to the pupil, which was thought to leave no room to doubt, but that in theſe animals the retina is perfectly ſenſible to the impreſſion of light at the inſertion of

* M. Muſſchenbroeck ſays, that in many animals, as the lion, camel, bear, ox, ſtag, ſheep, dog, cat, and many birds, the choroides is not black, but blue, green, yellow, or ſome other colour. *Introductio*, Vol. II. p. 748.

the nerve. But this obſervation may deſerve to be reconſidered.

M. De la Hire took part with M. Pecquet, arguing in favour of the retina from the analogy of the ſenſes, in all of which the nerves are the proper ſeat of ſenſation. This philoſopher, however, ſuppoſed that the choroides receives the impreſſions of images, in order to tranſmit them to the retina.

M. Perrault alſo took the part of M. Pecquet againſt M. Marriotte, and in M. Perrault's works we have ſeveral letters that paſſed between theſe two gentlemen upon this ſubject.

This diſpute about the immediate inſtrument of viſion was revived upon the occaſion of an odd experiment of M. Mery, recorded in the memoirs of the French Academy for 1704. He plunged a cat in water, and expoſing her eye to the ſtrong light of the ſun, obſerved that the pupil was not at all contracted by it; from which he concluded, that the contraction of the iris is not produced by the action of the light, but by ſome other circumſtance. For he contended that the eye receives more light in this ſituation than in the open air. At the ſame time he thought he obſerved that the retina of the cat's eye was tranſparent, and that he could ſee the opaque choroides beyond it: from which he concludes, that the choroides is the ſubſtance intended to receive the rays of light, and to be the chief inſtrument of viſion. But M. De la Hire replies to this argument of M. Mery, in a memoir for the year 1709, p. 119.; in which he endeavours to ſhow that fewer rays enter the eye under water, and that in thoſe circumſtances it is not ſo liable to be affected by them. Beſides, it is obvious to be remarked, that the cat muſt be in great terror in this ſituation; and being an animal that has a very great voluntary power over the muſcles of the iris, and being now extremely attentive to every thing about her, ſhe might keep her eye open notwithſtanding the action of the light upon it, and though it might be very painful to her. We are informed, that when a cat is placed in a window through which the ſun is ſhining, and conſequently her iris nearly cloſed, if ſhe hear a ruſtling, like that which is made by a mouſe, on the outſide of the window, ſhe will immediately open her eyes to their greateſt extent, without in the leaſt turning her face from the light.

M. Le Cat took part with M. Marriotte in this controverſy, it being peculiarly agreeable to his general hypotheſis, viz. that the pia mater, of which the choroides is a production, and not the nerves themſelves, is the proper inſtrument of ſenſation. He thought that the change which takes place in the eyes of old people (the choroides growing leſs black with age) favoured his hypotheſis, as they do not ſee with that diſtinctneſs with which young perſons do. M. Le Cat ſuppoſed that the retina anſwers a purpoſe ſimilar to that of the ſcarf-ſkin, covering the papillæ pyramidales, which are the immediate organ of feeling, or that of the porous membrane which covers the glandulous papillæ of the tongue. The retina, he ſays, receives the impreſſion of light, moderates it, and prepares it for its proper organ, but is not itſelf ſenſible of it.

It muſt be obſerved, that M. Le Cat had diſcovered that the pia mater, after cloſely embracing and conſtringing the optic nerve at its entrance into the eye, divides into two branches, one of which cloſely lines the cornea, and at length is loſt in it, while the ſecond branch makes what is called the *choroides*, or *uvea*. He alſo ſhowed that the ſclerotica is an expanſion of the dura mater; and he ſent diſſections of the eye to the royal Academy of Sciences in 1739, to prove theſe aſſertions, and ſeveral others which he had advanced in his *Traité de Sens*, that were contrary to the opinions of the celebrated Winſlow.

To theſe arguments in favour of the choroides, alleged by thoſe gentlemen among whom the ſubject was firſt diſcuſſed, Dr. Prieſtley in his hiſtory adds the following that had eſcaped their notice, but which were ſuggeſted to him by his friend Mr. Michell.

In order that viſion be diſtinct, the pencils of rays which iſſue from the ſeveral points of any object, muſt be collected either accurately, or at leaſt very nearly, to correſponding points in the eye, which can only be done upon ſome uniform ſurface. But the retina being of a conſiderable thickneſs, and the whole of it being uniformly nervous, and at leaſt nearly, if not perfectly, tranſparent, preſents no particular ſurface; ſo that, in whatever part of it the pencils be ſuppoſed to have their foci, the rays belonging to them will be ſeparated from one another, either before or after they arrive there, and conſequently viſion would be confuſed.

If we ſuppoſe the ſeat of viſion to be at the nearer ſurface of the retina, and the images of objects to be formed by direct rays, a conſiderable degree of confuſion could not but ariſe from the light reflected by the choroides, in thoſe animals in which it is white, or coloured. On the other hand, it would be impoſſible that viſion ſhould be performed at this place by light reflected from the choroides, becauſe in many animals it is perfectly black, and reflects no light at all; and yet ſuch animals ſee even more diſtinctly than others. And we cannot but ſuppoſe that, in whatever manner viſion is effected, it is the ſame in the eyes of all animals.

If the ſeat of viſion be at the farther ſurface of the retina, and it be performed by direct rays, a white choroides could be of no uſe; and if it were by reflected rays, a black one could not anſwer the purpoſe.

It is likewiſe an argument in favour of the choroides being the organ of viſion, that it is a ſubſtance which receives a more diſtinct impreſſion from the rays of light than any other membrane in any part of the animal ſyſtem, excepting (and perhaps not excepting) that white cuticle which lies under the ſcales of fiſhes; whereas the retina is a ſubſtance on which the light makes an exceedingly faint impreſſion, and perhaps no impreſſion at all; ſince light, in paſſing out of one tranſparent medium into another immediately contiguous to it, ſuffers no refraction or reflection, nor are any of the rays abſorbed, unleſs there is ſome difference in the refracting power of the two media, which probably is not the caſe between the retina and the vitreous humour, which is in contact with it. And wherever the light is not affected by the medium it falls upon, we can hardly ſuppoſe the medium to receive any impreſſion from the light, the action being probably always mutual and reciprocal.

Beſides, the retina is ſo ſituated, as to be expoſed to many rays beſides thoſe which terminate in it, and which, therefore, cannot be ſubſervient to viſion, if it be performed there. Now this is not the caſe with the choroides, which is in no ſhape tranſparent, and has no reflecting ſubſtance beyond it.

It is, moreover, peculiarly favourable to the hypotheſis of the ſeat of viſion being in the choroides, that we can then ſee a ſufficient reaſon for the diverſity of its colour in different animals, according as they are circumſtanced with reſpect to viſion. In all terreſtrial animals which have occaſion to make uſe of their eyes by night, the choroides is either of a bright white, or of ſome very vivid colour, which reflects the light very ſtrongly. On this account viſion may be performed with leſs light, but it cannot be with great diſtinctneſs, the reflection of the rays doubling their effect, ſince it muſt extend over ſome ſpace, all reflection being made at a diſtance from the reflecting body. Beſides, the choroides in brutes is not in general perfectly white, but a little inclined to blue; and is therefore, probably, better adapted to ſee by the fainter coloured light which chiefly prevails in the night; and we would add, is on the ſame account more liable to be ſtrongly impreſſed by the colours to which they are chiefly expoſed.

On the other hand, the choroides of birds in general, eſpecially eagles, hawks, and other birds of prey, is black; by which

means they are able to ſee with the greateſt diſtinctneſs, but only in bright day-light. The owl, however, ſeeking her food by night, has the choroides white, like that of a cat. Laſtly, in the eyes of man, which are adapted to various uſes, the choroides is neither ſo black as that of birds, nor ſo white as that of thoſe animals who make the greateſt uſe of their eyes in the night.

As to a third hypotheſis, which is in effect that of M. De la Hire, which makes both the retina and the choroides equally neceſſary to viſion, and ſuppoſes it to be performed by the impreſſion of light on the choroides communicated to the retina; Mr. Michell obſerves, that the perceptions can hardly be ſuppoſed to be ſo acute, when the nerves, which are the chief inſtruments of ſenſation, do not receive the impreſſions immediately, but only after they have been communicated to another ſubſtance. Beſides, it muſt be more natural to ſuppoſe, that, when the principal impreſſion is made upon the choroides, it is communicated to the brain by its own proper nerves, which are abundantly ſufficient for the purpoſe.

The dimenſions and preciſe form of the ſpot in the eye in which there is no viſion, were more accurately calculated by Daniel Bernouilli, in the following manner. He placed a piece of money O (Pl. 10. fig. 3.) upon the floor; and then ſhutting one of his eyes, and making a pendulum to ſwing, ſo that the extremity of it might be nearly in the line AO, he obſerved at what place C it began to be inviſible, and where it again emerged into view at A. Raiſing the pendulum higher and lower, he found other points, as H, N, P, G, B, at which it began to be inviſible; and others, as M, L, E, A, at which it began to be viſible again; and drawing a curve through them, he found that it was elliptical; and, with reſpect to his own eye, the dimenſions of it were as follows; OC was 23, AC 10, BD 3, DH 13, and EG 14; ſo that the centre being at F, the greater axis was to the leſs as 8 to 7.

From theſe *data*, the plane on which the figure was drawn being obliquely ſituated with reſpect to the eye, he found, that the place in the eye that correſponded to it was a circle, the diameter of which was a ſeventh part of the diameter of the eye, the centre of it being 27 parts of the diameter from the point oppoſite to the pupil, a little above the middle. He concludes with obſerving, that, in order that this ſpace in which there is no viſion may be as ſmall as poſſible, it is neceſſary that the nerve ſhould enter the eye perpendicularly, and that both this end, and alſo its entering the eye at a diſtance from its axis, are gained by the particular manner in which the two optic nerves unite and become ſeparate again, by croſſing one another.

In favour of one of the obſervations of Mr. Michell, concerning the uſe of the choroides in viſion, Dr. Prieſtley obſerves, that Aquapendente mentions the caſe of a perſon at Piſa, who could ſee very well in the night, but very little or none at all in the day-time. This is alſo ſaid to be the caſe with thoſe white people among the blacks of Africa, and the inhabitants of the iſthmus of America, who, from this circumſtance, are called *moon-eyed*. Our author thinks it probable that their choroides is not of a dark colour, as it is in others of the human ſpecies; but white or light-coloured, as in thoſe animals which have moſt occaſion for their eyes in the night. See ALBINOS.

The following conſiderations in favour of the retina being the proper ſeat of viſion, are worthy of remark.

Dr. Porterfield obſerves, that the reaſon why there is no viſion at the entrance of the optic nerve into the eye, may be, that it wants that ſoftneſs and delicacy which it has when it is expanded upon the choroides; and that, in thoſe animals in which that nerve is inſerted in the axis of the eye, it is obſerved to be equally delicate, and therefore probably equally ſenſible, in that place as in any other part of the retina. In general, the nerves, when conſtringed by their coats, have but little ſenſibility in compariſon of what they are endued with when they are diveſted of them, and unfolded in a ſoft and pulpy ſubſtance.

Haller obſerves, that the choroides cannot be the univerſal inſtrument of viſion, becauſe that ſometimes in men and birds, but eſpecially in fiſhes, it is covered internally with a black mucus, through which the rays cannot penetrate. This writer ſpeaks of a fibrous membrane in the retina diſtinct from its pulpy ſubſtance. On theſe fibres, he conjectures, that the images of objects are painted.

M. De la Hire's argument in favour of the retina, from the analogy of the ſenſes, is much ſtrengthened by conſidering that the retina is a large nervous apparatus, immediately expoſed to the impreſſion of light; whereas the choroides receives but a ſlender ſupply of nerves, in common with the ſclerotica, the conjunctiva, and the eyelids, and that its nerves are much leſs expoſed to the light than the naked fibres of the optic nerve. Indeed, from anatomical conſiderations, one might imagine that any other part of the body was as ſenſible of the impreſſion of light as the choroides.

That the optic nerve is of principal uſe in viſion, is farther probable from ſeveral phenomena attending ſome of the diſeaſes in which the ſight is affected. When an amauroſis has affected one eye only, the optic nerve of that eye has been found manifeſtly altered from its ſound ſtate. Dr. Prieſtley was preſent when Mr. Hey examined the brain of a young girl, who had been blind of one eye, and ſaw that the optic nerve belonging to it was conſiderably ſmaller than the other; and he informed him, that upon cutting into it, he found it to be much harder, and cineritious. Morgagni, indeed, mentions two caſes, in one of which he found the optic nerves ſmaller than uſual, and of a cineritious colour, when, upon inquiry, he was informed that the perſon had not been blind, though there might have been ſome defect in the ſight of one of the eyes. In the other caſe, only one of the optic nerves was affected in that manner, and the eye itſelf was in other reſpects very perfect. Here, alſo, he was expreſsly told, that the perſon was not blind of that eye: but it appears that he himſelf had not been acquainted with the perſons whom he diſſected; and there have been many caſes of perſons being blind of one eye, without knowing it themſelves, for a conſiderable time.

Moreover, as the optic nerve is ſolely ſpent in forming the retina, ſo no function of the eye, not immediately ſubſervient to viſion, is affected by an amauroſis. On the contrary, thoſe nerves which go to the choroides are found to retain, in this diſeaſe, their natural influence. The iris will contract in a recent gutta ſerena of one eye, if the other remains ſound, and is ſuddenly expoſed to a ſtrong light. The ſclerotis, conjunctiva, and eyelids, which receive their nerves from the ſame branches as the choroides, retain their ſenſibility in this diſorder.

The manner in which perſons recover from an amauroſis, favours the ſuppoſition of the ſeat of viſion being in the retina; ſince thoſe parts which are the moſt diſtant from the inſertion of the nerve recover their ſenſibility the ſooneſt, being in thoſe places the moſt pulpy and ſofteſt; whereas there is no reaſon to think that there is any difference in this reſpect in the different parts of the choroides. Mr. Hey has been repeatedly informed, by perſons labouring under an imperfect amauroſis, or gutta ſerena, that they could not, when looking at any object with one eye, ſee it ſo diſtinctly when it was placed directly oppoſite to the pupil, as when it was ſituated ſomewhat obliquely. And thoſe perſons whom he had known to recover from a perfect amauroſis, firſt diſcovered the objects whoſe images fell upon that part of the retina which is at the greateſt diſtance from the optic nerve.

We ſhall conclude theſe remarks with obſerving, that if the retina be as tranſparent as it is generally repreſented to be, ſo

that the termination of the pencils muſt neceſſarily be either upon the choroides, or ſome other opaque ſubſtance interpoſed between it and the retina, the action and reaction occaſioned by the rays of light being at the common ſurface of this body and the retina, both theſe mediums (ſuppoſing them to be equally ſenſible to the impreſſion of light) may be equally affected; but the retina, being naturally much more ſenſible to this kind of impreſſion, may be the only inſtrument by which the ſenſation is conveyed to the brain, though the choroides, or the black ſubſtance with which it is ſometimes lined, may alſo be abſolutely neceſſary for the purpoſe of viſion. Indeed, when the reflection of the light is made at the common boundary of any two mediums, it is with no propriety that this effect is aſcribed to one of them rather than the other; and the ſtrongeſt reflections are often made back into the denſeſt mediums, when they have been contiguous to the rareſt, or even to a vacuum. This is not far from the hypotheſis of M. De la Hire, and will completely account for the entire defect of viſion at the inſertion of the optic nerve.

Viſion is diſtinguiſhed into *bright* and *obſcure*, *diſtinct* and *confuſed*.—It is ſaid to be bright, when a ſufficient number of rays enter the pupil at the ſame time; obſcure, when too few. It is diſtinct when each pencil of rays is collected into a focus exactly upon the retina; *confuſed*, when they meet before they come at it, or when they would paſs it before they meet; for, in either of theſe laſt caſes, the rays flowing from different parts of the object will fall upon the ſame part of the retina, which muſt neceſſarily render the image confuſed and indiſtinct.—Now, that objects may appear with a due brightneſs, whether more or fewer rays proceed from them, we have a power of contracting or dilating the pupil, by means of the muſcular fibres of the iris, in order to take in more or fewer rays as occaſion requires. But this power has its limits. In ſome animals it is much greater than in others; particularly in ſuch as are obliged to ſeek their food by night as well as by day, as in cats, &c.

That the rays may be collected into points exactly upon the retina, that is, that objects may appear diſtinct, whether they be nearer or farther off, *i. e.* whether the rays proceeding from them diverge more or leſs, we have a power of contracting or relaxing the *ligamenta ciliaria*, and thereby altering the form of the cryſtalline humour, and with it the focal diſtance of the rays. Thus, when the object we view is far off, and the rays fall upon the pupil with a very ſmall degree of divergency, we contract the *ligamenta ciliaria*, which, being concave towards the vitreous humour, do thereby compreſs it more than otherwiſe they would do: by this means it is made to preſs harder upon the backſide of the cryſtalline humour, which is thereby rendered flatter; and thus the rays proceed farther before they meet in a focus, than otherwiſe they would have done. Add to this, that we dilate the pupils of our eyes (unleſs in caſes where the light is ſo ſtrong that it offends the eye), and thereby admit rays into them that are more diverging than thoſe which would otherwiſe enter. And, when the rays come from an object that is very near, and therefore diverge too much to be collected into their reſpective foci upon the retina, by relaxing the *ligamenta ciliaria*, we give the cryſtalline a more convex form, by which means the rays are made to ſuffer a proportionably greater degree of refraction in paſſing through it. Some philoſophers are of opinion that we do this by a power of altering the form of the eye; and others, by removing the cryſtalline forwards or backwards as occaſion requires: but neither of theſe opinions is probable; for the coats of the eye are too hard, in ſome animals, for the firſt; and, as to moving the cryſtalline out of its place, the cavities of the eye ſeem to be too well filled with the other humours to admit of ſuch removal.

Beſides this, in the caſe above-mentioned, by contracting the pupils of our eyes, we exclude the more diverging rays, and admit only ſuch as are more eaſily refracted into their reſpective foci *. But viſion is not diſtinct at all diſtances, for our power of contracting and relaxing the *ligamenta ciliaria* is alſo circumſcribed within certain limits.

In thoſe eyes where the tunica cornea is very protuberant and convex, the rays of light ſuffer a very conſiderable refraction at their entrance into the aqueous humour, and are therefore collected into a focus before they fall upon the retina, unleſs the object be placed very near, ſo that the rays which enter the eye may have a conſiderable degree of divergency. People that have ſuch eyes are ſaid to be *purblind*. Now, the nearer an object is to the eye, the greater is the image of it therein, as explained above: theſe people, therefore can ſee much ſmaller objects than others, as ſeeing much nearer ones with the ſame diſtinctneſs; and their ſight continues good longer than that of other people, becauſe the tunica cornea of their eyes, as they grow old, becomes plainer, for want of that redundancy of humours with which they were filled before. On the contrary, old men, having the cornea of their eyes too flat for want of a ſufficient quantity of the aqueous humour to fill them out, if the rays diverge too much before they enter the eye, they cannot be brought to a focus before they reach the retina; on which account thoſe people cannot ſee diſtinctly, unleſs the object be ſituated at a greater diſtance from the eye than is required for thoſe whoſe eyes are of a due form. The latter require the aſſiſtance of convex glaſſes to make them ſee objects diſtinctly; the former of concave ones. For if either the cornea *a b c* (Pl. 10. fig. 4.), or cryſtalline humour *e*, or both of them, be too flat, as in the eye A, their focus will not be on the retina as at A, where it ought to be, in order to render viſion diſtinct; but beyond the eye, as at *f*. This is remedied by placing a convex glaſs *g h* before the eye, which makes the rays converge ſooner, and imprints the image duly on the retina at *d*. Again, if either the cornea, or cryſtalline humour, or both of them, be too convex, as in the eye B, the rays that enter it from the object C will be converged to a focus in the vitreous humour, as at *f*; and by diverging from thence to the retina, will form a very confuſed image thereon; and ſo, of courſe, the obſerver will have as confuſed a view of the object as if his eye had been too flat. This inconvenience is remedied by placing a concave glaſs *g h* before the eye; which glaſs, by cauſing the rays to diverge between it and the eye, lengthens the focal diſtance ſo, that if the glaſs be properly choſen, the rays will unite at the retina, and form a diſtinct image of the object upon it.

Such eyes as are of a due convexity, cannot ſee any object diſtinctly at leſs diſtance than ſix inches; and there are numberleſs objects too ſmall to be ſeen at that diſtance, becauſe they cannot appear under any ſenſible angle.—Concerning the leaſt angle under which any object is viſible, there was a debate between Dr. Hooke and Hevelius. The former aſſerted, that no object could well be ſeen if it ſubtended an angle leſs than one minute; and, if the object be round, as a black circular ſpot upon a white ground, or a white circle upon a black ground, it follows, from an experiment made by Dr. Smith, that this is near the truth; and from thence he calculates, that the diameter of the picture of ſuch leaſt viſible point upon the retina is the 8000th part of an inch; which he therefore calls a *ſenſible point of the retina*. On the other hand, Mr. Courtivron concluded from his experiments, that the ſmalleſt angle of viſion was 40 ſeconds. According to Dr. Jurin, there are caſes in which a much ſmaller angle than one minute can be diſcerned by the

* Accordingly it is obſerved, that if we make a ſmall hole with the point of a needle through a piece of paper, and apply that hole cloſe to the eye, making uſe of it, as it were, inſtead of a pupil, we ſhall be able to ſee an object diſtinctly through it, though the object be placed within half an inch of the eye.

eye; and in order to throw light upon the ſubject, he obſerves, that, in order to our perceiving the impreſſion made by any object upon our ſenſes, it muſt either be of a certain degree of force, or of a certain degree of magnitude. For this reaſon, a ſtar, which appears only as a lucid point through a teleſcope, ſubtending not ſo much as an angle of one ſecond, is viſible to the eye; though a white or black ſpot, of 25 or 30 ſeconds, is not to be perceived. Alſo a line of the ſame breadth with the circular ſpot will be viſible, at ſuch a diſtance as the ſpot is not to be perceived at; becauſe the quantity of impreſſion from the line is much greater than from the ſpot; and a longer line is viſible at a greater diſtance than a ſhorter one of the ſame breadth. He found by experience, that a ſilver wire could be ſeen when it ſubtended an angle of three ſeconds and an half; and that a ſilk thread could be ſeen when it ſubtended an angle of two ſeconds and an half.

This greater viſibility of a line than of a ſpot ſeems to ariſe only from the greater quantity of the impreſſion; but without the limits of perfect viſion, our author obſerves, that another cauſe concurs, whereby the difference of viſibility between the ſpot and the line is rendered much more conſiderable. For the impreſſion upon the retina made by the line is then not only much greater, but alſo much ſtronger, than that of the ſpot; becauſe the faint image, or penumbra, of any one point of the line, when the whole is placed beyond the limits of diſtinct viſion, will fall within the faint image of the next point, and thereby much increaſe the light that comes from it.

In ſome caſes our author found the cauſe of indiſtinct viſion to be the unſteadineſs of the eye; as our being able to ſee a ſingle black line upon a white ground, or a ſingle white line upon a black ground, and not a white line between two black ones on a white ground. In viewing either of the former objects, if the eye be imperceptibly moved, all the effect will be, that the object will be painted upon a different part of the retina; but, wherever it is painted, there will be but one picture, ſingle and uncompounded with any other. But in viewing the other, if the eye fluctuate ever ſo little, the image of one or other of the black lines will be ſhifted to that part of the retina which was before poſſeſſed by the white line; and this muſt occaſion ſuch a dazzle in the eye, that the white line cannot be diſtinctly perceived, and diſtinguiſhed from the black lines; which, by a continual fluctuation, will alternately occupy the ſpace of the white line, whence muſt ariſe an appearance of one broad dark line, without any manifeſt ſeparation.

By trying this experiment with two pins of known diameters, ſet in a window againſt the ſky light, with a ſpace between them equal in breadth to one of the pins, he found that the diſtance between the pins could hardly be diſtinguiſhed when it ſubtended an angle of leſs than 40 ſeconds, though one of the pins alone could be diſtinguiſhed when it ſubtended a much leſs angle. But though a ſpace between two pins cannot be diſtinguiſhed by the eye when it ſubtends an angle leſs than 40 ſeconds, it would be a miſtake to think that the eye muſt neceſſarily commit an error of 40 ſeconds in eſtimating the diſtance between two pins when they are much farther from one another. For if the ſpace between them ſubtend an angle of one minute, and each of the pins ſubtend an angle of four ſeconds, which is greater than the leaſt angle the eye can diſtinguiſh, it is manifeſt that the eye may judge of the place of each pin within two ſeconds at the moſt; and conſequently the error committed in taking the angle between them cannot at the moſt exceed four ſeconds, provided the inſtrument be ſufficiently exact. And yet, ſays he, upon the like miſtake was founded the principal objection of Dr. Hooke againſt the accuracy of the celeſtial obſervations of Hevelius.

A black ſpot upon a white ground, or a white ſpot upon a black ground, he ſays, can hardly be perceived by the generality of eyes when it ſubtends a leſs angle than one minute. And if two black ſpots be made upon white paper, with a ſpace between them equal in breadth to one of their diameters, that ſpace is not to be diſtinguiſhed, even within the limits of perfect viſion, under ſo ſmall an angle as a ſingle ſpot of the ſame ſize can be diſtinguiſhed. To ſee the two ſpots diſtinctly, therefore, the breadth of the ſpace between them muſt ſubtend an angle of more than a minute. It would be very difficult, he ſays, to make this experiment accurately, within the limits of perfect viſion; becauſe the objects muſt be extremely ſmall: but by a rude trial, made with ſquare bits of white paper, placed upon a black ground, he judged, that the leaſt angle under which the interval of two objects could be perceived, was at leaſt a fourth part greater than the leaſt angle under which a ſingle object can be perceived. So that an eye which cannot perceive a ſingle object under a ſmaller angle than one minute, will not perceive the interval between two ſuch objects under a leſs angle than 75 ſeconds.

Without the limits of perfect viſion, the diſtance at which a ſingle object ceaſes to be perceivable will be much greater in proportion than the diſtance at which a ſpace of equal breadth between two ſuch objects ceaſes to be perceivable. For, without theſe limits, the image of each of the objects will be attended with a penumbra, and the penumbra of the two near objects will take up part of the ſpace between them, and thereby render it leſs perceivable; but the penumbra will add to the breadth of the ſingle object, and will thereby make it more perceivable, unleſs its image be very faint. Upon the ſame principles he likewiſe accounts for the radiation of the ſtars, whereby the light ſeems to project from them different ways at the ſame time.

Mr. Mayer made many experiments in order to aſcertain the ſmalleſt angle of viſion in a variety of reſpects. He began with obſerving at what diſtance a black ſpot was viſible on white paper; and found, that when it could barely be diſtinguiſhed, it ſubtended an angle of about 34 ſeconds. When black lines were diſpoſed with intervals broader than themſelves, they were diſtinguiſhed at a greater diſtance than they could be when the objects and the intervals were of an equal breadth. In all theſe caſes it made no difference whether the objects were placed in the ſhade or in the ſtrong light of the ſun; but when the degrees of light were ſmall, their differences had a conſiderable effect, though by no means in proportion to the differences of the light. For if an object was illuminated to ſuch a degree as to be juſt viſible at the diſtance of nine feet, it would be viſible at the diſtance of four feet, though the light was diminiſhed above 160 times. It appeared in the courſe of theſe experiments, that common day-light is, at a medium, equal to that of 25 candles placed at the diſtance of one foot from the object.

As an image of every viſible object is painted on the retina of each of our eyes, it thence becomes a natural queſtion, Why we do not ſee every thing double? It was the opinion of Sir Iſaac Newton and others, that objects appear ſingle becauſe the two optic nerves unite before they reach the brain. But Dr. Porterfield ſhows, from the obſervation of ſeveral anatomiſts, that the optic nerves do not mix, or confound their ſubſtance, being only united by a cloſe cohesion; and objects have appeared ſingle where the optic nerves were found to be diſjoined.

Dr. Briggs ſuppoſed that ſingle viſion was owing to the equal tenſion of the correſponding parts of the optic nerves, whereby they vibrated in a ſynchronous manner. But, beſides ſeveral improbable circumſtances in this account, Dr. Porterfield ſhows that facts do by no means favour it.

To account for this phenomenon, this ingenious writer ſuppoſes, that by an original law in our natures we imagine objects to be ſituated ſomewhere in a right line drawn from the picture of it upon the retina, through the centre of the pupil. Conſequently, the ſame object appearing to both eyes to be in the ſame place, the mind cannot diſtinguiſh it into two. In

anſwer to an objection to this hypotheſis, from objects appearing double when one eye is diſtorted, he ſays the mind miſtakes the poſition of the eye, imagining that it had moved in a manner correſponding to the other, in which caſe the concluſion would have been juſt. In this he ſeems to have recourſe to the power of habit, though in words he diſclaims that hypotheſis.

This principle, however, has generally been thought to be ſufficient to account for this appearance. Originally, every object making two pictures, one in each eye, is imagined to be double; but by degrees, we find, that when two correſponding parts of the retina are impreſſed, the object is but one; but if thoſe correſponding parts be changed, by the diſtortion of one of the eyes, the object muſt again appear double as at the firſt. This ſeems to be verified by Mr. Cheſelden; who informs us, that a gentleman, who from a blow on his head had one eye diſtorted, found every object to appear double; but by degrees the moſt familiar ones came to appear ſingle again, and in time all objects did ſo, without any amendment of the diſtortion. A caſe ſimilar to this is mentioned by Dr. Smith.

On the other hand, Dr. Reid is of opinion, that the correſpondence of the centres of the two eyes, on which ſingle viſion depends, does not ariſe from cuſtom, but from ſome natural conſtitution of the eye and of the mind. He makes ſeveral juſt objections to the caſe of Mr. Foſter, recited by Dr. Smith and others; and thinks that the caſe of the young man couched by Cheſelden, who ſaw ſingly with both eyes immediately upon receiving his ſight, is nearly deciſive in proof of his ſuppoſition. He alſo found that three young gentlemen, whom he endeavoured to cure of ſquinting, ſaw objects ſingly, as ſoon as ever they were brought to direct the centres of both their eyes to the ſame object, though they had never been uſed to do ſo from their infancy; and he obſerves, that there are caſes, in which, notwithſtanding the fulleſt conviction of an object being ſingle, no practice of looking at it will ever make it appear ſo, as when it is ſeen through a multiplying glaſs.

To all theſe ſolutions of the difficulty reſpecting ſingle viſion by both eyes, objections have been lately made which ſeem inſurmountable. By experiments judiciouſly conceived and accurately conducted, Dr. Wells has ſhown, that it is neither by cuſtom alone, nor by an original property of the eyes alone, that objects appear ſingle; and having demoliſhed the theories of others, he thus accounts for the phenomenon himſelf.

"The viſible place of an object being compoſed of its viſible diſtance and viſible direction, to ſhow how it may appear the ſame to both eyes, it will be neceſſary (ſays he in his Eſſay on ſingle Viſion, &c.) to explain in what manner the diſtance and direction, which are perceived by one eye, may coincide with thoſe which are perceived by the other." With reſpect to viſible diſtance, the author's opinion ſeems not to differ from that which we have ſtated elſewhere (ſee METAPHYSICS); and therefore we have to attend only to what he ſays of viſible direction.

When a ſmall object is ſo placed with reſpect to either eye, as to be ſeen more diſtinctly than in any other ſituation, our author ſays that it is then in the *optic axis*, or the axis of that eye. When the two optic axes are directed to a ſmall object not very diſtant, they may be conceived to form two ſides of a triangle, of which the baſe is the interval between the points of the corners where the axes enter the eyes. This baſe he called the *viſual baſe*; and a line drawn from the middle of it to the point of interſection of the optic axes he calls the *common axis*. He then proceeds to ſhow, that objects *really ſituated* in the *optic* axis do not *appear* to be in that line, but in the *common axis*.

"Every perſon (ſays he) knows, that if an object be viewed through two ſmall holes, one applied to each eye, the two holes, appear but as one. The theories hitherto invented afford two explanations of this fact. According to Aguilonius, Dechales, Dr. Porterfield, and Dr. Smith, the two holes, or rather their borders, will be ſeen in the ſame place as the object viewed through them, and will conſequently appear united, for the ſame reaſon that the object itſelf is ſeen ſingle. But whoever makes the experiment will diſtinctly perceive, that the united hole is much nearer to him than the object; not to mention, that any fallacy on this head might be corrected by the information from the ſenſe of touch, that the card or other ſubſtance in which the holes have been made is within an inch or leſs of our face. The other explanation is that furniſhed by the theory of Dr. Reid. According to it, the centres of the retinas, which in this experiment receive the pictures of the holes, will, by an original property, repreſent but one. This theory, however, though it makes the two holes to appear one, does not determine where this one is to be ſeen. It cannot be ſeen in only one of the perpendiculars to the images upon the retinas, for no reaſon can be given why this law of viſible direction, which Dr. Reid thinks eſtabliſhed beyond diſpute, if it operates at all, ſhould not operate upon both eyes at the ſame time; and if it be ſeen by both eyes in ſuch lines, it muſt appear where thoſe lines croſs each other, that is, in the ſame place with the object viewed through the holes, which, as I have already mentioned, is contrary to experience. Nor is it ſeen in any direction, the conſequence of a law affecting both eyes conſidered as one organ, but ſuſpended when each eye is uſed ſeparately. For when the two holes appear one, if we pay attention to its ſituation, and then cloſe one eye, the truly ſingle hole will be ſeen by the eye remaining open in exactly the ſame direction as the apparently ſingle hole was by both eyes.

"Hitherto I have ſuppoſed the holes almoſt touching the face. But they have the ſame unity of appearance, in whatever parts of the optic axes they are placed; whether both be at the ſame diſtance from the eyes, or one be cloſe to the eye in the axis of which it is, and the other almoſt contiguous to the object ſeen through them. If a line, therefore, be drawn from the object to one of the eyes, it will repreſent all the real or tangible poſitions of the hole, which allow the object to be ſeen by that eye, and the whole of it will coincide with the optic axis. Let a ſimilar line be drawn to the other eye, and the two muſt appear but as one line; for if they do not, the two holes in the optic axes will not, at every diſtance, appear one, whereas experiments prove that they do. This united line will therefore repreſent the viſible direction of every object ſituated in either of the optic axes. But the end of it, which is toward the face, is ſeen by the right eye to the left, and by the left eye as much to the right. It muſt be ſeen then in the middle between the two, and conſequently in the common axis. And as its other extremity coincides with the point where the optic axes interſect each other, the whole of it muſt lie in the common axis. Hence the truth of the propoſition is evident, that objects ſituated in the optic axis, do not appear to be in that line, but in the common axis."

He then proves by experiments, for which we muſt refer to his work, that objects ſituated in the common axis do not *appear* to be in that line, but in the axis of the eye by which they are not ſeen: that is, an object ſituated in the common axis appears to the right eye in the axis of the left, and *vice verſa*. His next propoſition, proved likewiſe by experiments, is, that "objects, ſituated in any line drawn through the mutual interſection of the optic axes to the viſual baſe, do not appear to be in that line, but in another, drawn through the ſame interſection, to a point in the viſual baſe diſtant half this baſe from the ſimilar extremity of the former line towards the left, if the objects be ſeen by the right eye, but towards the right if ſeen by the left eye."

From theſe propoſitions he thus ſatisfactorily accounts for ſingle viſion by both eyes. "If the queſtion be concerning an object at the concourſe of the optic axes, it is ſeen ſingle, be-

cauſe its two ſimilar appearances, in regard to ſize, ſhape, and colour, are ſeen by both eyes in one and the ſame direction, or, if you will, in two directions, which coincide with each other through the whole of their extent. It therefore matters not whether the diſtance be truly or falſely eſtimated; whether the object be thought to touch our eyes, or to be infinitely remote. And hence we have a reaſon, which no other theory of viſible direction affords, why objects appeared ſingle to the young gentleman mentioned by Mr. Cheſelden, immediately after his being couched, and before he could have learned to judge of diſtance by ſight.

"When two ſimilar objects are placed in the optic axes, one in each, at equal diſtances from the eyes, they will appear in the ſame place, and therefore one, for the ſame reaſon that a truly ſingle object, in the concourſe of the optic axes, is ſeen ſingle.

"To finiſh this part of my ſubject, it ſeems only neceſſary to determine, whether the dependence of viſible direction upon the actions of the muſcles of the eyes be eſtabliſhed by nature, or by cuſtom. But facts are here wanting. As far as they go, however, they ſerve to prove that it ariſes from an original principle of our conſtitution. For Mr. Cheſelden's patient ſaw objects ſingle, and conſequently in the ſame directions with both eyes, immediately after he was couched; and perſons affected with ſquinting from their earlieſt infancy ſee objects in the ſame directions with the eye they have never been accuſtomed to employ, as they do with the other they have conſtantly uſed."

The author removes many difficulties, and obviates the objections to which his theory may ſeem moſt liable. The whole work deſerves to be attentively ſtudied by every optician; and we therefore recommend it to the peruſal of our readers.

We are indebted to Dr. Jurin for the following curious experiments, to determine whether an object ſeen by both eyes appears brighter than when ſeen with one only.

He laid a ſlip of clean white paper directly before him on a table, and applying the ſide of a book cloſe to his right temple, ſo as that the book was advanced conſiderably more forward than his face, he held it in ſuch a manner, as to hide from his right eye that half of the paper which lay to his left hand, while the left half of the paper was ſeen by both eyes, without any impediment.

Then looking at the paper with both eyes, he obſerved it to be divided, from the top to the bottom, by a dark line, and the part which was ſeen with one eye only was manifeſtly darker than that which was ſeen with both eyes; and, applying the book to his left temple, he found, by the reſult of the experiment, that both his eyes were of equal goodneſs.

He then endeavoured to find to what degree this exceſs of brightneſs amounted; and comparing it with the appearance of an object illuminated partly by one candle and partly by two, he was ſurpriſed to find that an object ſeen with two eyes is by no means twice as luminous as when it is ſeen with one only; and after a number of trials, by which he made the proportion leſs and leſs continually, he found, that when one paper was illuminated by a candle placed at the diſtance of three feet, and another paper by the ſame candle at the ſame diſtance, and by another candle at the diſtance of 11 feet, the former ſeen by both eyes, and the latter with one eye only, appeared to be of equal whiteneſs; ſo that an object ſeen with both eyes appears brighter than when it is ſeen with one only by about a 13th part. But he acknowledges, that it is difficult to make this experiment exactly.

He then proceeded to inquire, whether an object ſeen with both eyes appears any thing larger than when ſeen with one only; but he concluded that it did not, except on account of ſome particular circumſtances, as in the caſe of the binocular teleſcope and the concave ſpeculum.

M. du Tour maintains, that the mind attends to no more than the image made in one eye at a time; and produces ſeveral curious experiments in favour of this hypotheſis, which had alſo been maintained by Kepler and almoſt all the firſt opticians. But, as M. Buffon obſerves, it is a ſufficient anſwer to this hypotheſis, how ingeniouſly ſoever it may be ſupported, that we ſee more diſtinctly with two eyes than with one; and that when a round object is near us, we plainly ſee more of the ſurface in one caſe than in the other. There are alſo other facts which clearly prove the contrary of what is maintained by M. du Tour.

With reſpect to ſingle viſion with two eyes, Dr. Hartley obſerves, that it deſerves particular attention, that the optic nerves of men, and ſuch other animals as look the ſame way with both eyes, unite in the *cella turcica* in a ganglion, or little brain, as one may call it, peculiar to themſelves; and that the aſſociations between ſynchronous impreſſions on the two retinas muſt be made ſooner and cemented ſtronger on this account; alſo that they ought to have a much greater power over one another's images, than in any other part of the body. And thus an impreſſion made on the right eye alone, by a ſingle object, may propagate itſelf into the left, and there raiſe up an image almoſt equal in vividneſs to itſelf; and conſequently when we ſee with one eye only, we may, however, have pictures in both eyes.

A curious deception in viſion, ariſing from the uſe of both eyes, was obſerved and accounted for by Dr. Smith. It is a common obſervation, he ſays, that objects ſeen with both eyes appear more vivid and ſtronger than they do to a ſingle eye; eſpecially when both of them are equally good. A perſon not ſhort-ſighted may ſoon be convinced of this fact, by looking attentively at objects that are pretty remote, firſt with one eye, and then with both. This obſervation gave occaſion to the conſtruction of the binocular teleſcope, in the uſe of which the phenomenon is ſtill more ſtriking.

Beſides this, our author obſerves, that there is another phenomenon obſervable with this inſtrument, which is very remarkable. In the foci of the two teleſcopes there are two equal rings, as uſual, which terminate the pictures of the objects there formed, and conſequently the viſible area of the objects themſelves. Theſe equal rings, by reaſon of the equal eye-glaſſes, appear equal, and equally diſtant when ſeen ſeparately by each eye; but when they are ſeen with both eyes, they appear much larger, and more diſtant alſo; and the objects ſeen through them do alſo appear much larger, though circumſcribed by their united rings, in the ſame places as when they were ſeen ſeparately.

He obſerves, that the phenomenon of the enlarged circle of the viſible area in the binocular teleſcope, may be ſeen very plainly in looking at diſtant objects through a pair of ſpectacles, removed from the eyes about four or five inches, and held ſteady at that diſtance. The two innermoſt of the four apparent rings, which hold the glaſſes, will then appear united in one larger and more diſtant ring than the two outermoſt, which will hardly be viſible unleſs the ſpectacles be farther removed.

A curious circumſtance relating to the effect of one eye upon the other, was noticed by M. Æpinus, who obſerved, that, when he was looking through a hole made in a plate of metal, about the 10th part of a line in diameter, with his left eye, both the hole itſelf appeared larger, and alſo the field of view ſeen through it was more extended, whenever he ſhut his right eye; and both theſe effects were more remarkable when that eye was covered with his hand. He found conſiderable difficulty in meaſuring this augmentation of the apparent diameter of the hole, and of the field of view; but at length he found, that, when the hole was half an inch, and the tablet which he viewed through it was three feet from his eye, if the diameter of the field when both his eyes were open was 1, it became 1½ when

the other eye was ſhut, and nearly 2 when his hand was laid upon it.

Upon examining this phenomenon, it preſently appeared to depend upon the enlargement of the pupil of one eye when the the other is cloſed, the phyſical or anatomical cauſe of which he did not pretend to aſſign; but he obſerves, that it is wiſely appointed by divine Providence, in order that when one eye fails, the field of view in the other may be extended. That this effect ſhould be more ſenſible when the eye is covered with the hand, is owing, he obſerves, to the eye-lids not being impervious to the light. But the enlargement of the pupil does not enlarge the field of view, except in looking through a hole, as in this particular caſe; and therefore perſons who are blind of one eye can derive no advantage from this circumſtance. Before we applaud the wiſdom of Providence in any part of the conſtitution of nature, we ſhould be very ſure that we do not miſtake concerning the effects of that conſtitution.

A great deal has been written by Gaſſendi, Le Clerc, Muſſchenbroek, and Du Tour, concerning the place to which we refer an object viewed by one or both eyes. But the moſt ſatisfactory account of this matter that we have met with, the reader will find in Dr. Wells's Eſſay above quoted, which will teach any perſon how to ſatisfy himſelf by experiment with reſpect to viſible poſition and viſible motion.

§ 4. *Of the Appearance of Objects ſeen through Media of different Forms.*

For the more eaſy apprehenſion of what relates to this ſubject, we ſhall premiſe the five following particulars, which either have been already mentioned, or follow from what has been before laid down.

1. That as each point of an object, when viewed by the naked eye, appears in its proper place, and as that place is always to be found in the line in which the axis of a pencil of rays flowing from it enters the eye, or elſe in the line which Dr. Wells calls the common axis; we from hence acquire an habit of judging the point to be ſituated in that line: and, becauſe the mind is unacquainted with what refractions the rays ſuffer before they enter the eye, therefore, in caſes where they are diverted from their natural courſe, by paſſing through any medium, it judges the point to be in that line produced back in which the axis of a pencil of rays flowing from it is ſituated the inſtant they enter they eye, and not in that it was in before refraction. We ſhall therefore, in what follows, ſuppoſe the apparent place of an object, when ſeen through a refracting medium, to be ſomewhere in that line produced back in which the axis of a pencil of rays flowing from it proceeds after they have paſſed through the medium.

2. That we are able to judge, though imperfectly, of the diſtance of an object by the degree of divergency, wherein the rays flowing from the ſame point of the object enter the pupil of the eye, in caſes where that divergency is conſiderable; but becauſe in what follows it will be neceſſary to ſuppoſe an object, when ſeen through a medium whereby its apparent diſtance is altered, to appear in ſome determinate ſituation, in thoſe caſes where the divergency of the rays at their entrance into the eye is conſiderable, we will ſuppoſe the object to appear where thoſe lines which they deſcribe in entering, if produced back, would croſs each other: though it muſt not be aſſerted, that this is the preciſe diſtance; becauſe the brightneſs, diſtinctneſs, and apparent magnitude of the object, on which its apparent diſtance in ſome meaſure depends, will alſo ſuffer an alteration by the refraction of the rays in paſſing through that medium.

3. That we eſtimate the magnitude of an object by that of the optic angle.

4. That viſion is the brighter, the greater the number of rays is which enter the pupil. And,

5. That, in ſome caſes, the apparent brightneſs, diſtinctneſs, and magnitude of an object, are the only means whereby our judgment is determined in eſtimating the diſtance of it.

Prop. I. An object placed within a medium terminated by a plane ſurface on that ſide which is next the eye, if the medium be denſer than that in which the eye is (as we ſhall always ſuppoſe it to be, unleſs where the contrary is expreſſed), appears nearer to the ſurface of the medium than it is.

Thus, if A be a point of an object placed within the medium BDCE (Pl. 10. fig. 5.), and *A b Ac* be two rays proceeding from thence, theſe rays paſſing out of a denſer into a rarer medium, will be refracted from their reſpective perpendiculars *b d*, *c c*, and will enter the eye at H, ſuppoſe in the directions *b f*, *c g*: let then theſe lines be produced back till they meet in F; this will be the apparent place of the point A: and becauſe the refracted rays *b f*, *c g* will diverge more than the incident ones *Ab*, *Ac*, it will be nearer to the points *b* and *c* than the point A; and as the ſame is true of each point in the object, the whole will appear to an eye at H, nearer to the ſurface BC than it is.

From hence it is, that when one end of a ſtraight ſtick is put under water, and the ſtick is held in an oblique poſition, it appears bent at the ſurface of the water; viz. becauſe each point that is under water appears nearer the ſurface, and conſequently higher than it is.

From hence likewiſe it is, that an object at the bottom of a veſſel may be ſeen when the veſſel is filled with water, though it be ſo placed with reſpect to the eye, that it cannot be ſeen when the veſſel is empty. To explain this, let ABCD (fig. 6.) repreſent a veſſel, and let E be an object lying at the bottom of it. This object, when the veſſel is empty, will not be ſeen by an eye at F, becauſe HB, the upper part of the veſſel, will obſtruct the ray EH; but when it is filled with water to the height GH, the ray EK being refracted at the ſurface of the water in the line KF, the eye at F ſhall ſee the object by means of that.

In like manner, an object ſituated in the horizon appears above its true place, upon account of the refraction of the rays which proceed from it in their paſſage through the atmoſphere of the earth. For, firſt, if the object be ſituated beyond the limits of the atmoſphere, its rays in entering it will be refracted towards the perpendicular; that is, towards a line drawn from the point where they enter, to the centre of the earth, which is the centre of the atmoſphere: and as they paſs on, they will be continually refracted the ſame way, becauſe they are all along entering a denſer part, the centre of whoſe convexity is ſtill the ſame point; upon which account the line they deſcribe will be a curve bending downwards: and therefore none of the rays that come from that object can enter an eye upon the ſurface of the earth, except what enter the atmoſphere higher than they need to do if they could come in a right line from the object: conſequently the object muſt appear above its proper place. Secondly, if the object be placed within the atmoſphere, the caſe is ſtill the ſame; for the rays which flow from it muſt continually enter a denſer medium whoſe centre is below the eye; and therefore being refracted towards the centre, that is, downwards as before, thoſe which enter the eye muſt neceſſarily proceed as from ſome point above the object; wherefore the object will appear above its proper place.

From hence it is, that the ſun, moon, and ſtars, appear above the horizon, when they are juſt below it; and higher than they ought to do, when they are above it: Likewiſe diſtant hills, trees, &c. ſeem to be higher than they are.

Further, the lower theſe objects are in the horizon, the greater is the obliquity with which the rays which flow from them enter the atmoſphere, or paſs from the rarer into the denſer parts of it; and therefore they appear to be the more

elevated by refraction: upon which account the lower parts of them are apparently more elevated than the other. This makes their upper and under parts ſeem nearer than they are; as is evident from the ſun and moon, which appear of an oval form when they are in the horizon, their horizontal diameters appearing of the ſame length they would do if the rays ſuffered no refraction, while their vertical ones are ſhortened thereby.

Prop. II. An object ſeen through a medium terminated by plane and parallel ſurfaces, appears nearer, brighter, and larger, than with the naked eye.

For inſtance, let AB (pl. 10. fig. 7.) be the object, CDEF the medium, and GH the pupil of an eye, which is here drawn large to prevent confuſion in the figure. And, 1ſt, let RK, RL, be two rays proceeding from the point R, and entering the denſer medium at K and L; theſe rays will here by refraction be made to diverge leſs, and to proceed afterwards, ſuppoſe in the lines K*a*, L*b*; at *a* and *b*, where they paſs out of the denſer medium, they will be as much refracted the contrary way, proceeding in the lines *ac*, *bd*, parallel to their firſt directions. Produce theſe lines back till they meet in *e*: this will be the apparent place of the point R; and it is evident from the figure, that it muſt be nearer the eye than that point; and becauſe the ſame is true of all other pencils flowing from the object AB, the whole will be ſeen in the ſituation *fg*, nearer to the eye than the line AB. 2d, As the rays RK, RL, would not have entered the eye, but have paſſed by it in the directions K*r*, L*t*, had they not been refracted in paſſing through the medium, the object appears brighter. 3d, The rays A*b*, B*i*, will be refracted at *b* and *i* into the leſs converging lines *bk*, *il*, and at the other ſurface into *k*M, *l*M, parallel to A*b* and B*i* produced; ſo that the extremities of the object will appear in the lines M*k*, M*l* produced, viz. in *f* and *g*, and under as large an angle *f*M*g*, as the angle A*q*B under which an eye at *q* would have ſeen it had there been no medium interpoſed to refract the rays; and therefore it appears larger to the eye at GH, being ſeen through the interpoſed medium, than otherwiſe it would have done. But it is here to be obſerved, that the nearer the point *e* appears to the eye on account of the refraction of the rays RK, RL, the ſhorter is the image *fg*, becauſe it is terminated by the lines M*f* and M*g*, upon which account the object is made to appear leſs; and therefore the apparent magnitude of an object is not much augmented by being ſeen through a medium of this form.

Farther, it is apparent from the figure, that the effect of a medium of this form depends wholly upon its thickneſs; for the diſtance between the lines R*r* and *ec*, and conſequently the diſtance between the points *e* and R, depends upon the length of the line K*a*: Again, the diſtance between the lines AM and *f*M depends on the length of the line *bk*; but both K*u* and *kb* depend on the diſtance between the ſurfaces CE and DF, and therefore the effect of this medium depends upon its thickneſs.

Prop. III. An object ſeen through a convex lens, appears larger, brighter, and more diſtant, than with the naked eye.

To illuſtrate this, let AB (fig. 8.) be the object, CD the lens, and EF the eye. 1. From A and B, the extremities of the object, draw the lines AY*r*, BX*r*, croſſing each other in the pupil of the eye; the angle A*r*B comprehended between theſe lines is the angle under which the object would be ſeen with the naked eye. But by the interpoſition of a lens of this form, whoſe property it is to render converging rays more ſo, the rays AY and BX will be made to croſs each other before they reach the pupil. There the eye at E will not perceive the extremities of the object by means of theſe rays (for they will paſs it without entering), but by ſome others which muſt fall without the points Y and X, or between them; but if they fall between them, they will be made to concur ſooner than they themſelves would have done; and therefore, if the extremities of the object could not be ſeen by them, it will much leſs be ſeen by theſe. It remains therefore, that the rays which will enter the eye from the points A and B after refraction, muſt fall upon the lens without the points Y and X; let then the rays AO and BP be ſuch. Theſe after refraction entering the eye at *r*, the extremities of the object will be ſeen in the lines *r*Q, *r*T, produced, and under the optic angle Q*r*T, which is larger than A*r*B, and therefore the apparent magnitude of the object will be increaſed. 2. Let GHI be a pencil of rays flowing from the point G; as it is the property of this lens to render diverging rays leſs diverging, parallel, or converging, it is evident that ſome of thoſe rays, which would proceed on to F and E, and miſs the eye, were they to ſuffer no refraction in paſſing through the lens, will now enter it; by which means the object will appear brighter. 3. As to the apparent diſtance of the object, that will vary according to the ſituation of it with reſpect to the focus of parallel rays of the lens. 1. Then, let us ſuppoſe the object placed ſo much nearer the lens than its focus of parallel rays, that the refracted rays KE and LF, though rendered leſs diverging by paſſing through it, may yet have a conſiderable degree of divergency, ſo that we may be able to form a judgment of the diſtance of the object thereby. In this caſe, the object ought to appear where EK, FL, produced back concur; which, becauſe they diverge leſs than the rays GH, GI, will be beyond G, that is, at a greater diſtance from the lens than the object is. But becauſe both the brightneſs and magnitude of the object will at the ſame time be augmented, prejudice will not permit us to judge it quite ſo far off as the point where thoſe lines meet, but ſomewhere between that point and its proper place. 2. Let the object be placed in the focus of parallel rays, then will the rays KE and LF become parallel; and though in this caſe the object would appear at an immenſe diſtance, if that diſtance were to be judged of by the direction of the rays KE and LF, yet upon account of the brightneſs and magnitude of it, we ſhall not think it much farther from us than if it were ſeen by the naked eye. 3. If the object be ſituated beyond the focus of parallel rays, as in BA (pl. 10. fig. 9.), the rays flowing from thence and falling upon the lens CD, will be collected into their reſpective foci at *a* and *b*, and the intermediate points *m*, *n*, &c. and will there form an image of the object AB; and after croſſing each other in the ſeveral points of it, as expreſſed in the figure, will paſs on diverging as from a real object. Now if an eye be ſituated at *c*, where A*c*, B*c*, rays proceeding from the extreme points of the object, make not a much larger angle A*c*B, than they would do if there were no lens interpoſed, and the rays belonging to the ſame pencil do not converge ſo much as thoſe which the eye would receive if it were placed nearer to *a* or *b*, the object upon theſe accounts appearing very little larger or brighter than with the naked eye, is ſeen nearly in its proper place; but if the eye recedes a little way towards *a b*, the object then appearing both brighter and larger, ſeems to approach the lens: which is an evident proof of what has been ſo often aſſerted, viz. that we judge of the diſtance of an object in ſome meaſure by its brightneſs and magnitude; for the rays converge the more the farther the eye recedes from the lens; and therefore if we judged of the diſtance of the object by the direction of the rays which flow from it, we ought in this caſe to conceive it at a greater diſtance, than when the rays were parallel, or diverged at their entrance into the eye.

That the object ſhould ſeem to approach the lens in this caſe, was a difficulty that exceedingly puzzled the learned Barrow, and which he pronounces inſuperable, and not to be accounted for by any theory we have of viſion. Molineux alſo leaves it to the ſolution of others, as that which will be inexplicable, till a more intimate knowledge of the viſive faculty, as he expreſſes it, be obtained by mortals.

They imagined, that ſeeing an object appears farther off, the

leſs the rays diverge which fall upon the eye, if they ſhould proceed parallel to each other, it ought to appear exceeding remote; and if they ſhould converge, it ſhould then appear more diſtant ſtill: the reaſon of this was, becauſe they looked upon the apparent place of an object, as owing only to the direction of the rays whatever it was, and not at all to its apparent magnitude or ſplendor.

Perhaps it may proceed from our judging of the diſtance of an object in ſome meaſure by its magnitude, that that deception of ſight commonly obſerved by travellers may ariſe; viz. that upon the firſt appearance of a building larger than uſual, as a cathedral church, or the like, it generally ſeems nearer to them, than they afterwards find it to be.

Prob. IV. If an object be placed farther from a convex lens than its focus of parallel rays, and the eye be ſituated farther from it on the other ſide than the place where the rays of the ſeveral pencils are collected into their reſpective foci, the object appears inverted, and pendulous in the air, between the eye and the lens.

To explain this, let AB (fig. 9.) repreſent the object, CD the lens; and let the rays of the pencil ACD be collected in *a*, and thoſe of BCD in *b*, forming there an inverted image of the object AB, and let the eye be placed in F: it is apparent from the figure, that ſome of the refracted rays which paſs through each point of the image will enter the eye as from a real object in that place; and therefore the object AB will appear there, as the propoſition aſſerts. But we are ſo little accuſtomed to ſee objects in this manner, that it is very difficult to perceive the image with one eye; but if both eyes are ſituated in ſuch a manner, that rays flowing from each point of the image may enter both, as at G and H, and we direct our optic axes to the image, it is eaſy to be perceived.

If the eye be ſituated in *a* or *b*, or very near them on either ſide, the object appears exceedingly confuſed, viz. if at *d*, the rays which proceed from the ſame point of the object converge ſo very much, and if at *e*, they diverge ſo much, that they cannot be collected together upon the retina, but fall upon it as if they were the axes of ſo many many diſtinct pencils coming through every point of the lens; wherefore little more than one ſingle point of the object is ſeen at a time, and that appears all over the lens; from whence nothing but confuſion ariſes.

If the lens be ſo large that both eyes may be applied to it, as in *h* and *k*, the object will appear double; for it is evident from the figure, that the rays which enter the eye at *h* from either extremity of the object A or B, do not proceed as from the ſame point with that from whence thoſe which enter the other at *k* ſeem to flow; the mind therefore is here deceived, and looks upon the object as ſituated in two different places, and therefore judges it to be double.

Prop. V. An object ſeen through a concave lens appears nearer, ſmaller, and leſs bright, than with the naked eye. Thus, let AB (fig. 10.) be the object, CD the pupil of an eye, and EF the lens. Now, as it is the property of a lens of this form to render diverging rays more ſo, and converging ones leſs ſo, the diverging rays GH, GI, proceeding from the point G, will be made to diverge more, and ſo to enter the eye as from ſome nearer point *g*; and the rays AH, BI, which converge, will be made to converge leſs, and to enter the eye as from the points *a* and *b*; wherefore the objects will appear in the ſituation *agb*, leſs and nearer than without the lens. Farther, as the rays which proceed from G are rendered more diverging, ſome of them will be made to paſs by the pupil of the eye, which otherwiſe would have entered it, and therefore each point of the object will appear leſs bright.

Prob. VI. An object ſeen through a polygonous glaſs, that is, ſuch as is terminated by ſeveral plain ſurfaces, is multiplied thereby.

For inſtance, let A (fig. 11.) be an object, and BC a polygonous glaſs terminated by the plain ſurfaces BD, DE, &c. and let the ſituation of the eye F be ſuch, that the rays AB being refracted in paſſing through the glaſs, may enter it in the direction BF, and the rays AC in the direction CF. Then will the eye, by means of the former, ſee the object in G, and by the latter in H; and by means of the rays AI, the object will appear alſo in its proper ſituation A.

Sect. III. *Of the* Reflection *of Light.*

When a ray of light falls upon any body, however tranſparent, the whole of it never paſſes through the body, but ſome part is always driven back or reflected from it; and it is by this reflected light that all bodies which have no light of their own become viſible to us. Of that part of the ray which enters, another part is alſo reflected from the ſecond ſurface, or that which is fartheſt from the luminous body. When this part arrives again at the firſt ſurface, part of it is reflected back from that ſurface; and thus it continues to be reflected between the two ſurfaces, and to paſs backwards and forwards within the ſubſtance of the medium, till ſome part is totally extinguiſhed and loſt. Beſides this inconſiderable quantity, however, which is loſt in this manner, the ſecond ſurface often reflects much more than the firſt; inſomuch that, in certain poſitions, ſcarce any rays will paſs through both ſides of the medium. A very conſiderable quantity is alſo unaccountably loſt or extinguiſhed at each reflecting ſurface; inſomuch that no body, however tranſparent, can tranſmit all the rays which fall upon it; neither, though it be ever ſo well fitted for reflection, will it reflect them all.

§ 1. *Of the Cauſe of Reflection.*

The reflection of light is by no means ſo eaſily accounted for as the refraction of the ſame fluid. This property, as we have ſeen in the laſt ſection, may be accounted for in a ſatisfactory manner by the ſuppoſition of an attractive power diffuſed throughout the medium, and extending a very little way beyond it; but with regard to the reflection of light, there ſeems to be no ſatisfactory hypotheſis hitherto invented. Of the principal opinions on this ſubject Mr. Rowning hath given us the following account.

I. It was the opinion of philoſophers, before Sir Iſaac Newton diſcovered the contrary, that light is reflected by impinging upon the ſolid parts of bodies. But that it is not ſo, is clear for the following reaſons.

And firſt, it is not reflected at the firſt ſurface of a body by impinging againſt it.

For it is evident, that, in order to the due and regular reflection of light, that is, that the reflected rays ſhould not be diſperſed and ſcattered one from another, there ought to be no raſures or unevenneſs in the reflecting ſurface large enough to bear a ſenſible proportion to the magnitude of a ray of light; becauſe if the ſurface abounds with ſuch, the reflected rays will rather be ſcattered like a parcel of pebbles thrown upon a rough pavement, than reflected with that regularity with which light is obſerved to be from a well poliſhed ſurface. Now thoſe ſurfaces, which to our ſenſes appear perfectly ſmooth and well poliſhed, are far from being ſo; for to poliſh, is no other than to grind off the larger eminences and protuberances of the metal with the rough and ſharp particles of ſand, emery, or putty, which muſt of neceſſity leave behind them an infinity of raſures and ſcratches, which, though inconſiderable with regard to the former roughneſſes, and too minute to be diſcerned by us, muſt nevertheleſs bear a large proportion to, if not vaſtly exceed, the magnitude of the particles of light.

Secondly, it is not reflected at the ſecond ſurface by impinging againſt any ſolid particles.

That it is not reflected by impinging upon the ſolid particles

which conſtitute this ſecond ſurface, is ſufficiently clear from the foregoing argument; the ſecond ſurfaces of bodies being as incapable of a perfect polith as the firſt: and it is farther confirmed from hence, *viz.* that the quantity of light reflected differs according to the different denſity of the medium behind the body. And that it is not reflected by impinging upon the particles which conſtitute the ſurface of the medium behind it, is evident, becauſe the ſtrongeſt reflection of all at the ſecond ſurface of a body, is when there is a vacuum behind it. This therefore wants no farther proof.

II. It has been thought by ſome, that it is reflected at the firſt ſurface of a body, by a repulſive force equally diffuſed over it; and at the ſecond, by an attractive force.

1. If there be a repulſive force diffuſed over the ſurface of bodies that repels rays of light at all times, then, ſince by increaſing the obliquity of a ray we diminiſh its perpendicular force (which is that only whereby it muſt make its way through this repulſive force), however weakly that force may be ſuppoſed to act, rays of light may be made to fall with ſo great a degree of obliquity on the reflecting ſurface, that there ſhall be a total reflection of them there, and not one particle of light be able to make its way through: which is contrary to obſervation; the reflection of light at the firſt ſurface of a tranſparent body being never total in any obliquity whatever. The hypotheſis therefore in this particular muſt be falſe.

2. As to the reflection at the ſecond ſurface by the attractive force of the body; this may be conſidered in two reſpects: firſt, when the reflection is total; ſecondly, when it is partial.

And firſt, in caſes where the reflection is total, the cauſe of it is undoubtedly that ſame attractive force by which light would be refracted in paſſing out of the ſame body. This is manifeſt from that analogy which is obſervable between the reflection of light at this ſecond ſurface, and its refraction there. For otherwiſe, what can be the reaſon that the total reflection ſhould begin juſt when the obliquity of the incident ray, at its arrival at the ſecond ſurface, is ſuch that the refracted angle ought to be a right one; or when the ray, were it not to return in reflection, ought to paſs on parallel to the ſurface, without going from it? For in this caſe it is evident, that it ought to be returned by this very power, and in ſuch manner that the angle of reflection ſhall be equal to the angle of incidence; juſt as a ſtone thrown obliquely from the earth, after it is ſo far turned out of its courſe by the attraction of the earth, as to begin to move horizontally, or parallel to the ſurface of the earth, is then by the ſame power made to return in a curve ſimilar to that which is decribed in its departure from the earth, and ſo falls with the ſame degree of obliquity that it was thrown with.

But, ſecondly, as to the reflection at the ſecond ſurface, when it is partial; an attractive force uniformly ſpread over it, as the maintainers of this hypotheſis conceive it to be, can never be the cauſe thereof. Becauſe it is inconceivable, that the ſame force, acting in the ſame circumſtances in every reſpect, can ſometimes reflect the violet-coloured rays and tranſmit the red, and at other times reflect the red and tranſmit the violet.

We have ſtated this objection, becauſe it is our buſineſs to conceal no plauſible opinions: but it is not valid; for in each colour, the reflection takes place at that angle, and no other, where the refraction of *that* ray would make it parallel to the poſterior ſurface.

This partial reflection and refraction is a great difficulty in all the attempts which have been made to give a mechanical explanation of the phenomena of optics. It is equally a deſideratum in that explanation which was propoſed by Huygens, and, ſince his time, revived by Euler, by means of the undulations of an elaſtic fluid, although a vague conſideration of undulatory motions ſeems to offer a very ſpecious analogy. But a *rigid* application of ſuch *knowledge* as we have acquired of ſuch motions, will convince any unprejudiced mathematician, that the phenomena of undulation are eſſentially diſſimilar to the phenomena of light. The inflection of light, and its refraction, equally demonſtrate that light *is acted on* by moving forces in a direction perpendicular to the ſurface; and it is equally demonſtrable that ſuch forces muſt, in proper circumſtances, produce reflections preciſely ſuch as we obſerve. The only difficulty is to ſhow how there can be forces which produce both reflection and refraction, in circumſtances which are ſimilar. The fact is, that ſuch effects are produced: the firſt logical inference is, that with reſpect to the light which is reflected and that which is refracted, the circumſtances are *not* ſimilar; and our attention ſhould be directed to the diſcovery of that diſſimilarity. All the phenomena of combined reflection and refraction ſhould be examined and claſſed according to their generality, not doubting but that theſe points of reſemblance will lead to the diſcovery of their cauſes. Now the experiments of Mr. Bouguer ſhow that bodies differ extremely in their powers of thus ſeparating light by reflection and refraction, ſome of them reflecting much more at a given angle than others. It is not therefore *a general property of light* to be partly reflected and partly refracted, but a *diſtinctive* property of *different* bodies; and ſince we ſee that they poſſeſs it in *different* degrees, we are authoriſed to conclude that ſome bodies *may want it altogether*. We may therefore expect ſome ſucceſs by conſidering how bodies are affected by light, as well as how light is affected by bodies. Now, in all the phenomena of the material world we find bodies connected by mutual forces. We know no caſe where a body A tends towards a body B, or, in common language, is attracted by it, without, at the ſame time, the body B tending towards A. This is obſerved in the phenomena of magnetiſm, electricity, gravitation, corpuſcular attraction, impulſe, &c. We ſhould therefore conclude from analogy, that as bodies change the motion of light, light alſo changes the motion of bodies; and that the particles near the ſurface are put into vibration by the paſſage of light through among them. Suppoſe a parcel of cork-balls all hanging as pendulums in a ſymmetrical order, and that an electrified ball paſſes through the midſt of them; it is very eaſy to ſhow that it may proceed through this aſſemblage in various directions with a ſinuated motion, and without touching any of them, and that its ultimate direction will have a certain inclination to its primary direction, depending on the outline of the aſſemblage, juſt as is obſerved in the motion of light; and, in the mean time, the cork-balls will be variouſly agitated. Juſt ſo muſt it happen to the particles of a tranſparent body, if we ſuppoſe that they act on the particles of light by mutual attractions and repulſions.

An attentive conſideration of what happens here will ſhow us that the ſuperficial particles will be much more agitated than the reſt; and thus a ſtratum be produced, which, in any inſtant, will act on thoſe particles of light which are then approaching them in a manner different from that in which they will act on ſimilarly ſituated particles of light, which come into the place of the firſt in the following moment, when theſe acting particles of the body have (by their motion of vibration) changed their own ſituation. Now it is clearly underſtood, that in all motions of vibration, ſuch as the motions of pendulums, there is a moment when the body is in its natural ſituation, as when the pendulum is in the vertical line. This *may* happen in the ſame inſtant in each atom of the tranſparent body. The particles of light which *then* come within the ſphere of action may be wholly reflected; in the next moment, particles of light in the very ſituation of the firſt may be refracted.

Then will ariſe a ſeparation of light; and as this will depend on the manner in which the particles of bodies are agitated by

it during its paſſage, and as this again will depend on the nature of the body, that is on the law of action of thoſe forces which connect the particles with each other, and with the particles of light, it will be different in different bodies. But in all bodies there will be this general reſemblance, that the ſeparation will be moſt copious in great obliquities of incidence, which gives the repulſive forces more time for action, while it diminiſhes the perpendicular force of the light. Such a reſemblance between the phenomena and the legitimate conſequences of the aſſumption (the agitation of the parts of the body), gives us ſome authority for aſſigning this as the cauſe; nor can the aſſumption be called *gratuitous*. To ſuppoſe that the particles of the tranſparent body *are not thus agitated*, would be a moſt gratuitous contradiction of a law of nature to which we know no other exception.

III. Some, being apprehenſive of the inſufficiency of a repulſive and attractive force diffuſed over the ſurfaces of bodies and acting uniformly, have ſuppoſed, that, by the action of light upon the ſurface of bodies, the matter of theſe bodies is put into an undulatory motion; and that where the ſurface of it is ſubſiding light is tranſmitted, and in thoſe places where it is riſing light is reflected. But to overlook the objections which we have juſt made to this theory of undulation, we have only to obſerve, that, were it admitted, it ſeems not to advance us one jot farther; for in thoſe caſes, ſuppoſe where red is reflected and violet tranſmitted, how comes it to paſs that the red impinges only on thoſe parts when the waves are riſing, and the violet when they are ſubſiding?

IV. The next hypotheſis that we ſhall take notice of, is that remarkable one of Sir Iſaac Newton's fits of eaſy reflection and tranſmiſſion, which we ſhall now explain and examine.

That author, as far as we can apprehend his meaning in this particular, is of opinion, that light in its paſſage from the luminous body, is diſpoſed to be alternately reflected by and tranſmitted through any refracting ſurface it may meet with; that theſe diſpoſitions (which he calls *fits of eaſy reflection and eaſy tranſmiſſion*) return ſucceſſively at equal intervals; and that they are communicated to it at its firſt emiſſion out of the luminous body it proceeds from, probably by ſome very ſubtle and elaſtic ſubſtance diffuſed through the univerſe, and that in the following manner. As bodies falling into water, or paſſing through the air, cauſe undulations in each, ſo the rays of light may excite vibrations in this elaſtic ſubſtance. The quickneſs of which vibrations depending on the elaſticity of the medium (as the quickneſs of the vibrations in the air, which propagate ſound, depend ſolely on the elaſticity of the air, and not upon the quickneſs of thoſe in the ſounding body), the motion of the particles of it may be quicker than that of the rays: and therefore, when a ray at the inſtant it impinges upon any ſurface, is in that part of a vibration of this elaſtic ſubſtance which conſpires with its motion, it may be eaſily tranſmitted; and when it is in that part of a vibration which is contrary to its motion, it may be reflected. He farther ſuppoſes, that when light falls upon the ſurface of a body, if it be not in a fit of eaſy tranſmiſſion, every ray is there put into one, ſo that when they come at the other ſide (for this elaſtic ſubſtance, eaſily pervading the pores of bodies, is capable of the ſame vibrations within the body as without it), the rays of one colour ſhall be in a fit of eaſy tranſmiſſion, and thoſe of another in a fit of eaſy reflection, according to the thickneſs of the body, the intervals of the fits being different in rays of a different kind. This ſeems to account for the different colours of the bubble and thin plate of air and water, as is obvious enough; and likewiſe for the reflection of light at the ſecond ſurface of a thicker body; for the light reflected from thence is alſo obſerved to be coloured, and to form rings according to the different thickneſs of the body, when not intermixed and confounded with other light, as will appear from the following experiment. If a piece of glaſs be ground concav one one ſide and convex on the other, both its concavity and convexity having one common centre; and if a ray of light be made to paſs through a ſmall hole in a piece of paper held in that common centre, and be permitted to fall on the glaſs; beſides thoſe rays which are regularly reflected back to the hole again, there will be others reflected to the paper, and form coloured rings ſurrounding the hole, not unlike thoſe occaſioned by the reflection of light from thin plates.

It is ever with extreme reluctance that we venture to call in queſtion the doctrines of Newton; but to his theory of reflection there is this inſuperable objection, that it explains nothing, unleſs the *cauſe* of the fits of more eaſy reflection and tranſmiſſion be held as legitimate, namely, that *they are produced by the undulations of another elaſtic fluid, incomparably more ſubtile than light*, acting upon it in the way of impulſe. The fits themſelves are *matters of fact*, and no way different from what we have endeavoured to account for: but to admit this theory of them would be to tranſgreſs every rule of philoſophiſing, as we have ſhown them to be ſuſceptible of explanation from acknowledged optical laws.

§ 2. *Of the Laws of Reflection.*

The fundamental law of the reflection of light, is, that in all caſes the angle of reflection is equal to the angle of incidence. This is found by experiment to be the caſe, and beſides may be demonſtrated mathematically from the laws of percuſſion in bodies perfectly elaſtic. The axiom therefore holds good in every caſe of reflection, whether it be from plane ſurfaces or ſpherical ones, and that whether they are convex or concave; and hence the ſeven following propoſitions relating to the reflection of light from plane and ſpherical ſurfaces may be deduced.

I. Rays of light reflected from a plane ſurface have the ſame degree of inclination to one another that their reſpective incident ones have.—For the angle of reflection of each ray being equal to that of its reſpective incident one, it is evident, that each reflected ray will have the ſame degree of inclination to that portion of the ſurface from whence it is reflected that its incident one has; but it is here ſuppoſed, that all thoſe portions of ſurface from whence the rays are reflected, are ſituated in the ſame plain; conſequently the reflected rays will have the ſame degree of inclination to each other that their incident ones have, from whatever part of the ſurface they are reflected.

II. Parallel rays reflected from a concave ſurface are rendered converging.—To illuſtrate this, let AF, CD, EB, (Pl. 11. fig. 1.) repreſent three parallel rays falling upon the concave ſurface FB, whoſe centre is C. To the points F and B draw the lines CF, CB; theſe being drawn from the centre, will be perpendicular to the ſurface at thoſe points. The incident ray CD alſo paſſing through the centre, will be perpendicular to the ſurface, and therefore will return after reflection in the ſame line; but the oblique rays AF and EB will be reflected into the lines FM and BM, ſituated on the contrary ſide of their reſpective perpendiculars CF and CB. They will therefore proceed converging after reflection towards ſome point, as M, in the line CD.

III. Converging rays falling on the like ſurface, are made to converge more.—For, every thing remaining as above, let GF, HB, be the incident rays. Now, becauſe theſe rays have larger angles in incidence than the parallel ones AF and EB in the foregoing caſe, their angles of reflection will alſo be larger than thoſe of the others; they will therefore converge after reflection, ſuppoſe in the lines FN and BN, having their point of concourſe N farther from the point C than M, that to which the parallel rays AF and EB converged to in the foregoing caſe; and their preciſe degree of convergency will be greater than that wherein they converged before reflection.

IV. Diverging rays falling upon the like ſurface, are, after reflection, parallel, diverging, or converging. If they diverge from the focus of parallel rays, they then become parallel; if from a point nearer to the ſurface than that, they will diverge, but in a leſs degree than before reflection; if from a point between that and the centre, they will converge after reflection, and that to ſome point on the contrary ſide of the centre, but ſituated farther from it than the point from which they diverged. If the incident rays diverge from a point beyond the centre, the reflected ones will converge to one on the other ſide of it, but nearer to it than the point they diverged from; and if they diverge from the centre, they will be reflected thither again.

1. Let them diverge in the lines MF, MB, proceeding from M, the focus of parallel rays; then, as the parallel rays AF and EB were reflected into the lines FM and BM (by Prop. II.), theſe rays will now on the contrary be reflected into them.

2. Let them diverge from N, a point nearer to the ſurface than the focus of parallel rays, they will then be reflected into the diverging lines FG and BH which the incident rays GF and HB deſcribed that were ſhewn to be reflected into them in the foregoing propoſition; but the degree wherein they diverge will be leſs than that wherein they diverged before reflection.

3. Let them proceed diverging from X, a point between the focus of parallel rays and the centre; they then make leſs angles of incidence than the rays MF and MB, which became parallel by reflection: they will conſequently have leſs angles of reflection, and proceed therefore converging towards ſome point, as Y; which point will always fall on the contrary ſide of the centre, becauſe a reflected ray always falls on the contrary ſide of the perpendicular with reſpect to that on which its incident one falls; and of conſequence it will be farther diſtant from the centre than X.

4. If the incident ones diverge from Y, they will, after reflection, converge to X; thoſe which were the incident rays in the former caſe being the reflected ones in this. And laſtly,

5. If the incident rays proceed from the centre, they fall in with their reſpective perpendiculars; and for that reaſon are reflected thither again.

V. Parallel rays reflected from a convex ſurface are rendered diverging.—For, let AB, GD, EF, (fig. 2.) be three parallel rays falling upon the convex ſurface BF, whoſe centre of convexity is C, and let one of them, viz. GD, be perpendicular to the ſurface. Through B, D, and F, the points of reflection, draw the lines CV, CG, and CT; which, becauſe they paſs through the centre, will be perpendicular to the ſurface at theſe points. The incident ray GD being perpendicular to the ſurface, will return after reflection in the ſame line, but the oblique ones AB and EF in the lines BK and FL, ſituated on the contrary ſide of their reſpective perpendiculars BV and FT. They will therefore diverge, after reflection, as from ſome point M in the line GD produced; and this point will be in the middle between D and C.

VI. Diverging rays reflected from the like ſurface are rendered more diverging.—For, every thing remaining as above, let GB, GF, be the incident rays. Theſe having larger angles of incidence than the parallel ones AB and EF in the preceding caſe, their angles of reflection will alſo be larger than theirs: they will therefore diverge after reflection, ſuppoſe in the lines BP and FQ, as from ſome point N, farther from C than the point M; and the degree wherein they will diverge will be greater than that wherein they diverged before reflection.

VII. Converging rays reflected from the like ſurface, are parallel, converging, or diverging. If they tend towards the focus of parallel rays, they then become parallel; if to a point nearer the ſurface than that, they converge, but in a leſs degree than before reflection; if to a point between that and the centre, they will diverge after reflection, as from ſome point on the contrary ſide of the centre, but ſituated farther from it than the point they converged to: if the incident rays converge to a point beyond the centre, the reflected ones will diverge as from one on the contrary ſide of it, but nearer to it than the point to which the incident ones converged; and if the incident rays converge towards the centre, the reflected ones will proceed as from thence.

1. Let them converge in the lines KB and LF, tending towards M, the focus of parallel rays; then, as the parallel rays AB, EF were reflected into the lines BK and FL (by Prop. V.), thoſe rays will now on the contrary be reflected into them.

2. Let them converge in the lines PB, QF, tending towards N a point nearer the ſurface than the focus of parallel rays, they will then be reflected into the converging lines BG and FG, in which the rays GB, GF proceeded that were ſhown to be reflected into them by the laſt propoſition: but the degree wherein they will converge will be leſs than that wherein they converged before reflection.

3. Let them converge in the lines RB and SF proceeding towards X, a point between the focus of parallel rays and the centre: their angles of incidence will then be leſs than thoſe of the rays KB and LF, which became parallel after reflection: their angles of reflection will therefore be leſs; on which account they muſt neceſſarily diverge, ſuppoſe in the lines BH and FI, from ſome point, as Y; which point (by Prop. IV.) will fall on the contrary ſide of the centre with reſpect to X, and will be farther from it than that.

4. If the incident rays tend towards Y, the reflected ones will diverge as from X; thoſe which were the incident ones in one caſe being the reflected ones in the other.

5. Laſtly, if the incident rays converge towards the centre, they fall in with their reſpective perpendiculars; on which account they proceed after reflection as from the centre.

We have already obſerved, that in ſome caſes there is a very great reflection from the ſecond ſurface of a tranſparent body. The degree of inclination neceſſary to cauſe a total reflection of a ray at the ſecond ſurface of a medium, is that which requires that the refracted angle (ſuppoſing the ray to paſs out there) ſhould be equal to or greater than a right one; and conſequently it depends on the refractive power of the medium through which the ray paſſes, and is therefore different in different media. When a ray paſſes through glaſs ſurrounded with air, and is inclined to its ſecond ſurface under an angle of 42 degrees or more, it will be wholly reflected there. For, as 11 is to 17 (the ratio of refraction out of glaſs into air), ſo is the ſine of an angle of 42 degrees to a fourth number that will exceed the ſine of a right angle. From hence it follows, that when a ray of light arrives at the ſecond ſurface of a tranſparent ſubſtance with as great or a greater degree of obliquity than that which is neceſſary to make a total reflection, it will there be all returned back to the firſt: and if it proceeds towards that with as great an obliquity as it did towards the other (which it will do if the ſurfaces of the medium be parallel to each other), it will there be all reflected again, &c. and will therefore never get out, but paſs from ſide to ſide, till it be wholly ſuffocated and loſt within the body.—From hence may ariſe an obvious inquiry, how it comes to paſs, that light falling very obliquely upon a glaſs window from without, ſhould be tranſmitted into the room. In anſwer to this it muſt be conſidered, that however obliquely a ray falls upon the ſurface of any medium whoſe ſides are parallel (as thoſe of the glaſs in a window are), it will ſuffer ſuch a degree of refraction in entering there, that it ſhall fall upon the ſecond with a leſs obliquity than that which is neceſſary to cauſe a total reflection. For inſtance, let the medium be glaſs, as ſuppoſed in the preſent caſe: then, as 17 is to 11 (the ratio of refraction out of air into glaſs), ſo is the ſine of the largeſt angle

of incidence with which a ray can fall upon any ſurface to the line of a leſs angle than that of total reflection. And therefore, if the ſides of the glaſs be parallel, the obliquity with which a ray falls upon the firſt ſurface, cannot be ſo great, but that it ſhall paſs the ſecond without ſuffering a total reflection there.

When light paſſes out of a denſer into a rarer medium, the nearer the ſecond medium approaches the firſt in denſity (or more properly in its refractive power), the leſs of it will be refracted in paſſing from one to the other; and when their refracting powers are equal, all of it will paſs into the ſecond medium.

The above propoſitions may be all mathematically demonſtrated in the following manner.

Prop. I. Of the reflection of rays from a plane ſurface. "When rays fall upon a plane ſurface, if they diverge, the focus of the reflected rays will be at the ſame diſtance behind the ſurface that the radiant point is before it: if they converge, it will be at the ſame diſtance before the ſurface that the imaginary focus of the incident rays is behind it." This propoſition admits of two caſes.

Case 1. Of diverging rays.

Dem. Let AB, AC, (Pl. 11. fig. 3.) be two diverging rays incident on the plane ſurface DE, the one perpendicularly, the other obliquely: the perpendicular one AB will be reflected to A, proceeding as from ſome point in the line AB produced; the oblique one AC will be reflected into ſome line as CF, ſuch that the point G, where the line FG produced interſects the line AB produced alſo, ſhall be at an equal diſtance from the ſurface DE with the radiant A. For the perpendicular CH being drawn, ACH and HCF will be the angles of incidence and reflection; which being equal, their complements ACB and FCE are ſo too: but the angle BCG is equal to FCE, as being vertical to it: therefore in the triangles ABC and GBC the angles at C are equal, the ſide BC is common, and the angles at B are alſo equal to each other, as being right ones; therefore the lines AB and BG, which reſpect the equal angles at C, are alſo equal; and conſequently the point G, the focus of the incident rays AB, AC, is at the ſame diſtance behind the ſurface, that the point A is before it. Q. E. D.

Case 2. Of converging rays.

This is the converſe of the former caſe. For ſuppoſing FC and AB to be two converging incident rays, CA and BA will be the reflected ones (the angles of incidence in the former caſe being now the angles of reflection, and *vice verſa*), having the point A for their focus; but this, from what was demonſtrated above, is at an equal diſtance from the reflecting ſurface with the point G, which in this caſe is the imaginary focus of the incident rays FC and AB.

Obs. It is not here, as in the refraction of rays in paſſing through a plane ſurface, where ſome of the refracted rays proceed as from one point, and ſome as from another: but they all proceed after reflection as from one and the ſame point, however obliquely they may fall upon the ſurface; for what is here demonſtrated of the ray AC holds equally of any other, as AI, AK, &c.

The caſe of parallel rays incident on a plane ſurface is included in this propoſition: for in that caſe we are to ſuppoſe the radiant to be at an infinite diſtance from the ſurface, and then by the propoſition the focus of the reflected rays will be ſo too; that is, the rays will be parallel after reflection, as they were before.

Prop. II. Of the reflection of parallel rays from a ſpherical ſurface.

"When parallel rays are incident upon a ſpherical ſurface, the focus of the reflected rays will be the middle point between the centre of convexity and the ſurface."

This propoſition admits of two caſes.

Case 1. Of parallel rays falling upon a convex ſurface.

Dem. Let AB, DH, (fig. 4.) repreſent two parallel rays incident on the convex ſurface BH, the one perpendicularly, the other obliquely; and let C be the centre of convexity; ſuppoſe HE to be the reflected ray of the oblique incident one DH proceeding as from F, a point in the line AB produced. Through the point H draw the line CI, which will be perpendicular to the ſurface at that point; and the angles DHI and IHE, being the angles of incidence and reflection, will be equal. To the former of theſe the angle HCF is equal, the lines AC and DH being parallel; and to the latter the angle CHF, as being vertical; wherefore the triangle CFH is iſoſceles, and conſequently the ſides CF and FH are equal: but ſuppoſing BH to vaniſh, FH is equal to FB; and therefore upon this ſuppoſition FC and FB are equal, that is, the focus of the reflected rays is the middle point between the centre of convexity and the ſurface. Q. E. D.

Case 2. Of parallel rays falling upon a concave ſurface.

Dem. Let AB, DH, (fig. 5.) be two parallel rays incident, the one perpendicularly, the other obliquely, on the concave ſurface BH, whoſe centre of concavity is C. Let BF and HF be the reflected rays meeting each other in F; this will be the middle point between B and C. For drawing through C the perpendicular CH, the angles DHC and FHC, being the angles of incidence and reflection, will be equal, to the former of which the angle HCF is equal, as alternate; and therefore the triangle CFH is iſoſceles. Wherefore CF and FH are equal: but if we ſuppoſe BH to vaniſh, FB and FH are alſo equal; and therefore CF is equal to FB, that is, the focal diſtance of the reflected rays is the middle point between the centre and the ſurface. Q. E. D.

Obs. It is here obſervable, that the farther the line DH, either in fig. 4 or 5. is taken from AB, the nearer the point F falls to the ſurface. For the farther the point H recedes from B, the larger the triangle CFH will become; and conſequently, ſince it is always an iſoſceles one, and the baſe CH, being the radius, is everywhere of the ſame length, the equal legs CF and FH will lengthen; but CF cannot grow longer unleſs the point F approach towards the ſurface. And the farther H is removed from B, the faſter F approaches to it.

This is the reaſon, that whenever parallel rays are conſidered as reflected from a ſpherical ſurface, the diſtance of the oblique one from the perpendicular one is taken ſo ſmall with reſpect to the focal diſtance of that ſurface, that without any phyſical error it may be ſuppoſed to vaniſh.

From hence it follows, that if a number of parallel rays, as AB, CD, EG, &c. fall upon a convex ſurface, (as fig. 6.) and if BA, DK, the reflected rays of the incident ones AB, CD, proceed as from the point F, thoſe of the incident ones CD, EG, viz. DK, GL, will proceed as from N, thoſe of the incident ones EG, HI, as from O, &c. becauſe the farther the incident ones CD, EG, &c. are from AB, the nearer to the ſurface are the points F, *f*, *f*, in the line BF, from which they proceed after reflection; ſo that properly the foci of the reflected rays BA, DK, GL, &c. are not in the line AB produced, but in a curve line paſſing through the points F, N, O, &c.

The ſame is applicable to the caſe of parallel rays reflected from a concave ſurface, as expreſſed by the pricked lines on the other half of the figure, where PQ, RS, TV, are the incident rays; QF, S*f*, V*f*, the reflected ones, interſecting each other in the points X, Y, and F; ſo that the foci of thoſe rays are not in the line FB, but in a curve paſſing through thoſe points.

Had the ſurface BH in fig. 4. or 5. been formed by the revolution of a parabola about its axis having its focus in the point F, all the rays reflected from the convex ſurface would

have proceeded as from the point F, and thoſe reflected from the concave would have fallen upon it, however diſtant their incident ones AB, DH, might have been from each other. For in the parabola, all lines drawn parallel to the axis make angles with the tangents to the points where they cut the parabola (that is, with the ſurface of the parabola) equal to thoſe which are made with the ſame tangents by lines drawn from thence to the focus; therefore, if the incident rays deſcribe thoſe parallel lines, the reflected ones will neceſſarily deſcribe theſe other, and ſo will all proceed as from, or meet in, the ſame point.

Prop. III. Of the reflection of diverging and converging rays from a ſpherical ſurface. "When rays fall upon any ſpherical ſurface, if they diverge, the diſtance of the focus of the reflected rays from the ſurface is to the diſtance of the radiant point from the ſame (or, if they converge, to that of the imaginary focus of the incident rays), as the diſtance of the focus of the reflected rays from the centre is to the diſtance of the radiant point (or imaginary focus of the incident rays) from the ſame." This propoſition admits of ten caſes.

Case 1. Of diverging rays falling upon a convex ſurface.

Dem. Let RB, RD (fig. 7.) repreſent two diverging rays flowing from the point R as from a radiant, and falling the one perpendicularly, the other obliquely, on the convex ſurface BD, whoſe centre is C. Let DE be the reflected ray of the incident one RD, produce ED to F, and through R draw the line RH parallel to FE till it meets CD produced in H. Then will the angle RHD be equal to EDH the angle of reflection, as being alternate to it, and therefore equal alſo to RDH which is the angle of incidence; wherefore the triangle DRH is iſoſceles, and conſequently DR is equal to RH. Now the lines FD and RH being parallel, the triangles FDC and RHC are ſimilar, (or, to expreſs it in Euclid's way, the ſides of the triangle RHC are cut proportionably, 2 Elem. 6.); and therefore FD is to RH, or its equal RD, as CF to CR; but BD vaniſhing, FD and RD differ not from FB and RB: wherefore FB is to RB alſo, as CF to CR; that is, the diſtance of the focus from the ſurface is to the diſtance of the radiant point from the ſame, as the diſtance of the focus from the centre is to the diſtance of the radiant from thence. Q. E. D.

Case 2. Of converging rays falling upon a concave ſurface.

Dem. Let KD and CB be the converging incident rays having their imaginary focus in the point R, which was the radiant in the foregoing caſe. Then as RD was in that caſe reflected into DE, KD will in this be reflected into DF; for, ſince the angles of incidence in both caſes are equal, as they are by being vertical, the angles of reflection will be ſo too; ſo that F will be the focus of the reflected rays: but it was there demonſtrated, that FB is to RB as CF to CR: that is, the diſtance of the focus from the ſurface is to the diſtance (in this Caſe) of the imaginary focus of the incident rays, as the diſtance of the focus from the centre is to the diſtance of the imaginary focus of the incident rays from the ſame. Q. E. D.

Case 3. Of converging rays falling upon a convex ſurface, and tending to a point between the focus of parallel rays and the centre.

Dem. Let BD (Pl. II. fig. 8.) repreſent a convex ſurface whoſe centre is C, and whoſe focus of parallel rays is P; and let AB, KD, be two converging rays incident upon it, and having their imaginary focus at R, a point between P and C. Now becauſe KD tends to a point between the focus of parallel rays and the centre, the reflected ray DE will diverge from ſome point on the other ſide the centre, ſuppoſe F; as explained above (p. 165.) under Prop. 7. Through D draw the perpendicular CD, and produce it to H; then will KDH and HDE be the angles of incidence and reflection, which being equal, their vertical ones RDC and CDF will be ſo too, and therefore the vertex of the triangle RDF is biſected by the line DC: wherefore (3 El. 6.) FD and DR, or, BD vaniſhing, FB and BR are to each other as FC to CR; that is, the diſtance of the focus of the reflected rays is to that of the imaginary focus of the incident ones, as the diſtance of the former from the centre is to the diſtance of the latter from the ſame. Q. E. D.

Case 4. Of diverging rays falling upon a concave ſurface, and proceeding from a point between the focus of parallel rays and the centre.

Dem. Let RB, RD, (fig. 8.) be the diverging rays incident upon the concave ſurface BD, having their radiant point in the point R, the imaginary focus of the incident rays in the foregoing caſe. Then as KD was in that caſe reflected into DE, RD will now be reflected into DF. But it was there demonſtrated, that FB and RB are to each other as CF to CR; that is, the diſtance of the focus is to that of the radiant as the diſtance of the former from the centre is to the diſtance of the latter from the ſame. Q. E. D.

The angles of incidence and reflection being equal, it is evident, that if, in any caſe, the reflected ray be made the incident one, the incident will become the reflected one; and therefore the four following caſes may be conſidered reſpectively as the converſe of the four foregoing; for in each of them the incident rays are ſuppoſed to coincide with the reflected ones in the other. Or they may be demonſtrated independently of them as follows.

Case 5. Of converging rays falling upon a convex ſurface, and tending to a point nearer the ſurface than the focus of parallel rays.

Dem. Let ED, RB (fig. 7.) be the converging rays incident upon the convex ſurface BD whoſe centre is C, and focus of parallel rays is P; and let the imaginary focus of the incident rays be at F, a point between P and B; and let DR be the reflected ray. From C and R draw the lines CH, RH, the one paſſing through D, the other parallel to FE. Then will the angle RHD be equal to HDE the angle of incidence, as alternate to it; and therefore equal to HDR, the angle of reflection: wherefore the triangle HDR is iſoſceles, and conſequently DR is equal to RH. Now the lines FD and RH being parallel, the triangles FDC and RHC are ſimilar; and therefore RH, or RD, is to FD as CR to CF: but BD vaniſhing, RD and FD coincide with RB and FB, wherefore RB is to FB as CR to CF; that is, the diſtance of the focus from the ſurface is to the diſtance of the imaginary focus of the incident rays, as the diſtance of the focus from the centre is to the diſtance of the imaginary focus of the incident rays from the ſame. Q. E. D.

Case 6. Of diverging rays falling upon a concave ſurface, and proceeding from a point between the focus of parallel rays and the ſurface.

Dem. Let FD and FB repreſent two diverging rays flowing from the point F as a radiant, which was the imaginary focus of the incident rays in the foregoing caſe. Then as ED was in that caſe reflected into DR, FD will be reflected into DK (for the reaſon mentioned in Caſe 2.), ſo that the reflected ray will proceed as from the point R: but it was demonſtrated in the caſe immediately foregoing, that RB is to FB as CR to CF; that is, the diſtance of the focus from the ſurface is to that of the radiant from the ſame, as the diſtance of the former from the centre is to that of the latter from the ſame. Q. E. D.

Case 7. Of converging rays falling upon a convex ſurface, and tending towards a point beyond the centre.

Dem. Let AB, ED (fig. 8.) be the incident rays tending to F, a point beyond the centre C, and let DK be the reflected ray of the incident one ED. Then becauſe the incident ray ED tends to a point beyond the centre, the reflected ray DK will proceed as from one on the contrary ſide, ſup-

poſe R; as explained above under Prop. VII. Through D draw the perpendicular CD, and produce it to H. Then will EDH and HDK be the angles of incidence and reflection; which being equal, their vertical ones CDF and CDR will be ſo too: conſequently the vertex of the triangle FDR is biſected by the line CD: wherefore, RD is to DF, or (3 Elem. 6.) BD vaniſhing, RB is to BF as RC to CF; that is, the diſtance of the focus of the reflected rays is to that of the imaginary focus of the incident rays, as the diſtance of the former from the centre is to the diſtance of the latter from the ſame. Q. E. D.

Case 8. Of diverging rays falling upon a concave ſurface, and proceeding from a point beyond the centre.

Dem. Let FB, FD, be the incident rays having their radiant in F, the imaginary focus of the incident rays in the foregoing caſe. Then as ED was in that caſe reflected into DK, FD will now be reflected into DR; ſo that R will be the focus of the reflected rays. But it was demonſtrated in the foregoing caſe, that RB is to FB as RC to CF; that is, the diſtance of the focus of the reflected rays from the ſurface is to the diſtance of the radiant from the ſame, as the diſtance of the focus of the reflected rays from the centre is to the diſtance of the radiant from thence. Q. E. D.

The two remaining caſes may be conſidered as the converſe of thoſe under Prop. II. (p. 166.), becauſe the incident rays in theſe are the reflected ones in them; or they may be demonſtrated in the ſame manner with the foregoing, as follows.

Case 9. Converging rays falling upon a convex ſurface, and tending to the focus of parallel rays, become parallel after reflection.

Dem. Let ED, RB (fig. 7.), repreſent two converging rays incident on the convex ſurface BD, and tending towards F, which we will now ſuppoſe to be the focus of parallel rays; and let DR be the reflected ray, and C the centre of convexity of the reflecting ſurface. Through C draw the line CD, and produce it to H, drawing RH parallel to ED produced to F. Now it has been demonſtrated (Caſe 5. where the incident rays are ſuppoſed to tend to the point F), that RB is to FB as RC to CF; but F in this caſe being ſuppoſed to be the focus of parallel rays, it is the middle point between C and B (by Prop. II.), and therefore FB and FC are equal; and conſequently the two other terms in the proportion, *viz.* RB and RC, muſt be ſo too; which can only be upon the ſuppoſition that R is at an infinite diſtance from B; that is, that the reflected rays BR and DR be parallel. Q. E. D.

Case 10. Diverging rays falling upon a concave ſurface, and proceeding from the focus of parallel rays, become parallel after reflection.

Dem. Let RD, RB (fig. 8.), be two diverging rays incident upon the concave ſurface BD, as ſuppoſed in Caſe 4. where it was demonſtrated that FB is to RB as CF to CR. But in the preſent caſe RB and CR are equal, becauſe R is ſuppoſed to be the focus of parallel rays; therefore FB and FC are ſo too: which cannot be unleſs F be taken at an infinite diſtance from B; that is, unleſs the reflected rays BF and DF be parallel. Q. E. D.

Obs. It is here obſervable, that in the caſe of diverging rays falling upon a convex ſurface (ſee fig. 7.), the farther the point D is taken from B, the nearer the point F, the focus of the reflected rays, approaches to B, while the radiant R remains the ſame. For it is evident from the curvature of a circle, that the point D (fig. 9.) may be taken ſo far from B, that the reflected ray DE ſhall proceed as from F, G, H, or even from B, or from any point between B and R; and the farther it is taken from B, the faſter the point from which it proceeds approaches towards R: as will eaſily appear if we draw ſeveral incident rays with their reſpective reflected ones, in ſuch manner that the angles of reflection may be all equal to their reſpective angles of incidence, as is done in the figure. The like is applicable to any of the other caſes of diverging or converging rays incident upon a ſpherical ſurface. This is the reaſon, that when rays are conſidered as reflected from a ſpherical ſurface, the diſtance of the oblique rays from the perpendicular one is taken ſo ſmall, that it may be ſuppoſed to vaniſh.

From hence it follows, that if a number of diverging rays are incident upon the convex ſurface BD at the ſeveral points B, D, D, &c. they ſhall not proceed after reflection as from any point in the line RB produced, but as from a curve line paſſing through the ſeveral points F, *f*, *f*, &c. The ſame is applicable in all the other caſes.

Had the curvature BD (fig. 7.) been hyperbolical, having its foci in R and F; then R being the radiant (or the imaginary focus of incident rays), F would have been the focus of the reflected ones, and *vice verſa*, however diſtant the points B and D might be taken from each other. In like manner, had the curve BD (fig. 8.) been elliptical, having its foci in F and R, the one of theſe being made the radiant (or imaginary focus of incident rays), the other would have been the focus of reflected ones, and *vice verſa*. For both in the hyperbola and ellipſis, lines drawn from each of their foci through any point make equal angles with the tangent to that point. Therefore, if the incident rays proceed to or from one of their foci, the reflected ones will all proceed as from or to the other. So that, in order that diverging or converging rays may be accurately reflected to or from a point, the reflecting ſurface muſt be formed by the revolution of an *hyperbola* about its longer axis, when the incident rays are ſuch that their radiant or imaginary focus of incident rays ſhall fall on one ſide the ſurface, and the focus of the reflected ones on the other: when they are both to fall on the ſame ſide, it muſt be formed by the revolution of an *ellipſis* about its longer axis. However, upon account of the great facility with which ſpherical ſurfaces are formed in compariſon of that with which ſurfaces formed by the revolution of any of the conic ſections about their axes are made, the latter are very rarely uſed. Add to this another inconvenience, *viz.* that the foci of theſe curves being mathematical points, it is but one point of the ſurface of an object that can be placed in any of them at a time; ſo that it is only in theory that ſurfaces formed by the revolution of theſe curves about their axes render reflection perfect.

Now, becauſe the focal diſtance of rays reflected from a ſpherical ſurface cannot be found by the analogy laid down in the third propoſition, without making uſe of the quantity ſought; we ſhall here give an inſtance whereby the method of doing it in all others will readily appear.

Prob. Let it be required to find the focal diſtance of diverging rays incident upon a convex ſurface, whoſe radius of convexity is 5 parts, and the diſtance of the radiant from the the ſurface is 20.

Sol. Call the focal diſtance ſought x; then will the diſtance of the focus from the centre be $5-x$, and that of the radiant from the ſame 25: therefore by prop. 3. we have the following proportion, *viz.* $x : 20 :: 5-x : 25$; and multiplying extremes together and means together, we have $25x = 100-20x$, which, after due reduction, gives $x = \frac{100}{45}$.

If in any caſe it ſhould happen that the value of x ſhould be a negative quantity, the focal point muſt then be taken on the contrary ſide of the ſurface to that on which it was ſuppoſed that it would fall in ſtating the problem.

If letters inſtead of figures had been made uſe of in the foregoing ſolution, a general theorem might have been raiſed, to have determined the focal diſtance of reflected rays in all caſes

whatever. See this done in Suppl. to *Gregory's Optics*, 2d edit. p. 112.

Becauſe it was, in the preceding ſection, obſerved, that different incident rays, though tending to or from one point, would after refraction proceed to or from different points, a method was there inſerted, of determining the diſtinct point which each ſeparate ray entering a ſpherical ſurface converges to, or diverges from, after refraction: the ſame has been obſerved here with regard to rays reflected from a ſpherical ſurface (ſee Obſ. in Caſe 2. and Caſe 10.) But the method of determining the diſtinct point to or from which any given incident ray proceeds after reflection, is much more ſimple. It is only neceſſary to draw the reflected ray ſuch that the angle of reflection may be equal to the angle of incidence, which will determine the point it proceeds to or from in any caſe whatever.

§ 3. *Of the Appearance of Bodies ſeen by Light reflected from plane and ſpherical Surfaces.*

WHATEVER has been ſaid concerning the appearance of bodies ſeen by refracted light through lenſes, reſpects alſo the appearance of bodies ſeen by reflection. But beſides theſe, there is one thing peculiar to images by reflection, viz. that each point in the repreſentation of an object made by reflection appears ſituated ſomewhere in an infinite right line that paſſes through its correſpondent point in the object, and is perpendicular to the reflecting ſurface.

The truth of this appears ſufficiently from the propoſitions formerly laid down: in each of which, rays flowing from any radiant point, are ſhown to proceed after reflection to or from ſome point in a line that paſſes through the ſaid radiant, and is perpendicular to the reflecting ſurface. For inſtance (Pl. 11. fig. 1.), rays flowing from Y are collected in X, a point in the perpendicular CD, which, being produced, paſſes through Y: again (fig. 2.), rays flowing from G, proceed, after reflection, as from N, a point in the perpendicular CD, which, being produced, paſſes through G; and ſo of the reſt.

This obſervation, however, except where an object is ſeen by reflection from a plain ſurface, relates only to thoſe caſes where the repreſentation is made by means of ſuch rays as fall upon the reflecting ſurface with a very ſmall degree of obliquity; becauſe ſuch as fall at a conſiderable diſtance from the perpendicular, proceed not after reflection as from any point in that perpendicular, but as from other points ſituated in a certain curve, as hath already been explained; upon which account theſe rays are neglected, as making a confuſed and deformed repreſentation. And therefore it is to be remembered, that however the ſituation of the eye with reſpect to the object and reflecting ſurface may be repreſented in the following figures, it is to be ſuppoſed as ſituated in ſuch a manner with reſpect to the object, that rays flowing from thence, and entering it after reflection, may be ſuch only as fall with a very ſmall degree of obliquity upon the ſurface; that is, the eye muſt be ſuppoſed to be placed almoſt directly behind the object, or between it and the reflecting ſurface. The reaſon why it is not always ſo placed, is only to avoid confuſion in the figures.

I. When an object is ſeen by reflection from a plane ſurface, the image of it appears at the ſame diſtance behind the ſurface that the object is placed before it, of the ſame magnitude therewith, and directly oppoſite to it.

To explain this, let AB (fig. 10.) repreſent an object ſeen by reflection from the plain ſurface SV; and let the rays AF, AG, be ſo inclined to the ſurface, that they ſhall enter an eye at H after reflection; and let AE be perpendicular to the ſurface: then, by the obſervation juſt mentioned, the point A will appear in ſome part of the line AE produced, ſuppoſe I; that is, the oblique rays AF and AG will proceed after reflection as from that point; and further, becauſe the reflected rays FH, GK, will have the ſame degree of inclination to one another that their incident ones have, that point muſt neceſſarily be at the ſame diſtance from the ſurface that the point A is; the repreſentation therefore of the point A will be at the ſame diſtance behind the ſurface that the point itſelf is before it, and directly oppoſite to it: conſequently, ſince the like may be ſhown of the point B, or of any other, the whole image IM will appear at the ſame diſtance behind the ſurface that the object is before it, and directly oppoſite to it; and becauſe the lines AI, BM, which are perpendicular to the plain ſurface, are for that reaſon parallel to each other, it will alſo be of the ſame magnitude therewith.

II. When an object is ſeen by reflection from a convex ſurface, its image appears nearer to the ſurface, and leſs than the object.

Let AB (fig. 12.) repreſent the object, SV a reflecting ſurface whoſe centre of convexity is C; and let the rays AF, AG, be ſo inclined to the ſurface that after reflection therefrom they ſhall enter the eye at H; and let AE be perpendicular to the ſurface: then will the oblique rays AF, AG, proceed after reflection as from ſome point in the line AE produced, ſuppoſe from I; which point, becauſe the reflected rays will diverge more than the incident ones, muſt be nearer to the ſurface than the point A. And ſince the ſame is alſo true of the rays which flow from B, or any other point, the repreſentation IM will be nearer to the ſurface than the object; and becauſe it is terminated by the perpendiculars AE and FF, which incline to each other, as concurring at the centre, it will alſo appear leſs.

III. When an object is ſeen by reflection from a concave ſurface, the repreſentation of it is various, both with regard to its magnitude and ſituation, according as the diſtance of the object from the reflecting ſurface is greater or leſs.

1. When the object is nearer to the ſurface than its focus of parallel rays, the image falls on the oppoſite ſide of the ſurface, is more diſtant from it, and larger than the object.

Thus, let AB (fig. 13.) be the object, SV the reflecting ſurface, F the focus of parallel rays, and C its centre. Through A and B, the extremities of the object, draw the lines CA, CR, which will be perpendicular to the ſurface; and let the rays AR, AG, be incident upon ſuch points of it that they ſhall be reflected into an eye at H. Now, becauſe the radiant points A and B are nearer the ſurface than F the focus of parallel rays, the reflected rays will diverge, and will therefore proceed as from ſome points on the oppoſite ſide of the ſurface, which points, by the obſervation laid down at the beginning of this ſection, will be in the perpendiculars AE, BR, produced, ſuppoſe in I and M: but they will diverge in a leſs degree than their incident ones (ſee the propoſition juſt referred to); and therefore the ſaid points will be farther from the ſurface than the points A and B. The image therefore will be on the oppoſite ſide of the ſurface with reſpect to the object: it will be more diſtant than it; and conſequently being terminated by the perpendiculars CI and CM, it will alſo be larger.

2. When the object is placed in the focus of parallel rays, the reflected rays enter the eye parallel; in which caſe the image ought to appear at an infinite diſtance behind the reflecting ſurface: but the repreſentation of it, for the like reaſons that were given in the foregoing caſe, being large and diſtinct, we judge it not much farther from the ſurface than the image.

3. When the object is placed between the focus of parallel rays and the centre, the image falls on the oppoſite ſide of the centre, is larger than the object, and in an inverted poſition.

Thus let AB (Pl. 11. fig. 14.) repreſent the object, SV the reflecting ſurface, F its focus of parallel rays, and C its centre. Through A and B, the extremities of the object, draw the lines

CE and CN, which will be perpendicular to the ſurface; and let AR, AG, be a pencil of rays flowing from A. Theſe rays proceeding from a point beyond the focus of parallel rays, will after reflection converge towards ſome point on the oppoſite ſide the centre, which will fall upon the perpendicular EC produced, but at a greater diſtance from C than the radiant A from which they diverged. For the ſame reaſon, rays flowing from B will converge to a point in the perpendicular NC produced, which ſhall be farther from C than the point B; from whence it is evident, that the image IM is larger than the object AB, that it falls on the contrary ſide the centre, and that their poſitions are inverted with reſpect to each other.

4. If the object be placed beyond the centre of convexity, the image is then formed between the centre and the focus of parallel rays, is leſs than the object, and its poſition is inverted.

This propoſition is the converſe of the foregoing: for as in that caſe rays proceeding from A were reflected to I, and from B to M; ſo rays flowing from I and M will be reflected to A and B; if therefore an object be ſuppoſed to be ſituated beyond the centre in IM, the image of it will be formed in AB between that and the focus of parallel rays, will be leſs than the object, and inverted.

5. If the middle of the object be placed in the centre of convexity of the reflecting ſurface, the object and its image will be coincident; but the image will be inverted with reſpect to the object.

That the place of the image and the object ſhould be the ſame in this caſe needs little explication; for the middle of the object being in the centre, rays flowing from thence will fall perpendicularly upon the ſurface, and therefore neceſſarily return thither again; ſo that the middle of the image will be coincident with the middle of the object. But that the image ſhould be inverted is perhaps not ſo clear. To explain this, let AB (fig. 15.) be the object, having its middle point C in the centre of the reflecting ſurface SV; through the centre and the point R draw the line CR, which will be perpendicular to the reflecting ſurface; join the points AR and BR, and let AR repreſent a ray flowing from A; this will be reflected into RB: for C being the middle point between A and B, the angles ARC and CRB are equal; and a ray from B will likewiſe be reflected to A; and therefore the poſition of the image will be inverted with reſpect to that of the object.

In this propoſition it is to be ſuppoſed that the object AB is ſo ſituated with reſpect to the reflecting ſurface, that the angle ACR may be right; for otherwiſe the angles ARC and BRC will not be equal, and part of the image will therefore fall upon the object, and part off.

6. If in any of the three laſt caſes, in each of which the image is formed on the ſame ſide of the reflecting ſurface with the object, the eye be ſituated farther from the ſurface than the place where the image falls, the rays of each pencil, croſſing each other in the ſeveral points of the image, will enter the eye as from a real object ſituated there; ſo that the image will appear pendulous in the air between the eye and the reflecting ſurface, and in the poſition wherein it is formed, viz. inverted with reſpect to the object, in the ſame manner that an image formed by refracted light appears to an eye placed beyond it; which was fully explained under Prop. IV. (p. 304.), and therefore needs not be repeated.

But as what relates to the appearance of the object when the eye is placed nearer to the ſurface than the image, was not there fully inquired into, that point ſhall now be more ſtrictly examined under the following caſe, which equally relates to refracted and reflected light.

7. If the eye be ſituated between the reflecting ſurface and the place of the image, the object is then ſeen beyond the ſurface; and the farther the eye recedes from the ſurface towards the place of the image, the more confuſed, larger, and nearer the object appears.

To explain this, let AB (fig. 16.) repreſent the object; IM its image, one of whoſe points M is formed by the concurrence of the reflected rays DM, EM, &c. which before reflection came from B; the other, I, by the concurrence of DI, EI, &c. which came from A: and let *a b* be the pupil of an eye, ſituated between the ſurface DP and the image. This pupil will admit the rays H *a*, K *b*; which, becauſe they are tending towards I, are ſuch as came from A, and therefore the point A will appear diffuſed over the ſpace RS. In like manner the pupil will alſo receive into it the reflected rays K *a* and L *b*, which, becauſe they are tending towards M, by ſuppoſition came from B; and therefore the point B will be ſeen ſpread as it were over the ſpace TV, and the object will ſeem to fill the ſpace RV; but the repreſentation of it will be confuſed, becauſe the intermediate points of the object being equally enlarged in appearance, there will not be room for them between the points S and T, but they will coincide in part one with another: for inſtance, the appearance of that point in the object, whoſe repreſentation falls upon *c* in the image, will fill the ſpace *m n*; and ſo of the reſt. Now, if the ſame pupil be removed into the ſituation *e f*, the reflected rays E *e* and G *f* will then enter the eye, and therefore one extremity of the object will appear to cover the ſpace XY; and becauſe the rays O *f* and L *e* will alſo enter it in their progreſs towards M, the point B, from whence they came, will appear to cover ZV; the object therefore will appear larger and more confuſed than before. And when the eye recedes quite to the image, it ſees but one ſingle point of the object, and that appears diffuſed all over the reflecting ſurface: for inſtance, if the eye recedes to the point M, then rays flowing from the point B enter it upon whatever part of the ſurface they fall; and ſo for the reſt. The object alſo appears nearer to the ſurface the farther the eye recedes from it towards the place of the image; probably becauſe, as the appearance of the object becomes more and more confuſed, its place is not ſo eaſily diſtinguiſhed from that of the reflecting ſurface itſelf, till at laſt, when it is quite confuſed (as it is when the eye is arrived at M), they both appear as one, the ſurface aſſuming the colour of the object.

As to the preciſe apparent magnitude of an object ſeen after this manner, it is ſuch that the angle it appears under ſhall be equal to that which the image of the ſame object would appear under were we to ſuppoſe it ſeen from the ſame place: that is, the apparent object (for ſuch we muſt call it to diſtinguiſh it from the image of the ſame object) and the image ſubtend equal angles at the eye.

Dem. Here we muſt ſuppoſe the pupil of the eye to be a point only, becauſe the magnitude of that cauſes ſmall alteration in the apparent magnitude of the object; as we ſhall ſee by and by. Let then the point *a* repreſent the pupil, then will the extreme rays that can enter it be H *a* and K *a*; the object therefore will appear under the angle H *a* K, which is equal to its vertical one M *a* I, under which the image IM would appear were it to be ſeen from *a*. Again, if the eye be placed in *f*, the object appears under the angle G *f* O equal to I *f* M, which the image ſubtends at the ſame place, and therefore the apparent object and image of it ſubtend equal angles at the eye. Q. E. D.

Now if we ſuppoſe the pupil to have any ſenſible magnitude, ſuch, ſuppoſe, that its diameter may be *a b*; then the object ſeen by the eye in that ſituation will appear under the angle HXL, which is larger than the angle H *a* K, under which it appeared before; becauſe the angle at X is nearer than the angle at *a*, to the line IM, which is a ſubtenſe common to them both.

From this propoſition it follows, that, were the eye cloſe to the ſurface at K, the real and apparent object would be ſeen

under equal angles (for the real object appears from that place under the ſame angle that the image does, as will be ſhown at the end of this ſection): therefore, when the eye is nearer to the image than that point, the image will ſubtend a larger angle at it than the object does; and conſequently, ſince the image and apparent object ſubtend equal angles at the eye, the apparent object muſt neceſſarily be ſeen under a larger angle than the object itſelf, wherever the eye be placed, between the ſurface and the image.

As each point in the repreſentation of an object made by reflection is ſituated ſomewhere in a right line that paſſes through its correſpondent point in the object, and is perpendicular to the reflecting ſurface, as was ſhown in the beginning of this ſection; we may from hence deduce a moſt eaſy and expeditious method of determining both the magnitude and ſituation of the image in all caſes whatever. Thus,

Through the extremities of the object AB and the centre C (Pl. 11. fig. 17, 18, or 19.) draw the lines AC BC, and produce them as the caſe requires; theſe lines will be perpendicular to the reflecting ſurface, and therefore the extremities of the image will fall upon them. Through F the middle point of the object and the centre, draw the line FC, and produce it till it paſſes through the reflecting ſurface; this will alſo be perpendicular to the ſurface. Through G, the point where this line cuts the ſurface, draw the lines AG and BG, and produce them this way or that, till they croſs the former perpendiculars; and where they croſs, there I and M the extremities of the image will fall. For ſuppoſing AG to be a ray proceeding from the point A and falling upon G, it will be reflected to B; becauſe FA is equal to FB, and FG is perpendicular to the reflecting ſurface; and therefore the repreſentation of the point A will be in BG produced as well as in AC; conſequently it will fall on the point I, where they croſs each other. Likewiſe the ray BG will for the ſame reaſon be reflected to A; and therefore the repreſentation of the point B will be in AG produced, as well as in ſome part of BC, that is, in M where they croſs. From whence the propoſition is clear.

If it happens that the lines will not croſs which way ſoever they are produced, (as in fig. 20.), then is the object in the focus of parallel rays of that ſurface, and has no image formed in any place whatever. For in this caſe the rays AH, AG, flowing from the point A, become parallel after reflection in the lines HC, GB, and therefore do not flow as to or from any point: in like manner, rays flowing from B are reflected into the parallel lines KB and GA; ſo that no repreſentation can be formed by ſuch reflection.

From hence we learn another circumſtance relating to the magnitude of the image made by reflection; viz. that it ſubtends the ſame angle at the vertex of the reflecting ſurface that the object does. This appears by inſpection of the 17th, 18th, or 19th figure, in each of which the angle IGM, which the image ſubtends at G the vertex of the reflecting ſurface, is equal to the angle AGB, which the object ſubtends at the ſame place; for in the two firſt of thoſe figures they are vertical, in the third they are the ſame. And,

Farther, the angle ICM, which the image ſubtends at the centre, is alſo equal to the angle ACB which the object ſubtends at the ſame place; for in the two firſt figures they are the ſame; in the laſt they are vertical to each other.

From whence it is evident, that the object and its image are to each other in diameter, either as their reſpective diſtances from the vertex of the reflecting ſurface, or as their diſtances from the centre of the ſame.

IV. As objects are multiplied by ſeeing through tranſparent media, whoſe ſurfaces are properly diſpoſed, ſo they may alſo by reflecting ſurfaces. Thus,

1. If two reflecting ſurfaces be diſpoſed at right angles, as the ſurfaces AB, BC, (fig. 21.), an object at D may be ſeen by an eye at E, after one reflection at F, in the line EF produced; after two reflections, the firſt at G, the ſecond at H, in the line EH produced; and alſo, after one reflection made at A, in the line EA produced.

2. If the ſurfaces be parallel, as AB, CD, (fig. 22), and the object be placed at E and the eye at F, the object will appear multiplied an infinite number of times: thus, it may be ſeen in the line FG produced, after one reflection at G; in the line FH produced, after two reflections, the firſt at I, the ſecond at H; and alſo in FP produced, after ſeveral ſucceſſive reflections of the ray FL, at the points L, M, N, O, and P: and ſo on *in infinitum*. But the greater the number of reflections are, the weaker their repreſentation will be.

Sect. IV. *Of the different Refrangibility of Light.*

As this property of light ſolves a great number of the phenomena which could not be underſtood by former opticians, we ſhall give an account of it in the words of Sir Iſaac Newton, who firſt diſcovered it; eſpecially as his account is much more full, clear, and perſpicuous, than thoſe of ſucceeding writers.

"In a very dark chamber, at a round hole F (Pl. 12. fig. 1.), about one third of an inch broad, made in the ſhutter of a window, I placed a glaſs priſm ABC, whereby the beam of the ſun's light, SF, which came in at that hole, might be refracted upwards, toward the oppoſite wall of the chamber, and there form a coloured image of the ſun, repreſented at PT. The axis of the priſm (that is, the line paſſing through the middle of the priſm, from one end of it to the other end, parallel to the edge of the refracting angle) was in this and the following experiments perpendicular to the incident rays. About this axis I turned the priſm ſlowly, and ſaw the refracted light on the wall, or coloured image of the ſun, firſt to deſcend, and then to aſcend. Between the deſcent and aſcent, when the image ſeemed ſtationary, I ſtopped the priſm and fixed it in that poſture.

"Then I let the refracted light fall perpendicularly upon a ſheet of white paper, MN, placed at the oppoſite wall of the chamber, and obſerved the figure and dimenſions of the ſolar image, PT, formed on the paper by that light. This image was oblong, and not oval, but terminated by two rectilinear and parallel ſides and two ſemicircular ends. On its ſides it was bounded pretty diſtinctly; but on its ends very confuſedly and indiſtinctly, the light there decaying and vaniſhing by degrees. At the diſtance of 18½ feet from the priſm the breadth of the image was about 2⅝ inches, but its length was about 10⅝ inches, and the length of its rectilinear ſides about eight inches; and ACB, the refracting angle of the priſm, whereby ſo great a length was made, was 64 degrees. With a leſs angle the length of the image was leſs, the breadth remaining the ſame. It is farther to be obſerved, that the rays went on in ſtraight lines from the priſm to the image, and therefore at their going out of the priſm had all that inclination to one another from which the length of the image proceeded. This image PT was coloured, and the more eminent colours lay in this order from the bottom at T to the top at P; red, orange, yellow, green, blue, indigo, violet; together with all their intermediate degrees in a continual ſucceſſion perpetually varying."

Our author concludes from this experiment, and many more to be mentioned hereafter, "that the light of the ſun conſiſts of a mixture of ſeveral ſorts of coloured rays, ſome of which at equal incidences are more refracted than others, and therefore are called *more refrangible*. The red at T, being neareſt to the place Y, where the rays of the ſun would go directly if the priſm was taken away, is the leaſt refracted of all the rays; and the orange, yellow, green, blue, indigo, and violet, are continually more and more refracted, as they are more and more diverted

from the courſe of the direct light. For by mathematical reaſoning he has proved, that when the priſm is fixed in the poſture above-mentioned, ſo that the place of the image ſhall be the loweſt poſſible, or at the limit between its deſcent and aſcent, the figure of the image ought then to be round like the ſpot at Y, if all the rays that tended to it were equally refracted. Therefore, ſeeing by experience it is found that this image is not round, but about five times longer than broad, it follows that all the rays are not equally refracted. And this concluſion is further confirmed by the following experiments.

"In the ſun-beam SF (fig. 2.), which was propagated into the room through the hole in the window-ſhut EG, at the diſtance of ſome feet from the hole, I held the priſm ABC in ſuch a poſture that its axis might be perpendicular to that beam: then I looked through the priſm upon the hole F, and turning the priſm to and fro about its axis to make the image *p t* of the hole aſcend and deſcend, when between its two contrary motions it ſeemed ſtationary, I ſtopped the priſm; in this ſituation of the priſm, viewing through it the ſaid hole F, I obſerved the length of its refracted image *p t* to be many times greater than its breadth; and that the moſt refracted part thereof appeared violet at *p*; the leaſt refracted red, at *t*; and the middle parts indigo, blue, green, yellow, and orange, in order. The ſame thing happened when I removed the priſm out of the ſun's light, and looked through it upon the hole ſhining by the light of the clouds beyond it. And yet if the refractions of all the rays were equal according to one certain proportion of the ſines of incidence and refraction, as is vulgarly ſuppoſed, the refracted image ought to have appeared round, by the mathematical demonſtration above-mentioned. So then by theſe two experiments it appears, that in equal incidences there is a conſiderable inequality of refractions."

For the diſcovery of this fundamental property of light, which has opened the whole myſtery of colours, we ſee our author was not only beholden to the experiments themſelves, which many others had made before him, but alſo to his ſkill in geometry; which was abſolutely neceſſary to determine what the figure of the refracted image ought to be upon the old principle of an equal refraction of all the rays: but having thus made the diſcovery, he contrived the following experiment to prove it at ſight.

"In the middle of two thin boards DE *d e*, (fig. 3.), I made a round hole in each, at G and *g*, a third part of an inch in diameter; and in the window-ſhut a much larger hole being made, at F, to let into my darkened chamber a large beam of the ſun's light, I placed a priſm, ABC, behind the ſhutter in that beam, to refract it towards the oppoſite wall; and cloſe behind this priſm I fixed one of the boards DE, in ſuch a manner that the middle of the refracted light might paſs through the hole made in it at G, and the reſt be intercepted by the board. Then at the diſtance of about 12 feet from the firſt board, I fixed the other board, *d e*, in ſuch manner that the middle of the refracted light, which came through the hole in the firſt board, and fell upon the oppoſite wall, might paſs through the hole *g* in this other board *d e*, and the reſt being intercepted by the board, might paint upon it the coloured ſpectrum of the ſun. And cloſe behind this board I fixed another priſm *a b c*, to refract the light which came through the hole *g*. Then I returned ſpeedily to the firſt priſm ABC, and by turning it ſlowly to and fro about its axis, I cauſed the image which fell upon the ſecond board *d e*, to move up and down upon that board, that all its parts might paſs ſucceſſively through the hole in that board, and fall upon the priſm behind it. And in the mean time I noted the places, *M*, *N*, on the oppoſite wall, to which that light after its refraction in the ſecond priſm did paſs; and by the difference of the places at *M* and *N*, I found that the light, which being moſt refracted in the firſt priſm ABC, did go to the blue end of the image, was again more refracted by the ſecond priſm *a b c*, than the light which went to the red end of that image. For when the lower part of the light which fell upon the ſecond board *d e*, was caſt through the hole *g*, it went to a lower place M on the wall; and when the higher part of that light was caſt through the ſame hole *g*, it went to a higher place N on the wall; and when any intermediate part of the light was caſt through that hole, it went to ſome place in the wall between M and N. The unchanged poſition of the holes in the boards made the incidence of the rays upon the ſecond priſm to be the ſame in all caſes. And yet in that common incidence ſome of the rays were more refracted and others leſs: and thoſe were more refracted in this priſm, which by a greater refraction in the firſt priſm were more turned out of their way; and therefore, for their conſtancy of being more refracted, are deſervedly called *more refrangible*."

Our author ſhows alſo, by experiments made with convex glaſs, that lights (reflected from natural bodies) which differ in colour, differ alſo in degrees of refrangibility; and that they differ in the ſame manner as the rays of the ſun do.

"The ſun's light conſiſts of rays differing in reflexibility, and thoſe rays are more reflexible than others which are more refrangible. A priſm, ABC (fig. 4), whoſe two angles, at its baſe BC, were equal to one another and half right ones, and the third at A a right one, I placed in a beam FM of the ſun's light, let into a dark chamber through a hole F one third of an inch broad. And turning the priſm ſlowly about its axis until the light which went through one of its angles ACB, and was refracted by it to G and H, began to be reflected into the line MN by its baſe BC, at which till then it went out of the glaſs; I obſerved that thoſe rays, as MH, which had ſuffered the greateſt refraction, were ſooner reflected than the reſt. To make it evident that the rays which vaniſhed at H were reflected into the beam MN, I made this beam paſs through another priſm VXY, and being refracted by it to fall afterwards upon a ſheet of white paper *p t* placed at ſome diſtance behind it, and there by that refraction to paint the uſual colours at *p t*. Then cauſing the firſt priſm to be turned about its axis according to the order of the letters ABC, I obſerved, that when thoſe rays MH, which in this priſm had ſuffered the greateſt refraction, and appeared blue and violet, began to be totally reflected, the blue and violet light on the paper which was moſt refracted in the ſecond priſm received a ſenſible increaſe at *p*, above that of the red and yellow at *t*: and afterwards, when the reſt of the light, which was green, yellow, and red, began to be totally reflected and vaniſhed at G, the light of thoſe colours at *t*, on the paper *p t*, received as great an increaſe as the violet and blue had received before. Which puts it paſt diſpute, that thoſe rays became firſt of all totally reflected at the baſe BC, which before at equal incidences with the reſt upon the baſe BC, had ſuffered the greateſt refraction. I do not here take notice of any refractions made in the ſides AC, AB, of the firſt priſm, becauſe the light enters almoſt perpendicularly at the firſt ſide, and goes out almoſt perpendicularly at the ſecond; and therefore ſuffers none, or ſo little that the angles of incidence at the baſe BC are not ſenſibly altered by it; eſpecially if the angles of the priſm at the baſe BC be each about 40 degrees. For the rays FM begin to be totally reflected when the angle CMF is about 50 degrees, and therefore they will then make a right angle of 90 degrees with AC.

"It appears alſo from experiments, that the beam of light MN, reflected by the baſe of the priſm, being augmented firſt by the more refrangible rays, and afterwards by the leſs refrangible, is compoſed of rays differently refrangible.

"The light whoſe rays are all alike refrangible, I call *ſimple*, *homogeneal* and *ſimilar*; and that whoſe rays are ſome more refrangible than others, I call *compound*, *heterogeneal* and

diſſimilar. The former light I call *homogeneal*, not becauſe I would affirm it ſo in all reſpects, but becauſe the rays which agree in refrangibility agree at leaſt in all their other properties, which I conſider in the following diſcourſe.

"The colours of homogeneal lights I call *primary, homogeneal* and *ſimple*; and thoſe of heterogeneal lights, *heterogeneal* and *compound*. For theſe are always compounded of homogeneal lights, as will appear in the following diſcourſe.

"The homogeneal light and rays which appear red, or rather make objects appear ſo, I call *rubrific* or *red-making*; thoſe which make objects appear yellow, green, blue, and violet, I call *yellow-making, green-making, blue-making, violet-making*; and ſo of the reſt. And if at any time I ſpeak of light and rays as coloured or endowed with colours, I would be underſtood to ſpeak not philoſophically and properly, but groſsly, and according to ſuch conceptions as vulgar people in ſeeing all theſe experiments would be apt to frame. For the rays, to ſpeak properly, are not coloured. In them there is nothing elſe than a certain power and diſpoſition to ſtir up a ſenſation of this or that colour. For as ſound, in a bell or muſical ſtring or other ſounding body, is nothing but a trembling motion, and in the air nothing but that motion propagated from the object, and in the ſenſorium it is a ſenſe of that motion under the form of ſound; ſo colours in the object are nothing but a diſpoſition to reflect this or that ſort of rays more copiouſly than the reſt: in rays they are nothing but their diſpoſitions to propagate this or that motion into the ſenſorium; and in the ſenſorium they are ſenſations of thoſe motions under the forms of colours. See CHROMATICS.

"By the mathematical propoſition above-mentioned, it is certain that the rays which are equally refrangible do fall upon a circle anſwering to the ſun's apparent diſk, which will alſo be proved by experiment by and by. Now let AG (Pl. 12, fig. 5.) repreſent the circle which all the moſt refrangible rays, propagated from the whole diſk of the ſun, would illuminate and paint upon the oppoſite wall if they were alone; EL the circle, which all the leaſt refrangible rays would in like manner illuminate if they were alone; BH, CI, DK, the circles which ſo many intermediate ſorts would paint upon the wall, if they were ſingly propagated from the ſun in ſucceſſive order, the reſt being intercepted; and conceive that there are other circles without number, which innumerable other intermediate ſorts of rays would ſucceſſively paint upon the wall, if the ſun ſhould ſucceſſively emit every ſort apart. And ſeeing the ſun emits all theſe ſorts at once, they muſt all together illuminate and paint innumerable equal circles; of all which, being according to their degrees of refrangibility placed in order in a continual ſeries, that oblong ſpectrum PT is compoſed, which was deſcribed in the firſt experiment.

"Now if theſe circles, whilſt their centres keep their diſtances and poſitions, could be made leſs in diameter, their interſering one with another, and conſequently the mixture of the heterogeneous rays, would be proportionably diminiſhed. Let the circles AG, BH, CI, &c. remain as before; and let *ag, bh, ci*, &c. be ſo many leſs circles lying in a like continual ſeries, between two parallel right lines *a e* and *g l*, with the ſame diſtances between their centres, and illuminated with the ſame ſorts of rays: that is, the circle *a g* with the ſame ſort by which the correſponding circle AG was illuminated; and the reſt of the circles *b h, c i, d k, e l* reſpectively with the ſame ſorts of rays by which the correſponding circles BH, CI, DK, EL, were illuminated. In the figure PT, compoſed of the great circles, three of thoſe, AG, BH, CI, are ſo expanded into each other, that three ſorts of rays, by which thoſe circles are illuminated, together with innumerable other ſorts of intermediate rays, are mixed at QR in the middle of the circle BH. And the like mixture happens throughout almoſt the whole length of the figure PT. But in the figure *p t*, compoſed of the leſs circles, the three leſs circles *a g, b h, c i*, which anſwer to thoſe three greater, do not extend into one another; nor are there any where mingled ſo much as any two of the three ſorts of rays by which thoſe circles are illuminated, and which in the figure PT are all of them intermingled at QR. So then, if we would diminiſh the mixture of the rays, we are to diminiſh the diameters of the circles. Now theſe would be diminiſhed if the ſun's diameter, to which they anſwer, could be made leſs than it is, or (which comes to the ſame purpoſe) if without doors, at a great diſtance from the priſm towards the ſun, ſome opaque body were placed with a round hole in the middle of it to intercept all the ſun's light, except ſo much as coming from the middle of his body could paſs through that hole to the priſm. For ſo the circles AG, BH, and the reſt, would not any longer anſwer to the whole diſk of the ſun, but only to that part of it which could be ſeen from the priſm through that hole; that is, to the apparent magnitude of that hole viewed from the priſm. But that theſe circles may anſwer more diſtinctly to that hole, a lens is to be placed by the priſm to caſt the image of the hole (that is, every one of the circles AG, BH, &c.) diſtinctly upon the paper at PT; after ſuch a manner, as by a lens placed at a window the pictures of objects abroad are caſt diſtinctly upon a paper within the room. If this be done, it will not be neceſſary to place that hole very far off, no not beyond the window. And therefore, inſtead of that hole, I uſed the hole in the window-ſhut as follows.

"In the ſun's light let into my darkened chamber through a ſmall round hole in my window-ſhut, at about 10 or 12 feet from the window, I placed a lens MN (fig. 6), by which the image of the hole F might be diſtinctly caſt upon a ſheet of white paper placed at I. Then immediately after the lens I placed a priſm ABC, by which the trajected light might be refracted either upwards or ſideways, and thereby the round image which the lens alone did caſt upon the paper at I, might be drawn out into a long one with parallel ſides, as repreſented at *p t*. This oblong image I let fall upon another paper at about the ſame diſtance from the priſm as the image at I, moving the paper either towards the priſm or from it, until I found the juſt diſtance where the rectilinear ſides of the image *p t* become moſt diſtinct. For in this caſe the circular images of the hole, which compoſe that image, after the manner that the circles *a g, b h, c i*, &c. do the figure *p t*, were terminated moſt diſtinctly, and therefore extended into one another the leaſt that they could, and by conſequence the mixture of the heterogeneous rays was now the leaſt of all. The circles *ag, bh, c i*, &c. which compoſe the image *p t*, are each equal to the circle at I; and therefore, by diminiſhing the hole F, or by removing the lens farther from it, may be diminiſhed at pleaſure, whilſt their centres keep the ſame diſtances from each other. Thus, by diminiſhing the breadth of the image *p t*, the circles of heterogeneal rays that compoſe it may be ſeparated from each other as much as you pleaſe. Yet inſtead of the circular hole F, it is better to ſubſtitute an oblong hole ſhaped like a parallelogram, with its length parallel to the length of the priſm. For if this hole be an inch or two long, and but a 10th or 20th part of an inch broad, or narrower, the light of the image *p t* will be as ſimple as before, or ſimpler; and the image being much broader, is therefore fitter to have experiments tried in its light than before.

"Homogeneal light is refracted regularly without any dilatation, ſplitting, or ſhattering of the rays; and the confuſed viſion of objects ſeen through refracting bodies by heterogeneal light, ariſes from the different refrangibility of ſeveral ſorts of rays. This will appear by the experiments which will follow. In the middle of a black paper I made a round hole about a fifth or a ſixth part of an inch in diameter. Upon this paper I cauſed

the ſpectrum of homogeneal light, deſcribed in the former article, ſo to fall that ſome part of the light might paſs through the hole in the paper. This tranſmitted part of the light I refracted with a priſm placed behind the paper: and letting this refracted light fall perpendicularly upon a white paper, two or three feet diſtant from the priſm, I found that the ſpectrum formed on the paper by this light was not oblong, as when it is made in the firſt experiment, by refracting the ſun's compound light, but was, ſo far as I could judge by my eye, perfectly circular, the length being no where greater than the breadth; which ſhows that this light is refracted regularly without any dilatation of the rays, and is an ocular demonſtration of the mathematical propoſition mentioned above.

"In the homogeneal light I placed a paper circle of a quarter of an inch in diameter; and in the ſun's unrefracted, heterogeneal, white light, I placed another paper circle of the ſame bigneſs: and going from theſe papers to the diſtance of ſome feet, I viewed both circles through a priſm. The circle illuminated by the ſun's heterogeneal light appeared very oblong, as in the ſecond experiment, the length being many times greater than the breadth. But the other circle illuminated with homogeneal light appeared circular, and diſtinctly defined, as when it is viewed by the naked eye; which proves the whole propoſition mentioned in the beginning of this article.

"In the homogeneal light I placed flies and ſuch like minute objects, and viewing them through a priſm I ſaw their parts as diſtinctly defined as if I had viewed them with the naked eye. The ſame objects placed in the ſun's unrefracted heterogeneal light, which was white, I viewed alſo through a priſm, and ſaw them moſt confuſedly defined, ſo that I could not diſtinguiſh their ſmaller parts from one another. I placed alſo the letters of a ſmall print one while in the homogeneal light, and then in the heterogeneal; and viewing them through a priſm, they appeared in the latter caſe ſo confuſed and indiſtinct that I could not read them; but in the former they appeared ſo diſtinct that I could read readily, and thought I ſaw them as diſtinct as when I viewed them with my naked eye: in both caſes, I viewed the ſame objects through the ſame priſm, at the ſame diſtance from me, and in the ſame ſituation. There was no difference but in the lights by which the objects were illuminated, and which in one caſe was ſimple, in the other compound; and therefore the diſtinct viſion in the former caſe, and confuſed in the latter, could ariſe from nothing elſe than from that difference in the lights. Which proves the whole propoſition.

"In theſe three experiments, it is farther very remarkable, that the colour of homogeneal light was never changed by the refraction. And as theſe colours were not changed by refractions, ſo neither were they by reflections. For all white, grey, red, yellow, green, blue, violet bodies, as paper, aſhes, red lead, orpiment, indigo, bice, gold, ſilver, copper, graſs, blue flowers, violets, bubbles of water tinged with various colours, peacocks feathers, the tincture of lignum nephriticum, and ſuch like, in red homogeneal light appeared totally red, in blue light totally blue, in green light totally green, and ſo of other colours. In the homogeneal light of any colour they all appeared totally of that ſame colour; with this only difference, that ſome of them reflected that light more ſtrongly, others more faintly. I never yet found any body which by reflecting homogeneal light could ſenſibly change its colour.

"From all which it is manifeſt, that if the ſun's light conſiſted of but one ſort of rays, there would be but one colour in the world, nor would it be poſſible to produce any new colour by reflections and refractions; and by conſequence, that the variety of colours depends upon the compoſition of light.

"The ſolar image $p\,t$, formed by the ſeparated rays in the 5th experiment, did in the progreſs from its end p, on which the moſt refrangible rays fell, unto its end t, on which the leaſt refrangible rays fell, appear tinged with this ſeries of colours; violet, indigo, blue, green, yellow, orange, red, together with all their intermediate degrees in a continual ſucceſſion perpetually varying; ſo that there appeared as many degrees of colours as there were ſorts of rays differing in refrangibility. And ſince theſe colours could not be changed by refractions nor by reflections, it follows, that all homogeneal light has its proper colour anſwering to its degree of refrangibility.

"Every homogeneal ray conſidered apart is refracted, according to one and the ſame rule; ſo that its ſine of incidence is to its ſine of refraction in a given ratio: that is, every different coloured ray has a different ratio belonging to it. This our author has proved by experiment, and by other experiments has determined by what numbers thoſe given ratios are expreſſed. For inſtance, if an heterogeneal white ray of the ſun emerges out of glaſs into air; or, which is the ſame thing, if rays of all colours be ſuppoſed to ſucceed one another in the ſame line AC, and AD (fig 15.) their common ſine of incidence in glaſs be divided into 50 equal parts, then EF and GH, the ſines of refraction into air, of the leaſt and moſt refrangible rays, will be 77 and 78 ſuch parts reſpectively. And ſince every colour has ſeveral degrees, the ſines of refraction of all the degrees of red will have all intermediate degrees of magnitude from 77 to $77\frac{1}{8}$, of all the degrees of orange from $77\frac{1}{8}$ to $77\frac{1}{4}$, of yellow from $77\frac{1}{4}$ to $77\frac{1}{3}$, of green from $77\frac{1}{3}$ to $77\frac{1}{2}$, of blue from $77\frac{1}{2}$ to $77\frac{2}{3}$, of indigo from $77\frac{2}{3}$ to $77\frac{3}{5}$, and of violet from $77\frac{3}{5}$ to 78."

PART II.

SECT. I. *The Application of the foregoing Theory to ſeveral natural Phenomena.*

§ 1. *Of the Rainbow.*

THIS beautiful phenomenon hath engaged the attention of all ages. By ſome nations it hath been deified; though the more ſenſible part always looked upon it as a natural appearance, and endeavoured, however imperfectly, to account for it. The obſervations of the ancients and philoſophers of the middle ages concerning the rainbow were ſuch as could not have eſcaped the notice of the moſt illiterate huſbandmen who gazed at the ſky; and their various hypotheſes deſerve no notice. It was a conſiderable time even after the dawn of true philoſophy in this weſtern part of the world, before we find any diſcovery of importance on this ſubject. Maurolycus was the firſt who pretended to have meaſured the diameters of the two rainbows with much exactneſs; and he reports, that he found that of the inner bow to be 45 degrees, and that of the outer bow 56; from which Deſcartes takes occaſion to obſerve, how little we can depend upon the obſervations of thoſe who were not acquainted with the cauſe of the appearances.

One *Clichtovæus* (the ſame, it is probable, who diſtinguiſhed himſelf by his oppoſition to Luther, and who died in 1543) had maintained, that the ſecond bow is the image of the firſt, as he thought was evident from the inverted order of the colours. For, ſaid he, when we look into the water, all the images that we ſee reflected by it are inverted with reſpect to the objects themſelves; the tops of the trees, for inſtance, that ſtand near the brink, appearing lower than the roots.

That the rainbow is oppoſite to the ſun had always been obſerved. It was, therefore, natural to imagine, that the colours of it were produced by ſome kind of reflection of the rays of light from drops of rain, or vapour. The regular order of the colours was another circumſtance that could not have eſcaped the notice of any perſon. But, notwithſtanding mere reflection had in no other caſe been obſerved to produce colours, and it could not but have been obſerved that refraction is frequently attended with that phenomenon, yet no perſon ſeems to have thought of having recourſe to a proper refraction in this caſe, before one *Fletcher* of Breſlau, who, in a treatiſe which he publiſhed in 1571, endeavoured to account for the colours of the rainbow by means of a double refraction and one reflection. But he imagined that a ray of light, after entering a drop of rain, and ſuffering a refraction both at its entrance and exit, was afterwards reflected from another drop, before it reached the eye of the ſpectator. He ſeems to have overlooked the reflection at the farther ſide of the drop, or to have imagined that all the bendings of the light within the drop would not make a ſufficient curvature to bring the ray of the ſun to the eye of the ſpectator. That he ſhould think of two refractions, was the neceſſary conſequence of his ſuppoſing that the ray entered the drop at all. This ſuppoſition, therefore, was all the light that he threw upon the ſubject. B. Porta ſuppoſed that the rainbow is produced by the refraction of light in the whole body of rain or vapour, but not in the ſeparate drops.

After all, it was a man whom no writers allow to have had any pretenſions to philoſophy, that hit upon this curious diſcovery. This was Antonio De Dominis, biſhop of Spalatro, whoſe treatiſe *De Radiis Viſus et Lucis* was publiſhed by J. Bartolus in 1611. He firſt advanced, that the double refraction of Fletcher, with an intervening reflection, was ſufficient to produce the colours of the bow, and alſo to bring the rays that formed them to the eye of the ſpectator, without any ſubſequent reflection. He diſtinctly deſcribes the progreſs of a ray of light entering the upper part of the drop, where it ſuffers one refraction, and after being thereby thrown upon the back part of the inner ſurface, is from thence reflected to the lower part of the drop; at which place undergoing a ſecond refraction, it is thereby bent, ſo as to come directly to the eye. To verify this hypotheſis, this perſon (no philoſopher as he was) proceeded in a very ſenſible and philoſophical manner. For he procured a ſmall globe of ſolid glaſs, and viewing it when it was expoſed to the rays of the ſun, in the ſame manner in which he had ſuppoſed that the drops of rain were ſituated with reſpect to them, he actually obſerved the ſame colours which he had ſeen in the true rainbow, and in the ſame order.

Thus the circumſtances in which the colours of the rainbow were formed, and the progreſs of a ray of light through a drop of water, were clearly underſtood; but philoſophers were a long time at a loſs when they endeavoured to aſſign reaſons for all the particular colours, and for the order of them. Indeed nothing but the doctrine of the different refrangibility of the rays of light, which was a diſcovery reſerved for the great Sir Iſaac Newton, could furniſh a complete ſolution of this difficulty. De Dominis ſuppoſed that the red rays were thoſe which had traverſed the leaſt ſpace in the inſide of a drop of water, and therefore retained more of their native force, and conſequently, ſtriking the eye more briſkly, gave it a ſtronger ſenſation; that the green and blue colours were produced by thoſe rays, the force of which had been, in ſome meaſure, obtunded in paſſing through a greater body of water; and that all the intermediate colours were compoſed (according to the hypotheſis which generally prevailed at that time) of a mixture of theſe three primary ones. That the different colours were cauſed by ſome difference in the impulſe of light upon the eye, and the greater or leſs impreſſion that was thereby made upon it, was an opinion which had been adopted by many perſons, who had ventured to depart from the authority of Ariſtotle.

Afterwards the ſame De Dominis obſerved, that all the rays of the ſame colour muſt leave the drop of water in a part ſimilarly ſituated with reſpect to the eye, in order that each of the colours may appear in a circle, the centre of which is a point of the heavens, in a line drawn from the ſun through the eye of the ſpectator. The red rays, he obſerved, muſt iſſue from the drop neareſt to the bottom of it, in order that the circle of red may be the outermoſt, and therefore the moſt elevated in the bow.

Notwithſtanding De Dominis conceived ſo juſtly of the manner in which the inner rainbow is formed, he was far from having as juſt an idea of the cauſe of the exterior bow. This he endeavoured to explain in the very ſame manner in which he had done the interior, viz. by one reflection of the light within the drop, preceded and followed by a refraction; ſuppoſing only that the rays which formed the exterior bow were returned to the eye by a part of the drop lower than that which tranſmitted the red of the interior bow. He alſo ſuppoſed that the rays which formed one of the bows came from the ſuperior part of the ſun's diſk, and thoſe which formed the other from the inferior part of it. He did not conſider, that upon thoſe principles the two bows ought to have been contiguous; or rather, that an indefinite number of bows would have had their colours all intermixed; which would have been no bow at all.

When Sir Iſaac Newton diſcovered the different refrangibility of the rays of light, he immediately applied his new theory of light and colours to the phenomena of the rainbow, taking this remarkable object of philoſophical enquiry where De Dominis and Deſcartes, for want of this knowledge, were obliged to leave their inveſtigations imperfect. For they could give no good reaſon why the bow ſhould be coloured, and much leſs could they give any ſatisfactory account of the order in which the colours appear.

If different particles of light had not different degrees of refrangibility, on which the colours depend, the rainbow, beſides being much narrower than it is, would be colourleſs; but the different refrangibility of differently coloured rays being admitted, the reaſon is obvious, both why the bow ſhould be coloured, and alſo why the colours ſhould appear in the order in which they are obſerved. Let *a* (pl. 12. fig. 8.) be a drop of water, and S a pencil of light; which, on its leaving the drop of water, reaches the eye of the ſpectator. This ray, at its entrance into the drop, begins to be decompoſed into its proper colours; and upon leaving the drop, after one reflection and a ſecond refraction, it is farther decompoſed into as many ſmall differently-coloured pencils as there are primitive colours in the light. Three of them only are drawn in this figure, of which the blue is the moſt, and the red the leaſt refracted.

The doctrine of the different refrangibility of light enables us to give a reaſon for the ſize of a bow of each particular colour. Newton, having found that the ſines of refraction of the moſt refrangible and leaſt refrangible rays, in paſſing from rain-water into air, are in the proportion of 185 to 182, when the ſine of incidence is 138, calculated the ſize of the bow; and he found, that if the ſun was only a phyſical point, without ſenſible magnitude, the breadth of the inner bow would be 2 degrees; and if to this 30′ was added for the apparent diameter of the ſun, the whole breadth would be 2½ degrees. But as the outermoſt colours, eſpecially the violet, are extremely faint, the breadth of the bow will not in reality appear to exceed two degrees. He finds, by the ſame principles, that the breadth of the exterior bow, if it was everywhere equally vivid, would be 4° 20′. But in this caſe there is a greater deduction to be made, on account of the faintneſs of the light of the exterior bow; ſo that, in fact, it will not appear to be more than 3 degrees broad.

The principal phenomena of the rainbow are all explained on Sir Iſaac Newton's principles, in the following propoſitions:

When the rays of the ſun fall upon a drop of rain and enter into it, ſome of them, after one reflection and two refractions, may come to the eye of a ſpectator who has his back towards the ſun, and his face towards the drop.

If XY (fig. 9.) is a drop of rain, and the ſun ſhines upon it in any lines *s f*, *s d*, *s a*, &c. moſt of the rays will enter into the drop; ſome few of them only will be reflected from the firſt ſurface; thoſe rays which are reflected from thence do not come under our preſent conſideration, becauſe they are never refracted at all. The greateſt part of the rays then enter the drop, and thoſe paſſing on to the ſecond ſurface, will moſt of them be tranſmitted through the drop; but neither do thoſe rays which are thus tranſmitted fall under our preſent conſideration, ſince they are not reflected. For the rays, which are deſcribed in the propoſition, are ſuch as are twice refracted and once reflected. However, at the ſecond ſurface, or hinder part of the drop, at *p g*, ſome few rays will be reflected, whilſt the reſt are tranſmitted: thoſe rays proceed in ſome ſuch lines as *n r*, *n q*; and coming out of the drop in the lines *r v*, *q t*, may fall upon the eye of a ſpectator, who is placed anywhere in thoſe lines, with his face towards the drop, and conſequently with his back towards the ſun, which is ſuppoſed to ſhine upon the drop in the lines *s f*, *s d*, *s a*, &c. Theſe rays are twice refracted and once reflected; they are refracted when they paſs out of the air into the drop; they are reflected from the ſecond ſurface, and are refracted again when they paſs out of the drop into the air.

When rays of light reflected from a drop of rain come to the eye, thoſe are called effectual which are able to excite a ſenſation.

When rays of light come out of a drop of rain, they will not be effectual, unleſs they are parallel and contiguous.

There are but few rays that can come to the eye at all: for ſince the greateſt part of thoſe rays which enter the drop XY (fig. 9.) between X and *a*, paſs out of the drop through the hinder ſurface *p g*; only few are reflected from thence, and come out through the nearer ſurface between *a* and *y*. Now, ſuch rays as emerge, or come out of the drop, between *a* and Y, will be ineffectual, unleſs they are parallel to one another, as *r v* and *q t* are; becauſe ſuch rays as come out diverging from one another will be ſo far aſunder when they come to the eye, that all of them cannot enter the pupil; and the very few that can enter it will not be ſufficient to excite any ſenſation. But even rays, which are parallel, as *r v*, *q t*, will not be effectual, unleſs there are ſeveral of them contiguous or very near to one another. The two rays *r v* and *q t* alone will not be perceived, though both of them enter the eye; for ſo very few rays are not ſufficient to excite a ſenſation.

When rays of light come out of a drop of rain after one reflection, thoſe will be effectual which are reflected from the ſame point, and which entered the drop near to one another.

Any rays, as *s b* and *c d*, (pl. 12 fig. 10.) when they have paſſed out of the air into a drop of water, will be refracted towards the perpendiculars *b l d l*; and as the ray *s b* falls farther from the axis *a v* than the ray *c d*, *s b* will be more refracted than *c d*; ſo that theſe rays, though parallel to one another at their incidence, may deſcribe the lines *b e* and *d e* after refraction, and be both of them reflected from one and the ſame point *e*. Now all rays which are thus reflected from one and the ſame point, when they have deſcribed the lines *e f*, *e g*, and after reflection emerge at *f* and *g*, will be ſo refracted, when they paſs out of the drop into the air, as to deſcribe the lines *f h*, *g i*, parallel to one another. If theſe rays were to return from *e* in the lines *e b*, *e d*, and were to emerge at *b* and *d*, they would be refracted into the lines of their incidence *b s*, *d c*. But if theſe rays, inſtead of being returned in the lines *e b*, *e d*, are reflected from the ſame point *e* in the lines *e g*, *e f*, the lines of reflection *e g* and *e f* will be inclined both to one another, and to the ſurface of the drop; juſt as much as the lines *e b* and *e d* are. Firſt *e b* and *e g* make juſt the ſame angle with the ſurface of the drop: for the angle *b e x*, which *e b* makes with the ſurface of the drop, is the complement of incidence, and the angle *g e v*, which *e g* makes with the ſurface, is the complement of reflection; and theſe two are equal to one another. In the ſame manner we might prove, that *e d* and *e f* make equal angles with the ſurface of the drop. Secondly, the angle *b e d* is equal to the angle *f e g*; or the reflected rays *e g*, *e f*, and the incident rays *b e*, *d e*, are equally inclined to each other. For the angle of incidence *b e l* is equal to the angle of reflection *g e l*, and the angle of incidence *d e l* is equal to the angle of reflection *f e l*; conſequently the difference between the angles of incidence is equal to the difference between the angles of reflection, or *b e l — d e l = g e l — f e l*, or *b e d = g e f*. Since therefore either the lines *e g*, *e f*, or the lines *e b*, *e d*, are equally inclined both to one another and to the ſurface of the drop, the rays will be refracted in the ſame manner, whether they were to return in the lines *e b*, *e d*, or are reflected in the lines *e g*, *e f*. But if they were to return in the lines *e b*, *e d*, the refraction, when they emerge at *b* and *d*, would make them parallel. Therefore, if they are reflected from one and the ſame point *e* in the lines *e g*, *e f*, the refraction, when they emerge at *g* and *f*, will likewiſe make them parallel.

But though ſuch rays as are reflected from the ſame point in the hinder part of a drop of rain, are parallel to one another when they emerge, and ſo have one condition that is requiſite towards making them effectual, yet there is another condition neceſſary; for rays, that are effectual, muſt be contiguous as well as parallel. And though rays, which enter the drop in different places, may be parallel when they emerge, thoſe only will be contiguous which enter it nearly at the ſame place.

Let XY (fig. 9.) be a drop of rain, *a g* the axis or diameter of the drop, and *s a* a ray of light that comes from the ſun and enters the drop at the point *a*. This ray *s a*, becauſe it is perpendicular to both the ſurfaces, will paſs ſtraight through the drop in the line *a g h* without being refracted; but any collateral rays, ſuch as thoſe that fall about *s b*, as they paſs through the drop, will be made to converge to their axis, and paſſing out at *n* will meet the axis at *h*: rays which fall farther from the axis than *s b*, ſuch as thoſe which fall about *s c*, will likewiſe be made to converge; but then their focus will be nearer to the drop than *h*. Suppoſe therefore *i* to be the focus to which the rays that fall about *s c* will converge, any ray *s c*, when it has deſcribed the line *c o* within the drop, and is tending to the focus *i*, will paſs out of the drop at the point *o*. The rays that fall upon the drop about *s d*, more remote ſtill from the axis, will converge to a focus ſtill nearer than *i*, as ſuppoſe at *k*. Theſe rays therefore go out of the drop at *p*. The rays, that fall ſtill more remote from the axis, as *s e*, will converge to a focus nearer than *k*, as ſuppoſe at *l*; and the ray *s e*, when it has deſcribed the line *e o* within the drop, and is tending to *l*, will paſs out at the point *o*. The rays that fall ſtill more remote from the axis will converge to a focus ſtill nearer. Thus the ray *s f* will after refraction converge to a focus at *m*, which is nearer than *l*; and having deſcribed the line *f n* within the drop, it will paſs out to the point *n*. Now here we may obſerve, that as any rays *s b*, or *s c* fall farther above the axis *s a*, the points *n*, or *o*, where they paſs out behind the drop, will be farther above *g*; or that, as the incident ray riſes from the axis *s a*, the arc *g n o* increaſes, till we come to ſome

ray *s d*, which paſſes out of the drop at *p*; and this is the higheſt point where any ray that falls upon the quadrant or quarter *a x* can paſs out: for any rays *s e*, or *s f*, that fall higher than *s d*, will not paſs out in any point above *p*, but at the points *o* or *n*, which are below it. Conſequently, though the arc *g n o p* increaſes, whilſt the diſtance of the incident ray from the axis *s a* increaſes, till we come to the ray *s d*; yet afterwards, the higher the ray falls above the axis *s a*, this arc *p o n g* will decreaſe.

We have hitherto ſpoken of the points on the hinder part of the drop, where the rays paſs out of it; but this was for the ſake of determining the points from whence thoſe rays are reflected, which do not paſs out behind the drop. For, in explaining the rainbow, we have no farther reaſon to conſider thoſe rays which go through the drop; ſince they can never come to the eye of a ſpectator placed anywhere in the lines *r v* or *q t* with his face towards the drop. Now, as there are many rays which paſs out of the drop between *g* and *p*, ſo ſome few rays will be reflected from thence; and conſequently the ſeveral points between *g* and *p*, which are the points where ſome of the rays paſs out of the drop, are likewiſe the points of reflection for the reſt which do not paſs out. Therefore, in reſpect of thoſe rays which are reflected, we may call *g p* the arc of reflection; and may ſay, that this arc of reflection increaſes, as the diſtance of the incident ray from the axis *s a* increaſes, till we come to the ray *s d*; the arc of reflection is *g n* for the ray *s b*, it is *g o* for the ray *s c*; and *g p* for the ray *s d*. But after this, as the diſtance of the incident ray from the axis *s a* increaſes, the arc of reflection decreaſes; for *o g* leſs than *p g* is the arc of reflection for the ray *s e*, and *n g* is the arc of reflection for the ray *s f*.

From hence it is obvious, that ſome one ray, which falls above *s d*, may be reflected from the ſame point with ſome other ray which falls below *s d*. Thus, for inſtance, the ray *s b* will be reflected from the point *n*, and the ray *s f* will be reflected from the ſame point; and conſequently, when the reflected rays *n r*, *n q*, are refracted as they paſs out of the drop at *r* and *q*, they will be parallel, by what has been ſhown in the former part of this propoſition. But ſince the intermediate rays, which enter the drop between *s f* and *s b*, are not reflected from the ſame point *n*, theſe two rays alone will be the parallel to one another when they come out of the drop, and the intermediate rays will not be parallel to them. And conſequently theſe rays *r v*, *q t*, though they are parallel after they emerge at *r* and *q*, will not be contiguous, and for that reaſon will not be effectual; the ray *s d* is reflected from *p*, which has been ſhown to be the limit of the arc of reflection; ſuch rays as fall juſt above *s d*, and juſt below *s d*, will be reflected from nearly the ſame point *p*, as appears from what has been already ſhown. Theſe rays therefore will be parallel, becauſe they are reflected from the ſame point *p*; and they will likewiſe be contiguous, becauſe they all of them enter the drop at one and the ſame place very near to *d*. Conſequently, ſuch rays as enter the drop at *d*, and are reflected from *p* the limit of the arc of reflection, will be effectual; ſince, when they emerge at the fore part of the drop between *a* and *y*, they will be both parallel and contiguous.

If we can make out hereafter that the rainbow is produced by the rays of the ſun which are thus reflected from drops of rain as they fall whilſt the ſun ſhines upon them, this propoſition may ſerve to ſhow us, that this appearance is not produced by *any* rays that fall upon *any part*, and are reflected from any part of thoſe drops: ſince this appearance cannot be produced by any rays but thoſe which are effectual; and effectual rays muſt always enter each drop at one certain place in the forepart of it, and muſt likewiſe be reflected from one certain place in the hinder ſurface.

When rays that are effectual emerge from a drop of rain after one reflection and two refractions, thoſe which are moſt refrangible will, at their emerſion, make a leſs angle with the incident rays than thoſe do which are leaſt refrangible; and by this means the rays of different colours will be ſeparated from one another.

Let *f h* and *g i* (Pl. 12. fig. 10.) be effectual violet rays emerging from the drop at *f g*; and *f n*, *g p*, effectual red rays emerging from the ſame drop at the ſame place. Now, though all the violet rays are parallel to one another, becauſe they are ſuppoſed effectual, and though all the red rays are likewiſe parallel to one another for the ſame reaſon; yet the violet rays will not be parallel to the red rays. Theſe rays, as they have different colours, and different degrees of refrangibility, will diverge from one another; any violet ray *g i*, which emerges at *g*, will diverge from any red ray *g p*, which emerges at the ſame place. Now, both the violet ray *g i*, and the red ray *g p*, as they paſs out of the drop of water into the air, will be refracted from the perpendicular *l o*. But the violet ray is more refrangible than the red one; and for that reaſon *g i*, or the refracted violet ray, will make a greater angle with the perpendicular than *g p* the refracted red ray; or the angle *i g o* will be greater than the angle *p g o*. Suppoſe the incident ray *s b* to be continued in the direction *s k*, and the violet ray *i g* to be continued backward in the direction *i k*, till it meets the incident ray at *k*. Suppoſe likewiſe the red ray *p g* to be continued backwards in the ſame manner, till it meets the incident ray at *w*. The angle *i k s* is that which the violet ray, or moſt refrangible ray at its emerſion, makes with the incident ray; and the angle *p w s* is that which the red ray, or leaſt refrangible ray at its emerſion, makes with the incident ray. The angle *i k s* is leſs than the angle *p w s*. For, in the triangle, *g w k*, *g w s*, or *p w s*, is the external angle at the baſe, and *g k w* or *i k s* is one of the internal oppoſite angles; and either internal oppoſite angle is leſs than the external angle at the baſe. (Euc. b. 1. prop. 16.) What has been ſhown to be true of the rays *g i* and *g p* might be ſhown in the ſame manner of the rays *f h* and *f n*, or of any other rays that emerge reſpectively parallel to *g i* and *g p*. But all the effectual violet rays are parallel to *g i*, and all the effectual red rays are parallel to *g p*. Therefore the effectual violet rays at their emerſion make a leſs angle with the incident ones than the effectual red ones. And for the ſame reaſon, in all the other ſorts of rays, thoſe which are moſt refrangible, at their emerſion from a drop of rain after one reflection, will make a leſs angle with the incident rays, than thoſe do which are leſs refrangible.

Or otherwiſe: When the rays *g i* and *g p* emerge at the ſame point *g*, as they both come out of water into air, and conſequently are refracted from the perpendicular, inſtead of going ſtraight forwards in the line *e g* continued, they will both be turned round upon the point *g*, from the perpendicular *g o*. Now it is eaſy to conceive, that either of theſe lines might be turned in this manner upon the point *g* as upon a centre, till they became parallel to *s b* the incident ray. But if either of theſe lines or rays were refracted ſo much from *g o* as to become parallel to *s b*, the ray ſo much refracted would, after emerſion, make no angle with *s k*, becauſe it would be parallel to it. And conſequently that ray which is moſt turned round upon the point *g*, or that ray which is moſt refrangible, will after emerſion be neareſt parallel to the incident ray, or will make the leaſt angle with it. The ſame may be proved of all other rays emerging parallel to *g i* and *g p* reſpectively or of all effectual rays; thoſe which are moſt refrangible will after emerſion make a leſs angle with the incident rays, than thoſe do which are leaſt refrangible.

But ſince the effectual rays of different colours make different angles with *s k* at their emerſion, they will be ſeparated

from one another: ſo that if the eye was placed in the beam *f g h i*, it would receive only rays of one colour from the drop *x a g v*; and if it was placed in the beam *f g n p*, it would receive only rays of ſome other colour.

The angle *s w p*, which the leaſt refrangible or red rays make with the incident ones when they emerge ſo as to be effectual, is found by calculation to be 42 degrees 2 minutes. And the angle *s k i*, which the moſt refrangible rays make with the incident ones when they emerge ſo as to be effectual, is found to be 40 degrees 17 minutes. The rays which have the intermediate degrees of refrangibility, make with the incident ones intermediate angles between 42 degrees 2 minutes, and 40 degrees 17 minutes.

If a line is ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator, the angle which any effectual ray, after two refractions and one reflection, makes with the incident ray, will be equal to the angle which it makes with that line.

Let the eye of the ſpectator be at *i* (Pl. 12. fig. 10.), and let *q t* be the line ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator; the angle *g i t*, which any effectual ray makes with this line, will be equal to the angle *i k s*, which the ſame ray makes with the incident ray *s b* or *s k*. If *s b* is a ray coming from the centre of the ſun, then, ſince *q t* is ſuppoſed to be drawn from the ſame point, theſe two lines, upon account of the remoteneſs of the point from whence they are drawn, may be looked upon as parallel to one another. But the right line *k i* croſſing theſe two parallel lines will make the alternate angles equal (Euc. b. 1. prop. 29.) Therefore *k i t* or *g i t* is equal to *s k i*.

When the ſun ſhines upon the drops of rain as they are falling, the rays that come from thoſe drops to the eye of a ſpectator, after one reflection and two refractions, produce the primary rainbow.

If the ſun ſhines upon the rain as it falls, there are commonly ſeen two bows, as AFB, CHD, (fig. 11.); or if the cloud and rain does not reach over that whole ſide of the ſky where the bows appear, then only a part of one or of both bows is ſeen in that place where the rain falls. Of theſe two bows, the innermoſt AFB is the more vivid of the two, and this is called the *primary bow*. The outer part TFY of the primary bow is red, the inner part VEX is violet; the intermediate parts, reckoning from the red to the violet, are orange, yellow, green, blue, and indigo. Suppoſe the ſpectator's eye to be at O, and let LOP be an imaginary line drawn from the centre of the ſun through the eye of the ſpectator: if a beam of light S coming from the ſun falls upon any drop F; and the rays that emerge at F in the line FO, ſo as to be effectual, make an angle FOP of 42° 2′ with the line LP; then theſe effectual rays make an angle of 42° 2′ with the incident rays, by the preceding propoſition, and conſequently theſe rays will be red, ſo that the drop F will appear red. All the other rays, which emerge at F, and would be effectual if they fell upon the eye, are refracted more than the red ones, and conſequently will paſs above the eye. If a beam of light S falls upon the drop E; and the rays that emerge at E in the line EO, ſo as to be effectual, make an angle EOP of 40° 17′ with the line LP; then theſe effectual rays make likewiſe an angle of 40° 17′ with the incident rays, and the drop E will appear of a violet colour. All the other rays, which emerge at E, and would be effectual if they came to the eye, are refracted leſs than the violet ones, and therefore paſs below the eye. The intermediate drops between F and E will for the ſame reaſons be of the intermediate colours.

Thus we have ſhown why a ſet of drops from F to E, as they are falling, ſhould appear of the primary colours, red, orange, yellow, green, blue, indigo, and violet. It is not neceſſary that the ſeveral drops, which produce theſe colours, ſhould all of them fall at exactly the ſame diſtance from the eye. The angle FOP, for inſtance, is the ſame whether the diſtance of the drop from the eye is OF, or whether it is in any other part of the line OF ſomething nearer to the eye. And whilſt the angle FOP is the ſame, the angle made by the emerging and incident rays, and conſequently the colour of the drop, will be the ſame. This is equally true of any other drop. So that although in the figure the drops F and E are repreſented as falling perpendicularly one under the other, yet this is not neceſſary in order to produce the bow.

But the coloured line FE, which we have already accounted for, is only the breadth of the bow. It ſtill remains to be ſhown, why not only the drop F ſhould appear red, but why all the other drops quite from A to B in the arc ATFYB ſhould appear of the ſame colour. Now it is evident, that wherever a drop of rain is placed, if the angle which the effectual rays make with the line LP is equal to the angle FOP, that is, if the angle which the effectual rays make with the incident rays is 42° 2′, any of thoſe drops will be red, for the ſame reaſon that the drop F is of this colour.

If FOP was to turn round upon the line OP, ſo that one end of this line ſhould always be at the eye, and the other be at P oppoſite to the ſun; ſuch a motion of this figure would be like that of a pair of compaſſes turning round upon one of the legs OP with the opening FOP. In this revolution the drop F would deſcribe a circle, P would be the centre, and ATFYB would be an arc in this circle. Now ſince, in this motion of the line and drop OF, the angle made by FO with OP, that is, the angle FOP, continues the ſame; if the ſun was to ſhine upon this drop as it revolves, the effectual rays would make the ſame angle with the incident rays, in whatever part of the arc ATFYB the drop was to be. Therefore, whether the drop is at A, or at T, or at Y, or at B, or wherever elſe it is in this whole arc, it would appear red, as it does at F. The drops of rain, as they fall, are not indeed turned round in this manner: but then, as innumerable of them are falling at once in right lines from the cloud, whilſt one drop is at F, there will be others at Y. at T, at B, at A, and in every other part of the arc ATFYB: and all theſe drops will be red for the ſame reaſon that the drop F would have been red, if it had been in the ſame place. Therefore, when the ſun ſhines upon the rain as it falls, there will be a red arc ATFYB oppoſite to the ſun. In the ſame manner, becauſe the drop E is violet, we might prove that any other drop, which, whilſt it is falling, is in any part of the arc AVEXB, will be violet; and conſequently, at the ſame time that the red arc ATFYB appears, there will likewiſe be a violet arc AVEXB below or within it. FE is the diſtance between theſe two coloured arcs; and from what has been ſaid, it follows, that the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours, orange, yellow, blue, green, and indigo. All theſe coloured arcs together make up the primary rainbow.

The primary rainbow is never a greater arc than a ſemicircle.

Since the line LOP is drawn from the ſun through the eye of the ſpectator, and ſince P (Pl. 12. fig. 9.) is the centre of the rainbow; it follows, that the centre of the rainbow is always oppoſite to the ſun. The angle FOP is an angle of 42° 2′, as was obſerved, or F the higheſt part of the bow is 42° 2′ from P the centre of it. If the ſun is more than 42° 2′ high, P the centre of the rainbow, which is oppoſite to the ſun, will be more than 42° 2′ below the horizon; and conſequently F the top of the bow, which is only 42° 2′ from P, will be below the horizon; that is, when the ſun is more than 42° 2′ high, no primary rainbow will be ſeen. If the ſun is ſomething leſs than 42° 2′ high, then P will be ſomething leſs than 42° 2′

below the horizon; and conſequently F, which is only 42° 2′ from P, will be juſt above the horizon; that is, a ſmall part of the bow at this height of the ſun will appear cloſe to the ground oppoſite to the ſun. If the ſun is 20° high, then P will be 20° below the horizon; and F the top of the bow, being 42° 2′ from P, will be 22° 2′ above the horizon; therefore, at this height of the ſun, the bow will be an arc of a circle whoſe centre is below the horizon; and conſequently that arc of the circle which is above the horizon, or the bow, will be leſs than a ſemicircle. If the ſun is in the horizon, then P, the centre of the bow, will be in the oppoſite part of the horizon; F, the top of the bow, will be 42° 2′ above the horizon; and the bow itſelf, becauſe the horizon paſſes through the centre of it, will be a ſemicircle. More than a ſemicircle can never appear; becauſe, if the bow was more than a ſemicircle, P the centre of it muſt be above the horizon; but P is always oppoſite to the ſun, therefore P cannot be above the horizon, unleſs the ſun is below it; and when the ſun is ſet, or is below the horizon, it cannot ſhine upon the drops of rain as they fall; and conſequently when the ſun is below the horizon, no bow at all can be ſeen.

When the rays of the ſun fall upon a drop of rain, ſome of them, after two reflections, and two refractions, may come to the eye of a ſpectator, who has his back towards the ſun and his face towards the drop.

If HGW (Pl. 12. fig. 12.) is a drop of rain, and parallel rays coming from the ſun, as $z v$, $y w$, fall upon the lower part of it, they will be refracted towards the perpendiculars $v l$, $w l$, as they enter into it, and will deſcribe ſome ſuch lines as $v h$, $w i$. At h and i great part of theſe rays will paſs out of the drop; but ſome of them will be reflected from thence in the lines $h f$, $i g$. At f and g again, great part of the rays that were reflected thither will paſs out of the drop. But theſe rays will not come to the eye of a ſpectator at o. However, here again all the rays will not paſs out; but ſome few will be reflected from f and g, in ſome ſuch lines as $f d$, $g b$; and theſe, when they emerge out of the drop of water into the air at b and d, will be refracted from the perpendiculars, and, deſcribing the lines $d t$, $b o$, may come to the eye of the ſpectator who has his back towards the ſun and his face towards the drop.

Theſe rays, which are parallel to one another after they have been once refracted and once reflected in a drop of rain, will be effectual when they emerge after two refractions and two reflections.

No rays can be effectual, unleſs they are contiguous and parallel. From what was ſaid, it appears, that when rays come out of a drop of rain contiguous to one another, either after one or after two reflections, they muſt enter the drop nearly at one and the ſame place. And if ſuch rays as are contiguous are parallel after the firſt reflection, they will emerge parallel, and therefore will be effectual. Let $z v$ and $y w$ be contiguous rays which come from the ſun, and are parallel to one another when they fall upon the lower part of the drop, ſuppoſe theſe rays to be refracted at v and w, and to be reflected at h and i; if they are parallel to one another, as $h f$, $g i$, after this firſt reflection, then, after they are reflected a ſecond time from f and g, and refracted a ſecond time as they emerge at d and b, they will go out of the drop parallel to one another in the lines $d t$ and $b o$, and will therefore be effectual.

The rays $z v$, $y w$, are refracted towards the perpendiculars $v l$, $w l$, when they enter the drop, and will be made to converge. As theſe rays are very oblique, their focus will not be far from the ſurface $v w$. If this focus is at k, the rays, after they have paſſed the focus, will diverge from thence in the directions $k h$, $k i$; and if $k i$ is the principal focal diſtance of the concave reflecting ſurface $h i$, the reflected rays $h f$, $i g$, will be parallel. Theſe rays $e f$, $i g$, are reflected again from the concave ſurface $f g$, and will meet in a focus at e, ſo that $g e$ will be the principal focal diſtance of this reflecting ſurface $f g$. And becauſe $h i$ and $f g$ are parts of the ſame ſphere, the principal focal diſtances $g e$ and $k i$ will be equal to one another. When the rays have paſſed the focus e, they will diverge from thence in the lines $e d$, $e b$: and we are to ſhow, that when they emerge at d and b, and are refracted there, they will become parallel.

Now if the rays $v k$, $w k$, when they have met at k, were to be turned back again in the directions $k v$, $k w$, and were to emerge at v and w, they would be refracted into the lines of their incidence, $v z$, $w y$, and therefore would be parallel. But ſince $g e$ is equal to $i k$, as has already been ſhown, the rays $e d$, $e b$, that diverge from e, fall in the ſame manner upon the drop at d and b, as the rays $k v$, $k w$, would fall upon it at v and w; and $e d$, $e b$, are juſt as much inclined to the refracting ſurface $d b$, as $k v$, $k w$, would be to the ſurface $v w$. From hence it follows, that the rays $e d$, $e b$, emerging at d and b, will be refracted in the ſame manner, and will have the ſame direction in reſpect of one another, as $k v$, $k w$, would have. But $k v$ and $k w$ would be parallel after refraction. Therefore $e d$ and $e b$ will emerge in lines $d p$, $b o$, ſo as to be parallel to one another, and conſequently ſo as to be effectual.

When rays that are effectual emerge from a drop of rain after two reflections and two refractions, thoſe which are moſt refrangible will at their emerſion make a greater angle with the incident rays than thoſe do which are leaſt refrangible; and by this means the rays of different colours will be ſeparated from one another.

If rays of different colours, which are differently refrangible, emerge at any point b (Pl. 12. fig. 12.), theſe rays will not be all of them equally refracted from the perpendicular. Thus, if $b o$ is a red ray, which is of all others the leaſt refrangible, and $b m$ is a violet ray, which is of all others the moſt refrangible; when theſe two rays emerge at b, the violet ray will be refracted more from the perpendicular $b x$ than the red ray, and the refracted angle $x b m$ will be greater than the refracted angle $x b o$. From hence it follows, that theſe two rays, after emerſion, will diverge from one another. In like manner, the rays that emerge at d will diverge from one another; a red ray will emerge in the line $d p$, a violet ray in the line $d t$. So that though all the effectual red rays of the beam $b d m t$ are parallel to one another, and all the effectual red rays of the beam $b d o p$ are likewiſe parallel to one another, yet the violet rays will not be parallel to the red ones, but the violet beam will diverge from the red beam. Thus the rays of different colours will be ſeparated from one another.

This will appear farther, if we conſider what the propoſition affirms, That any violet or moſt refrangible ray will make a greater angle with the incident rays, than any red or leaſt refrangible ray makes with the ſame incident rays. Thus if $y w$ is an incident ray, $b m$ a violet ray emerging from the point b, and $b o$ a red ray emerging from the ſame point; the angle which the violet ray makes with the incident one is $y r m$, and that which the red ray makes with it is $y s o$. Now $y r m$ is a greater angle than $y s o$. For in the triangle $b r s$ the internal angle $b r s$ is leſs than $b s y$ the external angle at the baſe. (Euc. b. 1. prop. 16.) But $y r m$ is the complement of $b r s$ or of $b r y$ to two right ones, and $y s o$ is the complement of $b s y$ to two right ones. Therefore, ſince $b r y$ is leſs than $b s y$, the complement of $b r y$ to two right angles will be greater than the complement of $b s y$ to two right angles; or $y r m$ will be greater than $y s o$.

Or otherwiſe: both the rays $b o$ and $b m$, when they are refracted in paſſing out of the drop at b, are turned round upon the point b from the perpendicular $b x$. Now either of theſe

lines *b o* or *b m* might be turned round in this manner, till it made a right angle with *y w*. Conſequently, that ray which is moſt turned round upon *b*, or which is moſt refracted, will make an angle with *y w* that will be nearer to a right one than that ray makes with it which is leaſt turned round upon *b*, or which is leaſt refracted. Therefore that ray which is moſt refracted will make a greater angle with the incident ray than that which is leaſt refracted.

But ſince the emerging rays, as they are differently refrangible, make different angles with the ſame incident ray *y w*, the refraction which they ſuffer at emerſion will ſeparate them from one another.

The angle *y r m*, which the moſt refrangible or violet rays make with the incident ones, is found by calculation to be 54° 7′; and the angle *y s o*, which the leaſt refrangible or red rays make with the incident ones, is found to be 50° 57′: the angles, which the rays of the intermediate colours, indigo, blue, green, yellow, and orange, make with the incident rays, are intermediate angles between 54° 7′ and 50° 57′.

If a line is ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator; the angle which, after two refractions and two reflections, any effectual ray makes with the incident ray, will be equal to the angle which it makes with that line.

If *y w* (fig. 12.) is an incident ray, *b o* an effectual ray, and *q n* a line drawn from the centre of the ſun through *o* the eye of the ſpectator; the angle *y s o*, which the effectual ray makes with the incident ray, is equal to *s o n* the angle which the ſame effectual ray makes with the line *q n*. For *y w* and *q n*, conſidered as drawn from the centre of the ſun, are parallel; *b o* croſſes them, and conſequently makes the alternate angles *y s o*, *s o n*, equal to one another. Eucl. b. i. prop. 29.

When the ſun ſhines upon the drops of rain as they are falling, the rays that come from theſe drops to the eye of a ſpectator, after two reflections and two refractions, produce the ſecondary rainbow.

The ſecondary rainbow is the outermoſt CHD, fig. 11. When the ſun ſhines upon a drop of rain H; and the rays HO, which emerge at H ſo as to be effectual, make an angle HOP of 54° 7′ with LOP a line drawn from the ſun through the eye of the ſpectator; the ſame effectual rays will make likewiſe an angle of 54° 7′ with the incident rays S, and the rays which emerge at this angle are violet ones, by what was obſerved above. Therefore, if the ſpectator's eye is at O, none but violet rays will enter it: for as all the other rays make a leſs angle with OP, they will fall above the ſpectator's eye. In like manner, if the effectual rays that emerge from the drop G make an angle of 50° 57′ with the line P, they will likewiſe make the ſame angle with the incident rays S; and conſequently, from the drop G to the ſpectator's eye at O, no rays will come but red ones; for all the other rays, making a greater angle with the line O P, will fall below the eye at O. For the ſame reaſon, the rays emerging from the intermediate drops between H and G, and coming to the ſpectator's eye at O, will emerge at intermediate angles, and therefore will have the intermediate colours. Thus, if there are ſeven drops from H to G inclufively, their colours will be violet, indigo, blue, green, yellow, orange, and red. This coloured line is the breadth of the ſecondary rainbow.

Now, if HOP was to turn round upon the line OP, like a pair of compaſſes upon one of the legs OP with the opening HOP, it is plain from the ſuppoſition that, in ſuch a revolution of the drop H, the angle HOP would be the ſame, and conſequently the emerging rays would make the ſame angle with the incident ones. But in ſuch a revolution the drop would deſcribe a circle of which P would be the centre, and CNHRD an arc. Conſequently, ſince, when the drop is at N, or at R, or any where elſe in that arc, the emerging rays make the ſame angle with the incident ones as when the drop is at H, the colour of the drop will be the ſame to an eye placed at O, whether the drop is at N, or at H, or at R, or anywhere elſe in that arc. Now, though the drop does not thus turn round as it falls, and does not paſs through the ſeveral parts of this arc, yet, ſince there are drops of rain falling every where at the ſame time, when one drop is at H, there will be another at R, another at N, and others in all parts of the arc; and theſe drops will all of them be violet-coloured, for the ſame reaſon that the drop H would have been of this colour if it had been in any of thoſe places. In like manner, as the drop G is red when it is at G, it would likewiſe be red in any part of the arc CWGQD; and ſo will any other drop, when, as it is falling, it comes to any part of that arc. Thus, as the ſun ſhines upon the rain whilſt it falls, there will be two arcs produced, a violet-coloured one CNHRD, and a red one CWGQD; and for the ſame reaſons the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours. All theſe arcs together make up the ſecondary rainbow.

The colours of the ſecondary rainbow are fainter than thoſe of the primary rainbow; and are ranged in the contrary order.

The primary rainbow is produced by ſuch rays as have been only once reflected; the ſecondary rainbow is produced by ſuch rays as have been twice reflected. But at every reflection ſome rays paſs out of the drop of rain without being reflected; ſo that the oftener the rays are reflected, the fewer of them are left. Therefore the colours of the ſecondary bow are produced by fewer rays, and conſequently will be fainter, than the colours of the primary bow.

In the primary bow, reckoning from the outſide of it, the colours are ranged in this order; red, orange, yellow, green, blue, indigo, violet. In the ſecondary bow, reckoning from the outſide, the colours are violet, indigo, blue, green, yellow, orange, red. So that the red, which is the outermoſt or higheſt colour in the primary bow, is the innermoſt or loweſt colour in the ſecondary one.

Now the violet rays, when they emerge ſo as to be effectual after one reflection, make a leſs angle with the incident rays than the red ones; conſequently the violet rays make a leſs angle with the lines OP (Pl. 12. fig. 11.) than the red ones. But, in the primary rainbow, the rays are only once reflected, and the angle which the effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops, or violet arc, in the primary bow, will be nearer to the centre of the bow than the red drops or red arc; that is, the innermoſt colour in the primary bow will be violet, and the outermoſt colour will be red. And, for the ſame reaſon, through the whole primary bow, every colour will be nearer to the centre P, as the rays of that colour are more refrangible.

But the violet rays, when they emerge ſo as to be effectual after two reflections, make a greater angle with the incident rays than the red ones; conſequently the violet rays will make a greater angle with the line OP, than the red ones. But in the ſecondary rainbow the rays are twice reflected, and the angle which effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the ſecondary bow will be farther from the centre of the bow than the red drops or red arc; that is, the outermoſt colour in the ſecondary bow will be violet, and the innermoſt colour will be red. And, for the ſame reaſon, through the whole ſecondary bow, every colour will be further from the centre P, as the rays of that colour are more refrangible.

§ 2. *Of Coronas, Parhelia,* &c.

Under the articles Corona and Parhelion a pretty full account is given of the different hypotheſes concerning theſe phenomena, and likewiſe of the method by which theſe hypotheſes are ſupported, from the known laws of refraction and reflection; to which therefore, in order to avoid repetition, we muſt refer.

§ 3. *Of the apparent Place, Diſtance, Magnitude, and Motion of Objects.*

Philosophers in general had taken for granted, that the place to which the eye refers any viſible object ſeen by reflection or refraction, is that in which the viſual ray meets a perpendicular from the object upon the reflecting or refracting plane. But this method of judging of the place of objects was called in queſtion by Dr. Barrow, who contended that the arguments brought in favour of the opinion were not concluſive. Theſe arguments are, that the images of objects appear ſtraight in a plane mirror, but curved in a convex or concave one: that a ſtraight thread, when partly immerſed perpendicularly in water, does not appear crooked as when it is obliquely plunged into the fluid; but that which is within the water ſeems to be a continuation of that which is without. With reſpect to the reflected image, however, of a perpendicular right line from a convex or concave mirror, he ſays, that it is not eaſy for the eye to diſtinguiſh the curve that it really makes; and that, if the appearance of a perpendicular thread, part of which is plunged in water, be cloſely attended to, it will not favour the common hypotheſis. If the thread is of any ſhining metal, as ſilver, and viewed obliquely, the image of the part immerſed will appear to detach itſelf ſenſibly from that part which is without the water, ſo that it cannot be true that every object appears to be in the ſame place where the refracted ray meets the perpendicular; and the ſame obſervation, he thinks, may be extended to the caſe of reflection. According to this writer, we refer every point of an object to the place from which the pencils of light, that give us the image of it, iſſue, or from which they would have iſſued if no reflecting or refracting ſubſtance intervened. Purſuing this principle, he proceeds to inveſtigate the place in which the rays iſſuing from each of the points of an object, and which reach the eye after one reflection or refraction, meet; and he found, that if the refracting ſurface was plane, and the refraction was made from a denſer medium into a rarer, thoſe rays would always meet in a place between the eye and a perpendicular to the point of incidence. If a convex mirror be uſed, the caſe will be the ſame; but if the mirror be plane, the rays will meet in the perpendicular, and beyond it if it be concave. He alſo determined, according to theſe principles, what form the image of a right line will take, when it is preſented in different manners to a ſpherical mirror, or when it is ſeen through a refracting medium.

Probable as Dr. Barrow thought the maxim which he endeavoured to eſtabliſh, concerning the ſuppoſed place of viſible objects, he has the candour to mention an objection to it, and to acknowledge that he was not able to give a ſatisfactory ſolution of it. It is this. Let an object be placed beyond the focus of a convex lens; and if the eye be cloſe to the lens, it will appear confuſed, but very near to its true place. If the eye be a little withdrawn, the confuſion will increaſe, and the object will ſeem to come nearer; and when the eye is very near the focus, the confuſion will be exceedingly great, and the object will ſeem to be cloſe to the eye. But in this experiment the eye receives no rays but thoſe that are converging; and the point from which they iſſue is ſo far from being nearer than the object, that it is beyond it; notwithſtanding which, the object is conceived to be much nearer than it is, though no very diſtinct idea can be formed of its preciſe diſtance. It may be obſerved, that in reality, the rays falling upon the eye in this caſe in a manner quite different from that in which they fall upon it in other circumſtances, we can form no judgment about the place from which they iſſue. This ſubject was afterwards taken up by Berkeley, Smith, Montucla, and others.

M. de la Hire made ſeveral valuable obſervations concerning the diſtance of viſible objects, and various other phenomena of viſion, which are well worth our notice. He alſo took particular pains to aſcertain the manner in which the eye conforms itſelf to the view of objects placed at different diſtances. He enumerates five circumſtances, which aſſiſt us in judging of the diſtance of objects, namely, their apparent magnitude, the ſtrength of the colouring, the direction of the two eyes, the parallax of the objects, and the diſtinctneſs of their ſmall parts. Painters, he ſays, can only take advantage of the two firſt mentioned circumſtances, and therefore pictures can never perfectly deceive the eye; but in the decorations of theatres, they, in ſome meaſure, make uſe of them all. The ſize of objects, and the ſtrength of their colouring, are diminiſhed in proportion to the diſtance at which they are intended to appear. Parts of the ſame object which are to appear at different diſtances, as columns in an order of architecture, are drawn upon different planes, a little removed from one another, that the two eyes may be obliged to change their direction, in order to diſtinguiſh the parts of the nearer plane from thoſe of the more remote. The ſmall diſtance of the planes ſerves to make a ſmall parallax, by changing the poſition of the eye; and as we do not preſerve a diſtinct idea of the quantity of parallax, correſponding to the different diſtances of objects, it is ſufficient that we perceive there is a parallax, to be convinced that theſe planes are diſtant from one another, without determining what that diſtance is; and as to the laſt circumſtance, viz. the diſtinctneſs of the ſmall parts of objects, it is of no uſe in diſcovering the deception, on account of the falſe light that is thrown upon theſe decorations.

To theſe obſervations concerning deceptions of ſight, we ſhall add a ſimilar one of M. le Cat, who took notice that the reaſon why we imagine objects to be larger when they are ſeen through a miſt, is the dimneſs or obſcurity with which they are then ſeen; this circumſtance being aſſociated with the idea of great diſtance. This he ſays is confirmed by our being ſurpriſed to find, upon approaching ſuch objects, that they are ſo much nearer to us, as well as ſo much ſmaller, than we had imagined.

Among other caſes concerning viſion, which fell under the conſideration of M. de la Hire, he mentions one which is of difficult ſolution. It is when a candle, in a dark place, and ſituated beyond the limits of diſtinct viſion, is viewed through a very narrow chink in a card; in which caſe a conſiderable number of candles, ſometimes ſo many as ſix, will be ſeen along the chink. This appearance he aſcribes to ſmall irregularities in the ſurface of the humours of the eye, the effect of which is not ſenſible when rays are admitted into the eye through the whole extent of the pupil, and conſequently one principal image effaces a number of ſmall ones; whereas, in this caſe, each of them is formed ſeparately, and no one of them is ſo conſiderable as to prevent the others from being perceived at the ſame time.

There are few perſons, M. de la Hire obſerves, who have both their eyes perfectly equal, not only with reſpect to the limits of diſtinct viſion, but alſo with reſpect to the colour with which objects appear tinged when they are viewed by them, eſpecially if one of the eyes has been expoſed to the impreſſion of a ſtrong light. To compare them together in this reſpect, he directs us to take two thin cards, and to make in each of them a round hole of a third or a fourth of a line in diameter, and, applying one of them to each of the eyes, to look through the holes on a white paper, equally illuminated; when a circle of the paper will appear to each of the eyes, and, placing the

cards properly, theſe two circles may be made to touch one another, and thereby the appearance of the ſame object to each of the eyes may be compared to the greateſt advantage. To make this experiment with the greateſt exactneſs, it is neceſſary, he ſays, that the eyes be kept ſhut ſome time before the cards be applied to them.

M. de la Hire firſt endeavoured to explain the cauſe of thoſe dark ſpots which ſeem to float before the eyes, eſpecially thoſe of old people. They are moſt viſible when the eyes are turned towards an uniform white object, as the ſnow in the open fields. If they be fixed when the eye is ſo, this philoſopher ſuppoſed that they were occaſioned by extravaſated blood upon the retina. But he thought that the moveable ſpots were occaſioned by opaque matter floating in the aqueous humour of the eye. He thought the vitreous humour was not ſufficiently limpid for this purpoſe.

By the following calculation, M. de la Hire gives us an idea of the extreme ſenſibility of the optic nerves. One may ſee very eaſily, at the diſtance of 4000 toiſes, the ſail of a windmill, 6 feet in diameter; and the eye being ſuppoſed to be an inch in diameter, the picture of this ſail, at the bottom of the eye, will be $\frac{1}{6000}$ of an inch, which is leſs than the 66th part of a line, and is about the 66th part of a common hair, or the 8th part of a ſingle thread of ſilk. So ſmall, therefore, muſt one of the fibres of the optic nerve be, which he ſays is almoſt inconceivable, ſince each of theſe fibres is a tube that contains ſpirits. If birds perceive diſtant objects as well as men, which he thinks very probable, he obſerves that the fibres of their optic nerves muſt be much finer than ours.

The perſon who firſt took much notice of Dr. Barrow's hypotheſis was the ingenious Dr. Berkeley, biſhop of Cloyne, who diſtinguiſhed himſelf ſo much by the objections which he ſtarted to the reality of a material world, and by his oppoſition to the Newtonian doctrine of fluxions. In his Eſſay towards a New Theory of Viſion, he obſerves, that the circle formed upon the retina, by the rays which do not come to a focus, produces the ſame confuſion in the eye, whether they croſs one another before they reach the retina, or tend to do it afterwards; and therefore that the judgment concerning diſtance will be the ſame in both the caſes, without any regard to the place from which the rays originally iſſued; ſo that in this caſe, as, by receding from the lens, the confuſion, which always accompanies the nearneſs of an object, increaſes; the mind will judge that the object comes nearer.

But, ſays Dr. Smith, if this be true, the object ought always to appear at a leſs diſtance from the eye than that at which objects are ſeen diſtinctly, which is not the caſe: and to explain this appearance, as well as every other in which a judgment is formed concerning diſtance, he maintains, that we judge of it by the apparent magnitude of objects only, or chiefly; ſo that, ſince the image grows larger as we recede from the lens through which it is viewed, we conceive the object to come nearer. He alſo endeavours to ſhow, that, in all caſes in which glaſſes are uſed, we judge of diſtance by the ſame ſimple rule; from which he concludes univerſally, that the apparent diſtance of an object ſeen in a glaſs is to its apparent diſtance ſeen by the naked eye as the apparent magnitude to the naked eye is to its apparent magnitude in the glaſs.

But that we do not judge of diſtance merely by the angle under which objects are ſeen, is an obſervation as old as Alhazen, who mentions ſeveral inſtances, in which, though the angles under which objects appear be different, the magnitudes are univerſally and inſtantaneouſly deemed not to be ſo. And Mr. Robins clearly ſhows the hypotheſis of Dr. Smith to be contrary to fact in the moſt common and ſimple caſes. In microſcopes, he ſays, it is impoſſible that the eye ſhould judge the object to be nearer than the diſtance at which it has viewed the object itſelf, in proportion to the degree of magnifying. For when the microſcope magniſies much, this rule would place the image at a diſtance, of which the ſight cannot poſſibly form any opinion, as being an interval from the eye at which no object can be ſeen. In general, he ſays, he believes, that whoever looks at an object through a convex glaſs, and then at the object itſelf without the glaſs, will find it to appear nearer in the latter caſe, though it be magnified in the glaſs; and in the ſame trial with the concave glaſs, though by the glaſs the object be diminiſhed, it will appear nearer through the glaſs than without it.

But the moſt convincing proof that the apparent diſtance of the image is not determined by its apparent magnitude, is the following experiment. If a double convex glaſs be held upright before ſome luminous object, as a candle, there will be ſeen two images, one erect, and the other inverted. The firſt is made ſimply by reflection from the neareſt ſurface, the ſecond by reflection from the farther ſurface, the rays undergoing a refraction from the firſt ſurface both before and after the reflection. If this glaſs has not too ſhort a focal diſtance, when it is held near the object, the inverted image will appear larger than the other, and alſo nearer; but if the glaſs be carried off from the object, though the eye remain as near to it as before, the inverted image will diminiſh ſo much faſter than the other, that, at length, it will appear very much leſs than it, but ſtill nearer. Here, ſays Mr. Robins, two images of the ſame object are ſeen under one view, and their apparent diſtances immediately compared; and here it is evident, that thoſe diſtances have no neceſſary connection with the apparent magnitude. He alſo ſhows how this experiment may be made ſtill more convincing, by ſticking a piece of paper on the middle of the lens, and viewing it through a ſhort tube.

M. Bouguer adopts the general maxim of Dr. Barrow, in ſuppoſing that we refer objects to the place from which the pencils of rays ſeemingly converge at their entrance into the pupil. But when rays iſſue from below the ſurface of a veſſel of water, or any other refracting medium, he finds that there are always two different places of this ſeeming convergence; one of them of the rays that iſſue from it in the ſame vertical circle, and therefore fall with different degrees of obliquity upon the ſurface of the refracting medium; and another, of thoſe that fall upon the ſurface with the ſame degree of obliquity, entering the eye laterally with reſpect to one another. Sometimes, he ſays, one of theſe images is attended to by the mind, and ſometimes the other, and different images may be obſerved by different perſons. An object plunged in water affords an example, he ſays, of this duplicity of images.

If BA*b* (Pl. 13. fig 1.) be part of the ſurface of water, and the object be at O, there will be two images of it in two different places; one at G, on the cauſtic by refraction, and the other at E, in the perpendicular AO, which is as much a cauſtic as the other line. The former image is viſible by the rays ODM, O*dm*, which are one higher than the other, in their progreſs to the eye; whereas the image at E is made by the rays ODM, O*ef*, which enter the eye laterally. This, ſays he, may ſerve to explain the difficulty of Father Tacquet, Barrow, Smith, and many other authors, and which Newton himſelf conſidered as a very difficult problem, though it might not be abſolutely inſoluble.

G. W. Kraft has ably ſupported the opinion of Dr. Barrow, that the place of any point, ſeen by reflection from the ſurface of any medium, is that in which rays iſſuing from it, infinitely near to one another, would meet; and conſidering the caſe of a diſtant object, viewed in a concave mirror, by an eye very near to it, when the image, according to Euclid and other writers, would be between the eye and the object, and the rule of Dr. Barrow cannot be applied; he ſays that in this caſe the

ſpeculum may be conſidered as a plane, the effect being the ſame, only the image is more obſcure.

Dr. Porterfield gives a diſtinct and comprehenſive view of the natural methods of judging concerning the diſtance of objects.

The conformation of the eye, he obſerves, can be of no uſe to us with reſpect to objects that are placed without the limits of diſtinct viſion. As the object, however, does then appear more or leſs confuſed, according as it is more or leſs removed from thoſe limits, this confuſion aſſiſts the mind in judging of the diſtance of the object; it being always eſteemed ſo much the nearer, or the farther off, by how much the confuſion is greater. But this confuſion hath its limits alſo, beyond which it can never extend; for when an object is placed at a certain diſtance from the eye, to which the breadth of the pupil bears no ſenſible proportion, the rays of light that come from a point in the object, and paſs the pupil, are ſo little diverging, that they may be conſidered as parallel. For a picture on the retina will not be ſenſibly more confuſed, though the object be removed to a much greater diſtance.

The moſt univerſal, and frequently the moſt ſure means of judging of the diſtance of objects is, he ſays, the angle made by the optic axis. For our two eyes are like two different ſtations, by the aſſiſtance of which diſtances are taken; and this is the reaſon why thoſe perſons who are blind of one eye, ſo frequently miſs their mark in pouring liquor into a glaſs, ſnuffing a candle, and ſuch other actions as require that the diſtance be exactly diſtinguiſhed. To convince ourſelves of the uſefulneſs of this method of judging of the diſtance of objects, he directs us to ſuſpend a ring in a thread, ſo that its ſide may be towards us, and the hole in it to the right and left hand; and taking a ſmall rod, crooked at the end, retire from the ring two or three paces, and having with one hand covered one of our eyes, to endeavour with the other to paſs the crooked end of the rod through the ring. This, ſays he, appears very eaſy; and yet, upon trial, perhaps once in 100 times we ſhall not ſucceed, eſpecially if we move the rod a little quickly.

Our author obſerves, that, by perſons recollecting the time when they began to be ſubject to the miſtakes above-mentioned, they may tell when it was that they loſt the uſe of one of their eyes; which many perſons are long ignorant of, and which may be a circumſtance of ſome conſequence to a ſurgeon. The uſe of this ſecond method of judging of diſtances De Chales limited to 120 feet; beyond which, he ſays, we are not ſenſible of any difference in the angle of the optic axis.

A third method of judging of the diſtance of objects, conſiſts in their apparent magnitudes, on which ſo much ſtreſs was laid by Dr. Smith. From this change in the magnitude of the image upon the retina, we eaſily judge of the diſtance of objects, as often as we are otherwiſe acquainted with the magnitude of the objects themſelves; but as often as we are ignorant of the real magnitude of bodies, we can never, from their apparent magnitude, form any judgment of their diſtance.

From this we may ſee why we are ſo frequently deceived in our eſtimates of diſtance, by any extraordinary magnitudes of objects ſeen at the end of it; as, in travelling towards a large city, or a caſtle, or a cathedral church, or a mountain larger than ordinary, we fancy them to be nearer than we find them to be. This alſo is the reaſon why animals, and all ſmall objects, ſeen in valleys contiguous to large mountains, appear exceedingly ſmall. For we think the mountains nearer to us than if it were ſmaller; and we ſhould not be ſurprized at the ſmallneſs of the neighbouring animals, if we thought them farther off. For the ſame reaſon, we think them exceedingly ſmall, when they are placed upon the top of a mountain, or a large building; which appear nearer to us than they really are, on account of their extraordinary ſize.

Dr. Jurin clearly accounts for our imagining objects, when ſeen from a high building, to be ſmaller than they are, and ſmaller than we fancy them to be when we view them at the ſame diſtance on level ground. It is, ſays he, becauſe we have no diſtinct idea of diſtance in that direction, and therefore judge of the things by their pictures upon the eye only; but cuſtom will enable us to judge rightly even in this caſe.

Let a boy, ſays he, who has never been upon any high building, go to the top of the Monument, and look down into the ſtreet; the objects ſeen there, as men and horſes, will appear ſo ſmall as greatly to ſurpriſe him. But 10 or 20 years after, if in the mean time he has uſed himſelf now and then to look down from that and other great heights, he will no longer find the ſame objects to appear ſo ſmall. And if he were to view the ſame objects from ſuch heights as frequently as he ſees them upon the ſame level with himſelf in the ſtreets, he ſuppoſes that they would appear to him juſt of the ſame magnitude from the top of the Monument, as they do from a window one ſtory high, For this reaſon it is, that ſtatues placed upon very high buildings ought to be made of a larger ſize than thoſe which are ſeen at a nearer diſtance; becauſe all perſons, except architects, are apt to imagine the height of ſuch buildings to be much leſs than it really is.

The fourth method by which Dr. Porterfield ſays that we judge of the diſtance of objects, is the force with which their colour ſtrikes upon our eyes. For if we be aſſured that two objects are of a ſimilar and like colour, and that one appears more bright and lively than the other, we judge that the brighter object is the nearer of the two.

The fifth method conſiſts in the different appearance of the ſmall parts of objects. When theſe parts appear diſtinct, we judge that the object is near; but when they appear confuſed, or when they do not appear at all, we judge that it is at a greater diſtance. For the image of any object, or part of an object, diminiſhes as the diſtance of it increaſes.

The ſixth and laſt method by which we judge of the diſtance of objects is, that the eye does not repreſent to our mind one object alone, but at the ſame time all thoſe that are placed betwixt us and the principal object, whoſe diſtance we are conſidering; and the more this diſtance is divided into ſeparate and diſtinct parts, the greater it appears to be. For this reaſon, diſtances upon uneven ſurfaces appear leſs than upon a plane: for the inequalities of the ſurfaces, ſuch as hills, and holes, and rivers, that lie low and out of ſight, either do not appear, or hinder the parts that lie behind them from appearing; and ſo the whole apparent diſtance is diminiſhed by the parts that do not appear in it. This is the reaſon that the banks of a river appear contiguous to a diſtant eye, when the river is low and not ſeen.

Dr. Porterfield very well explains ſeveral fallacies in viſion depending upon our miſtaking the diſtances of objects. Of this kind, he ſays, is the appearance of parallel lines, and long viſtas conſiſting of parallel rows of trees; for they ſeem to converge more and more as they are farther extended from the eye. The reaſon of this, he ſays, is becauſe the apparent magnitudes of their perpendicular intervals are perpetually diminiſhing, while, at the ſame time, we miſtake their diſtance. Hence we may ſee why, when two parallel rows of trees ſtand upon an aſcent, whereby the more remote parts appear farther off than they really are, becauſe the line that meaſures the length of the viſtas now appears under a greater angle than when it was horizontal, the trees, in ſuch a caſe, will ſeem to converge leſs, and ſometimes, inſtead of converging, they will be thought to diverge.

For the ſame reaſon that a long viſta appears to converge more and more the farther it is extended from the eye, the remoter parts of a horizontal walk or a long floor will appear to

aſcend gradually; and objects placed upon it, the more remote they are the higher they will appear, till the laſt be ſeen on a level with the eye; whereas the ceiling of a long gallery appears to deſcend towards a horizontal line, drawn from the eye of the ſpectator. For this reaſon, alſo, the ſurface of the ſea, ſeen from an eminence, ſeems to riſe higher and higher the farther we look; and the upper parts of high buildings ſeem to ſtoop, or incline forwards over the eye below, becauſe they ſeem to approach towards a vertical line proceeding from the ſpectator's eye; ſo that ſtatues on the top of ſuch buildings, in order to appear upright, muſt recline, or bend backwards.

Our author alſo ſhows the reaſon why a windmill, ſeen from a great diſtance, is ſometimes imagined to move the contrary way from what it really does, by our taking the nearer end of the ſail for the more remote. The uncertainty we ſometimes find in the courſe of the motion of a branch of lighted candles, turned round at a diſtance, is owing, he ſays, to the ſame cauſe; as alſo our ſometimes miſtaking a convex for a concave ſurface, more eſpecially in viewing ſeals and impreſſions with a convex glaſs or a double microſcope; and laſtly, that, upon coming in a dark night into a ſtreet, in which there is but one row of lamps, we often miſtake the ſide of the ſtreet they are on. Far more light was thrown upon this curious ſubject by M. Bouguer.

The proper method of drawing the appearance of two rows of trees that ſhall appear parallel to the eye, is a problem which has exerciſed the ingenuity of ſeveral philoſophers and mathematicians. That the apparent magnitude of objects decreaſes with the angle under which they are ſeen, has always been acknowledged. It is alſo acknowledged, that it is only by cuſtom and experience that we learn to form a judgment both of magnitudes and diſtances. But in the application of theſe maxims to the above-mentioned problem, all perſons, before M. Bouguer, made uſe of the real diſtance inſtead of the apparent one; by which only the mind can form its judgment. And it is manifeſt, that, if any circumſtances contribute to make the diſtance appear otherwiſe than it is in reality, the apparent magnitude of the object will be affected by it; for the ſame reaſon, that, if the magnitude be miſapprehended, the idea of the diſtance will vary.

For want of attending to this diſtinction, Tacquet pretended to demonſtrate, that nothing can give the idea of two parallel lines (rows of trees for inſtance) to an eye ſituated at one of their extremities, but two hyperbolical curves, turned the contrary way; and M. Varignon maintained, that, in order to make a viſta appear of the ſame width, it muſt be made narrower, inſtead of wider, as it recedes from the eye.

M. Bouguer obſerves, that very great diſtances, and thoſe that are conſiderably leſs than they, make nearly the ſame impreſſion upon the eye. We, therefore, always imagine great diſtances to be leſs than they are; and for this reaſon the ground plan of a long viſta always appears to riſe. The viſual rays come in a determinate direction; but as we imagine that they terminate ſooner than they do, we neceſſarily conceive that the place from which they iſſue is elevated. Every large plane, therefore, as AB, (Pl. 13. fig. 2.) viewed by an eye at O, will ſeem to lie in ſuch a direction as A*b*; and conſequently lines, in order to appear truly parallel on the plane AB, muſt be drawn ſo as that they would appear parallel on the plane A*b*, and be from thence projected to the plane AB.

To determine the inclination of the apparent ground-plan A*b* to the true ground-plan AB, our ingenious author directs us to draw upon a piece of level ground two ſtraight lines of a ſufficient length (for which purpoſe lines faſtened to ſmall ſticks are very convenient), making an angle of 3 or 4 degrees with one another. Then a perſon, placing himſelf within the angle, with his back towards the angular point, muſt walk backwards and forwards till he can fancy the lines to be parallel. In this ſituation, a line drawn from the point of the angle through the place of his eye, will contain the ſame angle with the true ground-plan which this does with the apparent one.

M. Bouguer then ſhows other more geometrical methods of determining this inclination; and ſays, that by theſe means he has often found it to be 4 or 5 degrees, though ſometimes only 2 or $2\frac{2}{7}$ degrees. The determination of this angle, he obſerves, is variable; depending upon the manner in which the ground is illuminated and the intenſity of the light. The colour of the ſoil is alſo not without its influence, as well as the particular conformation of the eye, by which it is more or leſs affected by the ſame degree of light, and alſo the part of the eye on which the object is painted. When, by a ſlight motion of his head, he contrived, that certain parts of the ſoil, the image of which fell towards the bottom of his eye, ſhould fall towards the top of the retina, he always thought that this apparent inclination became a little greater.

But what is very remarkable, and what he ſays he can aſſure his reader may be depended upon, is, that if he look towards a riſing ground, the difference between the apparent ground-plan and the true one will be much more conſiderable, ſo that they will ſometimes make an angle of 25 or 30 degrees. Of this he had made frequent obſervations. Mountains, he ſays, begin to be inacceſſible when their ſides make an angle from 35 to 37 degrees with the horizon, as then it is not poſſible to climb them but by means of ſtones or ſhrubs, to ſerve as ſteps to fix the feet on. In theſe caſes, both he and his companions always agreed that the apparent inclination of the ſide of the mountain was 60 or 70 degrees.

Theſe deceptions are repreſented in Pl. 13. fig. 3. in which, when the ground plan AM, or AN, are much inclined, the apparent ground-plan A*m*, or A*n*, makes a very large angle with it. On the contrary, if the ground dips below the level, the inclination of the apparent to the true ground-plan diminiſhes, till, at a certain degree of the ſlope, it becomes nothing at all; the two plans AP and A*p* being the ſame, ſo that parallel lines drawn upon them would always appear ſo. If the inclination below the horizon is carried beyond the ſituation AP, the error will increaſe; and what is very remarkable, it will be on the contrary ſide; the apparent plan A*r* being always below the true plan AR, ſo that if a perſon would draw upon the plan AR lines that ſhall appear parallel to the eye, they muſt be drawn converging, and not diverging, as is uſual on the level ground; becauſe they muſt be the projections of two lines imagined to be parallel, on the plan A*r*, which is more inclined to the horizon than AR.

Theſe remarks, he obſerves, are applicable to different planes expoſed to the eye at the ſame time. For if BH, fig. 4. be the front of a building, at the diſtance of AB from the eye, it will be reduced in appearance to the diſtance A*b*; and the front of the building will be *bb*, rather inclined towards the ſpectator, unleſs the diſtance be inconſiderable.

After making a great number of obſervations upon this ſubject, our author concludes, that when a man ſtands upon a level plane, it does not ſeem to riſe ſenſibly but at ſome diſtance from him. The apparent plane, therefore, has a curvature in it, at that diſtance, the form of which is not very eaſy to determine; ſo that a man ſtanding upon a level plane, of infinite extent, will imagine that he ſtands in the centre of a baſon. This is alſo, in ſome meaſure, the caſe with a perſon ſtanding upon the level of the ſea.

He concludes with obſerving, that there is no difficulty in drawing lines according to theſe rules, ſo as to have any given effect upon the eye, except when ſome parts of the proſpect are very near the ſpectator, and others very diſtant from him;

becauſe, in this caſe, regard muſt be had to the conical or conoidal figure of a ſurface. A right line paſſing at a ſmall diſtance from the obſerver, and below the level of his eye, in that caſe almoſt always appears ſenſibly curved at a certain diſtance from the eye; and almoſt all figures in this caſe are ſubject to ſome complicated optical alteration, to which the rules of perſpective have not as yet been extended. If a circle be drawn near our feet, and within that part of the ground which appears level to us, it will always appear to be a circle, and at a very conſiderable diſtance it will appear an ellipſe; but between theſe two ſituations, it will not appear to be either the one or the other, but will be like one of thoſe ovals of Deſcartes, which is more curved on one of its ſides than the other.

On theſe principles a parterre, which appears diſtorted when it is ſeen in a low ſituation, appears perfectly regular when it is viewed from a balcony or any other eminence. Still, however, the apparent irregularity takes place at a greater diſtance, while the part that is near the ſpectator is exempt from it. If AB, fig. 5. be the ground plane, and A *a* be a perpendicular, under the eye, the higher it is ſituated, at O, to the greater diſtance will T, the place at which the plane begins to have an apparent aſcent along T *t*, be removed.

All the varieties that can occur with reſpect to the viſible motion of objects, are thus ſuccinctly ſummed up by Dr. Porterfield under eleven heads.

1. An object moving very ſwiftly is not ſeen, unleſs it be very luminous. Thus a cannon-ball is not ſeen if it is viewed tranſverſely: but if it be viewed according to the line it deſcribes, it may be ſeen, becauſe its picture continues long on the ſame place of the retina; which, therefore, receives a more ſenſible impreſſion from the object.

2. A live coal ſwung briſkly round in a circle appears a continued circle of fire, becauſe the impreſſions made on the retina by light, being of a vibrating, and conſequently of a laſting nature, do not preſently periſh, but continue till the coal performs its whole circuit, and returns again to its former place.

3. If two objects, unequally diſtant from the eye, move with equal velocity, the more remote one will appear the ſlower; or, if their celerities be proportional to their diſtances, they will appear equally ſwift.

4. If two objects, unequally diſtant from the eye, move with unequal velocities in the ſame direction, their apparent velocities are in a ratio compounded of the direct ratio of their true velocities, and the reciprocal one of their diſtances from the eye.

5. A viſible object moving with any velocity appears to be at reſt, if the ſpace deſcribed in the interval of one ſecond be imperceptible at the diſtance of the eye. Hence it is that a near object moving very ſlowly, as the index of a clock, or a remote one very ſwiftly, as a planet, ſeems to be at reſt.

6. An object moving with any degree of velocity will appear at reſt, if the ſpace it runs over in a ſecond of time be to its diſtance from the eye as 1 to 1400.

7. The eye proceeding ſtraight from one place to another, a lateral object, not too far off, whether on the right or left, will ſeem to move the contrary way.

8. The eye proceeding ſtraight from one place to another, and being ſenſible of its motion, diſtant objects will ſeem to move the ſame way, and with the ſame velocity. Thus, to a perſon running eaſtwards, the moon on his right hand appears to move the ſame way, and with equal ſwiftneſs; for, by reaſon of its diſtance, its image continues fixed upon the ſame place of the retina, from whence we imagine that the object moves along with the eye.

9. If the eye and the object move both the ſame way, only the eye much ſwifter than the object, the laſt will appear to go backwards.

10. If two or more objects move with the ſame velocity, and a third remain at reſt, the moveable ones will appear fixed, and the quieſcent in motion the contrary way. Thus clouds moving very ſwiftly, their parts ſeem to preſerve their ſituation, and the moon to move the contrary way.

11. If the eye be moved with great velocity, lateral objects at reſt appear to move the contrary way. Thus to a perſon ſitting in a coach, and riding briſkly through a wood, the trees ſeem to retire the contrary way: and to people in a ſhip, &c. the ſhores ſeem to recede.

At the concluſion of theſe obſervations, our author endeavours to explain another phenomenon of motion, which, though very common and well known, had not, as far as he knew, been explained in a ſatisfactory manner. It is this: If a perſon turns ſwiftly round, without changing his place, all objects about will ſeem to move round in a circle the contrary way; and this deception continues not only while the perſon himſelf moves round, but, which is more ſurpriſing, it alſo continues for ſome time after he ceaſes to move, when the eye, as well as the object, is at abſolute reſt.

The reaſon why objects appear to move round the contrary way, when the eye turns round, is not ſo difficult to explain: for though, properly ſpeaking, motion is not ſeen, as not being in itſelf the immediate object of ſight; yet by the ſight we eaſily know when the image changes its place on the retina, and thence conclude that either the object, the eye, or both, are moved. But by the ſight alone we can never determine how far this motion belongs to the object, how far to the eye, or how far to both. If we imagine the eye at reſt, we aſcribe the whole motion to the object, though it be truly at reſt. If we imagine the object at reſt, we aſcribe the whole motion to the eye, though it belongs entirely to the object; and when the eye is in motion, though we are ſenſible of its motion, yet, if we do not imagine that it moves ſo ſwiftly as it really does, we aſcribe only a part of the motion to the eye, and the reſt of it we aſcribe to the object, though it be truly at reſt. This laſt, he ſays, is what happens in the preſent caſe, when the eye turns round; for though we are ſenſible of the motion of the eye, yet we do not apprehend that it moves ſo faſt as it really does; and therefore the bodies about appear to move the contrary way, as is agreeable to experience.

But the great difficulty ſtill remains, viz. Why, after the eye ceaſes to move, objects ſhould, for ſome time, ſtill appear to continue in motion, though their pictures on the retina be truly at reſt, and do not at all change their place. This, he imagined, proceeds from a miſtake we are in with reſpect to the eye, which, though it be abſolutely at reſt, we nevertheleſs conceive as moving the contrary way to that in which it moved before; from which miſtake, with reſpect to the motion of the eye, the objects at reſt will appear to move the ſame way which the eye is imagined to move; and, conſequently, will ſeem to continue their motion for ſome time after the eye is at reſt.

This is ingenious, but perhaps not juſt. An account of this matter, which ſeems to us more ſatisfactory, has been lately given to the public by Dr. Wells, "Some of the older writers upon optics (ſays this able philoſopher) imagined the viſive ſpirits to be contained in the head, as water is in a veſſel; which, therefore, when once put in motion by the rotation of our bodies, muſt continue in it for ſome time after this has ceaſed; and to this real circular movement of the viſive ſpirits, while the body is at reſt, they attributed the apparent motions of objects in giddineſs. Dechales ſaw the weakneſs of this hypotheſis; and conjectured, that the phenomenon might be owing to a real movement of the eyes; but produced no fact in proof of his opinion. Dr. Porterfield, on the contrary, ſuppoſed the difficulty of explaining it to conſiſt in ſhowing why objects at reſt appear in motion to an eye which is alſo at reſt. The ſolution he offered of this repreſentation of the pheno-

menon is not only extremely ingenious, but is I believe the only probable one which can be given. It does not apply, however, to the fact which truly exists; for I shall immediately show that the eye is not at rest, as he imagined. The last author I know of who has touched upon this subject is Dr. Darwin. His words are: 'When any one turns round rapidly on one foot till he becomes dizzy, and falls upon the ground, the spectra of the ambient objects continue to present themselves in rotation, or appear to librate, and he seems to behold them for some time in motion.' I do not indeed pretend to understand his opinion fully; but this much seems clear, that if such an apparent motion of the surrounding objects depends in any way upon their spectra, or the illusive representations of those objects, occasioned by their former impressions upon the retinas, no similar motion would be observed, were we to turn ourselves round with our eyes shut, and not to open them till we became giddy; for in this case, as the surrounding objects could not send their pictures to the retinas, there would consequently be no spectra to present themselves afterward in rotation. But whoever will make the experiment, will find, that objects about him appear to be equally in motion, when he has become giddy by turning himself round, whether this has been done with his eyes open or shut. I shall now venture to propose my own opinion upon this subject.

"If the eye be at rest, we judge an object to be in motion when its picture falls in succeeding times upon different parts of the retina; and if the eye be in motion, we judge an object to be at rest, as long as the change in the place of its picture upon the retina holds a certain correspondence with the change of the eye's position. Let us now suppose the eye to be in motion, while, from some disorder in the system of sensation, we are either without those feelings which indicate the various positions of the eye, or are not able to attend to them. It is evident, that in such a state of things an object at rest must appear to be in motion, since it sends in succeeding times its picture to different parts of the retina. And this seems to be what happens in giddiness. I was first led to think so from observing, that, during a slight fit of giddiness I was accidentally seized with, a coloured spot, occasioned by looking steadily at a luminous body, and upon which I happened at that moment to be making an experiment, was moved in a manner altogether independent of the positions I conceived my eyes to possess. To determine this point, I again produced the spot, by looking some time at the flame of a candle: then turning myself round till I became giddy, I suddenly discontinued this motion, and directed my eyes to the middle of a sheet of paper, fixed upon the wall of my chamber. The spot now appeared upon the paper, but only for a moment; for it immediately after seemed to move to one side, and the paper to the other, notwithstanding I conceived the position of my eyes to be in the mean while unchanged. To go on with the experiment, when the paper and spot had proceeded to a certain distance from each other, they suddenly came together again; and this separation and conjunction were alternately repeated a number of times, the limits of the separation gradually becoming less, till at length the paper and spot both appeared to be at rest, and the latter to be projected upon the middle of the former. I found also, upon repeating and varying the experiment a little, that when I had turned myself from left to right, the paper moved from right to left, and the spot consequently the contrary way; but that when I had turned from right to left, the paper would then move from left to right. These were the appearances observed while I stood erect. When I inclined, however, my head in such a manner as to bring the side of my face parallel to the horizon, the spot and paper would then move from each other, one upward and the other downward. But all these phenomena demonstrate, that there was a real motion in my eyes at the time I imagined them to be at rest; for the apparent situation of the spot, with respect to the paper, could not possibly have been altered, without a real change of the position of those organs. To have the same thing proved in another way, I desired a person to turn quickly round, till he became very giddy; then to stop himself, and look stedfastly at me. He did so, and I could plainly see, that although he thought his eyes were fixed, they were in reality moving in their sockets, first toward one side, and then toward the other."

M. le Cat well explains a remarkable deception, by which a person shall imagine an object to be on the opposite side of a board, when it is not so, and also inverted and magnified. It is illustrated by fig. 6. in Pl. 13, in which D represents the eye, and CB a large black board pierced with a small hole. E is a large white board placed beyond it, and strongly illuminated; and *d* a pin, or other small object, held betwixt the eye and the first board. In these circumstances, the pin shall be imagined to be at F, on the other side of the board, where it will appear inverted and magnified, because what is in fact perceived is the shadow of the pin upon the retina; and the light that is stopped by the upper part of the pin coming from the lower part of the enlightened board, and that which is stopped by the lower part coming from the upper part of the board, the shadow must necessarily be inverted with respect to the object.

There is a curious phenomenon relating to vision, which some persons have ascribed to the inflection of light, but which Mr. Melville explains in a very different and very simple manner.

When any opaque body is held at the distance of three or four inches from the eye, so that a part of some more distant luminous object, such as the window, or the flame of a candle, may be seen by rays passing near its edge; if another opaque body, nearer to the eye, be brought across from the opposite side, the edge of the first body will seem to swell outwards, and meet the latter; and in doing so will intercept a portion of the luminous object that was seen before.

This appearance he explains in the following manner: Let AB (fig. 7.) represent the luminous object to which the sight is directed, CD the more distant opaque body, GH the nearer, and EF the diameter of the pupil. Join ED, FD, EG, FG, and produce them till they meet AB in K, N, M, and L. It is plain that the parts AN, MB, of the luminous object cannot be seen. But taking any point *a* between N and K, and drawing *a* D *d*, since the portion *d* F of the pupil is filled with light flowing from that point, it must be visible. Any point *b*, between *a* and K, must fill *f* F, a greater portion of the pupil, and therefore must appear brighter. Again, any point *c*, between *b* and K, must appear brighter than *b*, because it fills a greater portion *g* F with light. The point K itself, and every other point in the space KL, must appear very luminous, since they send entire pencils of rays EKF, ELF, to the eye; and the visible brightness of every point from L towards M, must decrease gradually, as from K to N: that is, the spaces KN, LM, will appear as dim shadowy borders, or fringes, adjacent to the edges of the opaque bodies.

When the edge G is brought to touch the right line KF, the penumbras unite; and as soon as it reaches NDF, the above phenomenon begins; for it cannot pass that right line without meeting some line *a* D *d*, drawn from a point between N and K, and, by intercepting all the rays that fall upon the pupil, render it invisible. In advancing gradually to the line KDE, it will meet other lines *b* D *f*, *c* D *g*, &c. and therefore render the points *b*, *c*, &c. from N to K, successively invisible; and therefore the edge of the fixed opaque body CD must seem to swell outwards, and cover the whole space NK; while GH, by its motion, covers MK. When GH is placed at a greater distance from the eye, CD continuing fixed, the space OP to be passed over in order to intercept NK is less; and therefore,

with an equal motion of GH, the apparent ſwelling of CD muſt be quicker; which is found true by experience.

If ML repreſent a luminous object, and REFQ any plane expoſed to its light, the ſpace FQ will be entirely ſhaded from the rays, and the ſpace FE will be occupied by a penumbra, gradually darker, from E to F. Let now GH continue fixed, and CD move parallel to the plane EF; and as ſoon as it paſſes the line LF, it is evident that the ſhadow QF will ſeem to ſwell outwards; and when CD reaches ME, ſo as to cover with its ſhadow the ſpace RE, QF, by its extenſion, will cover FE. This is found to hold true likewiſe by experiment.

§ 4. *Of the Concave Figure of the Sky.*

This apparent concavity is only an optical deception founded on the incapacity of our organs of viſion to take in very large diſtances.—Dr. Smith, in his Complete Syſtem of Optics, hath demonſtrated, that, if the ſurface of the earth were perfectly plane, the diſtance of the viſible horizon from the eye would ſcarce exceed the diſtance of 5000 times the height of the eye above the ground, ſuppoſing the height of the eye between five and ſix feet: beyond this diſtance, all objects would appear in the viſible horizon. For, let OP (Pl. 13. fig. 8.) be the height of the eye above the line PA drawn upon the ground; and if an object AB, equal in height to PO, be removed to a diſtance PA equal to 5000 times that height, it will hardly be viſible by reaſon of the ſmallneſs of the angle AOB. Conſequently any diſtance AC, how great ſoever, beyond A, will be inviſible. For ſince AC and BO are parallel, the ray CO will always cut AB in ſome point D between A and B; and therefore the angle AOC, or AOD, will always be leſs than AOB, and therefore AD or AC will be inviſible. Conſequently all objects and clouds, as CE and FG, placed at all diſtances beyond A, if they be high enough to be viſible, or to ſubtend a greater angle at the eye than AOB, will appear at the horizon AB; becauſe the diſtance AC is inviſible.

Hence, if we ſuppoſe a vaſt long row of objects, or a vaſt long wall ABZY (fig. 9.), built upon this plane, and its perpendicular diſtance OA from the eye at O to be equal to or greater than the diſtance of O *a* of the viſible horizon, it will not appear ſtraight, but circular, as if it was built upon the circumference of the horizon *a c e g y*: and if the wall be continued to an immenſe diſtance, its extreme parts YZ will appear in the horizon at *yz*, where it is cut by a line O*y* parallel to the wall. For, ſuppoſing a ray YO, the angle YO*y* will become inſenſibly ſmall. Imagine this infinite plane OAY*y*, with the wall upon it, to be turned about the horizontal line O like the lid of a box, till it becomes prependicular to the other half of the horizontal plane LM*y*, and the wall parallel to it, like a vaſt ceiling over head; and then the wall will appear like the concave figure of the clouds over head. But though the wall in the horizon appear in the figure of a ſemicircle, yet the ceiling will not, but much flatter. Becauſe the horizontal plane was a viſible ſurface, which ſuggeſted the idea of the ſame diſtances quite round the eye: but in the vertical plane extended between the eye and the ceiling, there is nothing that affects the ſenſe with an idea of its parts but the common line O*y*; conſequently the apparent diſtances of the higher parts of the ceiling will be gradually diminiſhed in aſcending from that line. Now when the ſky is quite overcaſt with clouds of equal gravities, they will all float in the air at equal heights above the earth, and conſequently will compoſe a ſurface reſembling a large ceiling, as flat as the viſible ſurface of the earth. Its concavity therefore is not real, but apparent: and when the heights of the clouds are unequal, ſince their real ſhapes and magnitudes are all unknown, the eye can ſeldom diſtinguiſh the unequal diſtances of thoſe clouds that appear in the ſame directions, unleſs when they are very near us, or are driven by contrary currents of the air. So that the viſible ſhape of the whole ſurface remains alike in both caſes. And when the ſky is either partly overcaſt, or partly free from clouds, it is matter of fact that we retain much the ſame idea of its concavity as when it was quite overcaſt.

The concavity of the heavens appears to the eye, which is the only judge of an apparent figure, to be a leſs portion of a ſpherical ſurface than a hemiſphere. Dr. Smith ſays, that the centre of the concavity is much below the eye; and by taking a medium among ſeveral obſervations, he found the apparent diſtance of its parts at the horizon to be generally between three and four times greater than the apparent diſtance of its parts overhead. For let the arch ABCD (fig. 10.) repreſent the apparent concavity of the ſky, O the place of the eye, OA and OC the horizontal and vertical apparent diſtances, whoſe proportion is required. Firſt obſerve when the ſun or the moon, or any cloud or ſtar, is in ſuch a poſition at B, that the apparent arches BA, BC, extended on each ſide of this object towards the horizon and zenith, ſeem equal to the eye; then taking the altitude of the object B with a quadrant, or a croſs-ſtaff, or finding it by aſtronomy from the given time of obſervation, the angle AOB is known. Drawing therefore the line OB in the poſition thus determined, and taking in it any point B at pleaſure, in the vertical line CO produced downwards, ſeek the centre E of a circle ABC, whoſe arches BA, BC, intercepted between B and the legs of the right angle AOC, ſhall be equal to each other; then will this arch ABCD repreſent the apparent figure of the ſky. For by the eye we eſtimate the diſtance between any two objects in the heavens by the quantity of ſky that appears to lie between them; as upon earth we eſtimate it by the quantity of ground that lies between them. The centre E may be found geometrically by conſtructing a cubic equation, or as quickly and ſufficiently exact by trying whether the chords BA, BC, of the arch ABC drawn by conjecture are equal, and by altering its radius BE till they are ſo. Now in making ſeveral obſervations upon the ſun, and ſome others upon the moon and ſtars, they ſeemed to our author to biſect the vertical arch ABC at B when their apparent altitudes or the angle AOB was about 2$\frac{1}{2}$ degrees; which gives the proportion of OC to OA as 3 to 10 or as 1 to 3$\frac{1}{3}$ nearly. When the ſun was but 30 degrees high, the upper arch ſeemed always leſs than the under one; and, in our author's opinion, always greater when the ſun was about 18 or 20 degrees high.

§ 5. *Of the Blue Colour of the Sky, and of Blue and Green Shadows.*

The opinions of ancient writers concerning the colour of the ſky merit no notice. The firſt who gave any rational explanation was Fromondus. By him it was ſuppoſed that the blueneſs of the ſky proceeded from a mixture of the white light of the ſun with the black ſpace beyond the atmoſphere, where there is neither refraction nor reflection. This opinion prevailed very generally even in modern times, and was maintained by Otto Guerick and all his cotemporaries, who aſſerted that white and black may be mixed in ſuch a manner as to make a blue. Mr. Bouguer had recourſe to the vapours diffuſed through the atmoſphere, to account for the reflection of the blue rays rather than any other. He ſeems however to ſuppoſe, that it ariſes from the conſtitution of the air itſelf, whereby the fainter coloured rays are incapable of making their way through any conſiderable tract of it. Hence he is of opinion, that the colour of the air is properly blue; to which opinion Dr. Smith ſeems alſo to have inclined.

To this blue colour of the ſky is owing the appearance of blue and green ſhadows in the mornings and evenings.—Theſe were firſt taken notice of by M. Buffon in the month of July 1742, when he obſerved that the ſhadows of trees which fell upon a

white wall were green. He was at that time ſtanding upon an eminence, and the ſun was ſetting in the cleft of a mountain, ſo that he appeared conſiderably lower than the horizon. The ſky was clear, excepting in the weſt, which, though free from clouds, was lightly ſhaded with vapours of a yellow colour, inclining to red. Then the ſun itſelf was exceedingly red, and was ſeemingly at leaſt four times as large as he appears to be at mid-day. In theſe circumſtances, he ſaw very diſtinctly the ſhadows of the trees, which were 30 or 40 feet from the white wall, coloured with a light green, inclining to blue. The ſhadow of an arbour, which was three feet from the wall, was exactly drawn upon it, and looked as if it had been newly painted with verdigriſe. This appearance laſted near five minutes; after which it grew fainter, and vaniſhed at the ſame time with the light of the ſun.

The next morning, at ſunriſe, he went to obſerve other ſhadows, upon another white wall; but inſtead of finding them green, as he expected, he obſerved that they were blue, or rather of the colour of lively indigo. The ſky was ſerene, except a ſlight covering of yellowiſh vapours in the eaſt; and the ſun aroſe behind a hill, ſo that it was elevated above his horizon. In theſe circumſtances, the blue ſhadows were only viſible three minutes, after which they appeared black; and in the evening of the ſame day he obſerved the green ſhadows exactly as before. Six days paſſed without his being able to repeat his obſervations, on account of the clouds; but the 7th day, at ſunſet, the ſhadows were not green, but of a beautiful ſky-blue. He alſo obſerved, that the ſky was in a great meaſure free from vapours at that time; and that the ſun ſet behind a rock, ſo that it diſappeared before it came to his horizon. Afterwards he often obſerved the ſhadows both at ſunriſe and ſunſet; but always obſerved them to be blue, though with a great variety of ſhades of that colour. He ſhowed this phenomenon to many of his friends, who were as much ſurpriſed at it as he himſelf had been; but he ſays that any perſon may ſee a blue ſhadow, if he will only hold his finger before a piece of white paper at ſunriſe or ſunſet.

The firſt perſon who attempted to explain this phenomenon was the Abbé Mazeas, in a memoir of the ſociety in Berlin for the year 1752. He obſerved, that when an opaque body was illuminated by the moon and a candle at the ſame time, and the two ſhadows were caſt upon the ſame white wall, that which was enlightened by the candle was reddiſh, and that which was enlightened by the moon was blue. But, without attending to any other circumſtances, he ſuppoſed the change of colour to be occaſioned by the diminution of the light; but M. Melville, and M. Bouguer, both independent of one another, ſeem to have hit upon the true cauſe of this curious appearance, and which hath been already hinted at. The former of theſe gentlemen, in his attempts to explain the blue colour of the ſky, obſerves, that ſince it is certain that no body aſſumes any particular colour, but becauſe it reflects one ſort of rays more abundantly than the reſt; and ſince it cannot be ſuppoſed that the conſtituent parts of pure air are groſs enough to ſeparate any colours of themſelves; we muſt conclude with Sir Iſaac Newton, that the violet and blue making rays are reflected more copiouſly than the reſt, by the finer vapours diffuſed through the atmoſphere, whoſe parts are not big enough to give them the appearance of viſible opaque clouds. And he ſhows, that, in proper circumſtances, the blueiſh colour of the ſky-light may be actually ſeen on bodies illuminated by it, as, he ſays, it is objected ſhould always happen upon this hypotheſis. For that if, on a clear cloudleſs day, a ſheet of white paper be expoſed to the ſun's beams, when any opaque body is placed upon it, the ſhadow which is illuminated by the ſky only will appear remarkably blueiſh compared with the reſt of the paper, which receives the ſun's direct rays.

M. Bouguer, who has taken the moſt pains with this ſubject, obſerves, that as M. Buffon mentions the ſhadows appearing green only twice, and that at all other times they were blue, this is the colour which they regularly have, and that the blue was changed into green by ſome accidental circumſtance. Green, he ſays, is only a compoſition of blue and yellow, ſo that this accidental change may have ariſen from the mixture of ſome yellow rays in the blue ſhadow; and that perhaps the wall might have had that tinge, ſo that the blue is the only colour for which a general reaſon is required. And this, he ſays, muſt be derived from the colour of pure air, which always appears blue, and which always reflects that colour upon all objects without diſtinction; but which is too faint to be perceived when our eyes are ſtrongly affected by the light of the ſun, reflected from other objects around us.

To confirm this hypotheſis, he adds ſome curious obſervations of his own, in which this appearance is agreeably diverſified. Being at the village of Boucholtz in July 1764, he obſerved the ſhadows projected on the white paper of his pocket-book, when the ſky was clear. At half an hour paſt 6 in the evening, when the ſun was about four degrees high, he obſerved that the ſhadow of his finger was of a dark grey, while he held the paper oppoſite to the ſun; but when he inclined it almoſt horizontally, the paper had a blueiſh caſt, and the ſhadow upon it was of a beautiful bright blue.

When his eye was placed between the ſun and the paper laid horizontally, it always appeared of a blueiſh caſt; but when he held the paper thus inclined between his eye and the ſun, he could diſtinguiſh, upon every little eminence occaſioned by the inequality of the ſurface of the paper, the principal of the priſmatic colours. He alſo perceived them upon his nails, and upon the ſkin of his hand. This multitude of coloured points, red, yellow, green, and blue, almoſt effaced the natural colour of the objects.

At three quarters paſt ſix, the ſhadows began to be blue, even when the rays of the ſun fell perpendicularly. The colour was the moſt lively when the rays fell upon it at an angle of 45 degrees; but with a leſs inclination of the paper, he could diſtinctly perceive, that the blue ſhadow had a border of a ſtronger blue on that ſide which looked towards the ſky, and a red border on that ſide which was turned towards the earth. To ſee theſe borders, the body that made the ſhadow was obliged to be placed very near the paper; and the nearer it was the more ſenſible was the red border. At the diſtance of three inches, the whole ſhadow was blue. At every obſervation, after having held the paper towards the ſky, he turned it towards the earth, which was covered with verdure; holding it in ſuch a manner, that the ſun might ſhine upon it while it received the ſhadows of various bodies; but in this poſition he could never perceive the ſhadow to be blue or green at any inclination with reſpect to the ſun's rays.

At ſeven o'clock, the ſun being ſtill about two degrees high, the ſhadows were of a bright blue, even when the rays fell perpendicularly upon the paper, but were the brighteſt when it was inclined at an angle of 45°. At this time he was ſurpriſed to obſerve, that a large tract of ſky was not favourable to this blue colour, and that the ſhadow falling upon the paper placed horizontally was not coloured, or at leaſt the blue was very faint. This ſingularity, he concluded, aroſe from the ſmall difference between the light of that part of the paper which received the rays of the ſun and that which was in the ſhade in this ſituation. In a ſituation preciſely horizontal, the difference would vaniſh, and there could be no ſhadow. Thus too much or too little of the ſun's light produced, but for different reaſons, the ſame effect; for they both made the blue light reflected from the ſky to become inſenſible. This gentleman never ſaw any green ſhadows, but when he made them fall on yellow paper. But

he does not abſolutely ſay, that green ſhadows cannot be produced in any other manner; and ſuppoſes, that if it was on the ſame wall that M. Buffon ſaw the blue ſhadows, ſeven days after having ſeen the green ones, the cauſe of it might be the mixture of yellow rays, reflected from the vapours, which he obſerves were of that colour.

Theſe blue ſhadows, our author obſerves, are not confined to the times of the ſun-riſing and ſun-ſetting; on the 19th of July, when the ſun has the greateſt force, he obſerved them at three o'clock in the afternoon, but the ſun ſhone through a miſt at that time.

If the ſky is clear, the ſhadows begin to be blue; when, if they be projected horizontally, they are eight times as long as the height of the body that produces them, that is, when the centre of the ſun is 7° 8′ above the horizon. This obſervation, he ſays, was made in the beginning of Auguſt.

Beſides theſe coloured ſhadows, which are produced by the interception of the direct rays of the ſun, our author obſerved others ſimilar to them at every hour of the day, in rooms into which the light of the ſun was reflected from ſome white body, if any part of the clear ſky could be ſeen from the place, and all unneceſſary light was excluded as much as poſſible. Obſerving theſe precautions, he ſays that the blue ſhadows may be ſeen at any hour of the day, even with the direct light of the ſun; and that this colour will diſappear in all thoſe places of the ſhadow from which the blue ſky cannot be ſeen.

All the obſervations that our author made upon the yellow or reddiſh borders of ſhadows above-mentioned, led him to conclude, that they were occaſioned by the interception of the ſky-light, whereby part of the ſhadow was illuminated either by the red rays reflected from the clouds, when the ſun is near the horizon, or from ſome terreſtrial bodies in the neighbourhood. This conjecture is favoured by the neceſſity he was under of placing any body near the paper, in order to produce this bordered ſhadow; as he ſays it is eaſily demonſtrated, that the interception of the ſky-light can only take place when the breadth of the opaque body is to its diſtance from the white ground on which the ſhadow falls, as twice the ſine of half the amplitude of the ſky to its coſine.

At the concluſion of his obſervations on theſe blue ſhadows, he gives a ſhort account of another kind of them, which, he does not doubt, have the ſame origin. Theſe he often ſaw early in the ſpring when he was reading by the light of a candle in the morning, and conſequently the twilight mixed with that of his candle. In theſe circumſtances, the ſhadow that was made by intercepting the light of his candle, at the diſtance of about ſix feet, was of a beautiful and clear blue, which became deeper as the opaque body which made the ſhadow was brought nearer to the wall, and was exceedingly deep at the diſtance of a few inches only. But wherever the day light did not come, the ſhadows were all black without the leaſt mixture of blue.

§ 6. *Of the Irradiations of the Sun's Light appearing through the Interſtices of the Clouds.*

This is an appearance which every one muſt have obſerved when the ſky was pretty much overcaſt with clouds at ſome diſtance from each other. At that time ſeveral large beams of light, ſomething like the appearance of the light of the ſun admitted into a ſmoky room, will be ſeen generally with a very conſiderable degree of divergence, as if the radiant point was ſituated at no great diſtance above the clouds. Dr. Smith obſerves that this appearance is one of thoſe which ſerve to demonſtrate that very high and remote objects in the heavens do not appear to us in their real ſhapes and poſitions, but according to their perſpective projections on the apparent concavity of the ſky. He acquaints us, that though theſe beams are generally ſeen diverging, as repreſented in Pl. 13. fig. 11. it is not always the caſe. He himſelf, in particular, once ſaw them converging towards a point diametrically oppoſite to the ſun: for, as near as he could conjecture, the point to which they converged was ſituated as much below the horizon as the ſun was then elevated above the oppoſite part of it. This part is repreſented by the line *t*D*t* fig. 12. and the point below it in oppoſition to the ſun is E; towards which all the beams *v t*, *v t*, &c. appeared to converge.

"Obſerving (ſays our author) that the point of convergence was oppoſite to the ſun, I began to ſuſpect that this unuſual phenomenon was but a caſe of the uſual apparent divergence of the beams of the ſun from his apparent place among the clouds, as repreſented in fig. 11. I ſay an apparent divergence; for though nothing is more common than for rays to diverge from a luminous body, yet the divergence of theſe beams in ſuch large angles is not real, but apparent. Becauſe it is impoſſible for the direct rays of the ſun to croſs one another at any point of the apparent concavity of the ſky, in a greater angle than about half a degree. For the diameter of the earth being ſo extremely ſmall, in compariſon to the diſtance of the ſun, as to ſubtend an angle at any point of his body of but 20 or 22 ſeconds at moſt; and the diameter of our viſible horizon being extremely ſmaller than that of the earth; it is plain, that all the rays which fall upon the horizon from any given point of the ſun, muſt be inclined to each other in the ſmalleſt angles imaginable: the greateſt of them being as much ſmaller than that angle of 22 ſeconds, as the diameter of the viſible horizon is ſmaller than that of the earth. All the rays that come to us from any given point of the ſun may therefore be conſidered as parallel to each other; as the rays *e*B*g* (Pl. 13. fig. 13.) from the point *e*, or *f*B*b* from the oppoſite point *f*; and conſequently the rays of theſe two pencils that come from oppoſite points of the ſun's real diameter, and croſs each other in the ſun's apparent place B among the clouds, can conſtitute no greater an angle with each other than about half a degree; this angle of their interſection *e*B*f* being the ſame as the ſun would appear under to an eye placed among the clouds at B, or (which is much the ſame) to an eye at O upon the ground. Becauſe the ſun's real diſtance OS is inconceivably greater than his apparent diſtance OB. Therefore the rays of the ſun, as B*g*, B*b*, do really diverge from his apparent place B in no greater angles *g*B*b* than about half a degree. Nevertheleſs they appear to diverge from the place B (fig. 11.) in all poſſible angles, and even in oppoſite directions. Let us proceed then to an explanation of this apparent divergence, which is not ſelf-evident by any means; though at firſt ſight we are apt to think it is, by not diſtinguiſhing the vaſt difference between the true and apparent diſtances of the ſun.

"What I am going to demonſtrate is this. Suppoſing all the rays of the ſun to fall accurately parallel to each other upon the viſible horizon, as they do very nearly, yet in both caſes they muſt appear to diverge in all poſſible angles. Let us imagine the heavens to be partly overcaſt with a ſpacious bed of broken clouds, *v*, *v*, *v*, (fig. 14.) &c. lying parallel to the plane of the viſible horizon, here repreſented by the line AOD; and when the ſun's rays fall upon theſe clouds in the parallel lines *s v*, *s v*, &c. let ſome of them paſs through their intervals in the lines *v t*, *v t*, &c. and fall upon the plane of the horizon at the places *t*, *t*, &c. And ſince the reſt of the incident rays *s v*, *s v*, are ſuppoſed to be intercepted from the place of the ſpectator at O by the cloud *x*, and from the intervals between the tranſmitted rays *v t*, *v t*, &c. by the clouds *v*, *v*, &c. a ſmall part of theſe latter rays *v t*, *v t*, when reflected every way from ſome certain kind of thin vapours floating in the air, may undoubtedly be ſufficient to affect the eye with an appearance of lights and ſhades, in the form of bright beams in the places *v t*, *v t*, &c. and of dark ones in the

intervals between them; juſt as the like beams of light and ſhade appear in a room by reflections of the ſun's rays from a ſmoky or duſty air within it; the lights and ſhades being here occaſioned by the tranſmiſſion of the rays through ſome parts of the window, and by their interruption at other parts.

"Now, if the apparent concavity of this bed of clouds *v, v*, to the eye at O, be repreſented by the arch ABCD, and be cut in the point B by the line OB*x* drawn parallel to the beams *t v*; it will be evident by the rules of perſpective, that theſe long beams will not appear in their real places, but upon the concave ABCD diverging every way from the place B, where the ſun himſelf appears, or the cloud *x* that covers his body, as repreſented ſeparately in full view in fig. 11.

"And for the ſame reaſon, if the line BO be produced towards E, below the plane of the horizon AOD, and the eye be directed towards the region of the ſky directly above E, the lower ends of the ſame real beams *v t, v t*, will now appear upon the part DF of this concave; and will ſeem to converge towards the point E, ſituated juſt as much below the horizon as the oppoſite point B is above it: which is ſeparately repreſented in full view in fig. 12.

"For if the beams *v t, v t*, be ſuppoſed to be viſible throughout their whole lengths, and the eye be directed in a plane perpendicular to them, here repreſented by the line OF; they and their intervals will appear broadeſt in and about this plane, becauſe theſe parts of them are the neareſt to the eye; and therefore their remoter parts and intervals will appear gradually narrower towards the oppoſite ends of the line BE. As a farther illuſtration of this matter, we may conceive the ſpectator at O to be ſituated upon the top of ſo large a deſcent OHI towards a remote valley IK, and the ſun to be ſo very low, that the point E, oppoſite to him, may be ſeen above the horizon of this ſhady valley. In this caſe it is manifeſt, that the ſpectators at O would now ſee theſe beams converging ſo far as to meet each other at the point E in the ſky itſelf.

"I do not remember to have ever ſeen any phenomenon of this kind by moon-light; not ſo much as of beams diverging from her apparent place. Probably her light is too weak after reflections from any kind of vapours, to cauſe a ſenſible appearance of lights and ſhades ſo as to form theſe beams. And in the unuſual phenomenon I well remember, that the converging ſun-beams towards the point below the horizon were not quite ſo bright and ſtrong as thoſe uſually are that diverge from him; and that the ſky beyond them appeared very black (ſeveral ſhowers having paſſed that way), which certainly contributed to the evidence of this appearance. Hence it is probable that the thinneſs and weakneſs of the reflected rays from the vapours oppoſite to the ſun, is the chief cauſe that this appearance is ſo very uncommon in compariſon to that other of diverging beams. For as the region of the ſky round about the ſun is always brighter than the oppoſite one, ſo the light of the diverging beams ought alſo to be brighter than that of the converging ones. For, though rays are reflected from rough unpoliſhed bodies in all poſſible directions, yet it is a general obſervation, that more of them are reflected forwards obliquely, than are reflected more directly backwards. Beſides, in the preſent caſe, the incident rays upon the oppoſite region to the ſun, are more diminiſhed by continual reflections from a longer tract of the atmoſphere, than the incident rays upon the region next the ſun.

"The common phenomenon of diverging beams, I think, is more frequent in ſummer than in winter, and alſo when the ſun is lower than when higher up; probably becauſe the lower vapours are denſer, and therefore more ſtrongly reflective than the higher; becauſe the lower ſky-light is not ſo bright as the upper; becauſe the air is generally quieter in the mornings and evenings than about noon-day; and laſtly, becauſe many ſorts of vapours are exhaled in greater plenty in ſummer than in winter, from many kinds of volatile vegetables; which vapours, when the air is cooled and condenſed in the mornings and evenings, may become denſe enough to reflect a ſenſible light."

§ 7. *Of the Illumination of the Shadow of the Earth by the Refraction of the Atmoſphere.*

THE ancient philoſophers, who knew nothing of the refractive power of the atmoſphere, were very much perplexed to account for the body of the moon being viſible when totally eclipſed. At ſuch times ſhe generally appears of a dull red colour, like tarniſhed copper, or of iron almoſt red-hot. This, they thought, was the moon's native light, by which ſhe became viſible when hid from the brighter light of the ſun. Plutarch indeed, in his diſcourſe upon the face of the moon, attributes this appearance to the light of the fixed ſtars reflected to us by the moon; but this muſt be by far too weak to produce that effect. The true cauſe of it is the ſcattered beams of the ſun bent into the earth's ſhadow by refractions through the atmoſphere in the following manner.

"Let the body of the ſun, ſays Dr. Smith, be repreſented by the greater circle *ab* (Pl. 14. fig. 1), and that of the earth by the leſſer one *c d*; and let the lines *a c e* and *b d e* touch them both on their oppoſite ſides, and meet in *e* beyond the earth; then the angular ſpace *c e d* will repreſent the conic figure of the earth's ſhadow, which would be totally deprived of the ſun's rays, were none of them bent into it by the refractive power of the atmoſphere. Let this power juſt vaniſh at the circle *h i*, concentric to the earth, ſo that the rays *a h* and *b i*, which touch its oppoſite ſides, may proceed unrefracted, and meet each other at *k*. Then the two neareſt rays to theſe that flow within them, from the ſame points *a* and *b*, being refracted inwards through the margin of the atmoſphere, will croſs each other at a point *l*, ſomewhat nearer to the earth than *k*; and in like manner, two oppoſite rays next within the two laſt will croſs each other at a point *m*, ſomewhat nearer to the earth than *l*, having ſuffered greater refractions, by paſſing through longer and denſer tracts of air lying ſomewhat nearer to the earth. The like approach of the ſucceſſive interſections, *k, l, m*, is to be underſtood of innumerable couples of rays, till you come to the interſection *n* of the two innermoſt; which we may ſuppoſe juſt to touch the earth at the points *o* and *p*. It is plain then, that the ſpace bounded by theſe rays *on, np*, will be the only part of the earth's ſhadow wholly deprived of the ſun's rays. Let *f m g* repreſent part of the moon's orbit when it is neareſt to the earth, at a time when the earth's dark ſhadow *o n p* is the longeſt: in this caſe I will ſhow that the ratio of *tm* to *tn* is about 4 to 3; and conſequently that the moon, though centrally eclipſed at *m*, may yet be viſible by means of thoſe ſcattered rays above mentioned, firſt tranſmitted to the moon by refraction through the atmoſphere, and from thence reflected to the earth.

"For let the incident and emergent parts *a q, r n*, of the ray *a q o r n*, that juſt touches the earth a *o*, be produced till they meet at *u*, and let *a q u* produced meet the axis *s t* produced in *x*; and joining *u s* and *u m*, ſince the refractions of an horizontal ray paſſing from *o* to *r*, or from *o* to *q*, would be alike and equal, the external angle *n u x* is double the quantity of the uſual refraction of an horizontal ray; and the angle *a u s* is the apparent meaſure of the ſun's ſemidiameter ſeen from the earth; and the angle *u s t* is that of the earth's ſemidiameter *t u* ſeen from the ſun (called his *horizontal parallax*); and laſtly, the angle *u m t* is that of the earth's ſemidiameter ſeen from the moon (called her *horizontal parallax*); becauſe the elevation of the point *u* above the earth is too ſmall to make a

ſenſible error in the quantity of theſe angles; whoſe meaſures by aſtronomical tables are as follow:

		′	″
Sun's leaſt apparent ſemidiameter	= ang. *a u s* =	15	—50
Sun's horizontal parallax -	= ang. *u s t* =	00	—10
Their difference is -	= ang. *t x u* =	15	—40
Double the horizontal refraction	= ang. *n u x* =	67	—30
Their ſum is - -	= ang. *t n u* =	83	—10
Moon's greateſt horizontal parallax	= ang. *t m u* =	62	—10

Therefore (by a preceding prop.) we have *tm* : *tn* : : (ang. *t n u* : ang. *t m u* : : 83′—10″ : 62′—10″ : :) 4 : 3 in round numbers; which was to be proved. It is eaſy to collect from the moon's greateſt horizontal parallax of 62′—10″, that her leaſt diſtance *t m* is about $55\frac{1}{3}$ ſemidiameters of the earth; and therefore the greateſt length *t n* of the dark ſhadow, being three quarters of *t m*, is about $41\frac{1}{2}$ ſemidiameters.

"The difference of the laſt mentioned angles *t n u*, *t m u*, is *m u n* = 21′, that is, about two thirds of 31′—40″, the angle which the whole diameter of the ſun ſubtends at *u*. Whence it follows, that the middle point *m* of the moon centrally eclipſed, is illuminated by rays which come from two thirds of every diameter of the ſun's diſk, and paſs by one ſide of the earth; and alſo by rays that come from the oppoſite two thirds of every one of the ſaid diameters, and paſs by the other ſide of the earth. This will appear by conceiving the ray *a q o r n* to be inflexible, and its middle point *o* to ſlide upon the earth, while the part *r n* is approaching to touch the point *m*; for then the oppoſite part *q a* will trace over two thirds of the ſun's diameter. The true proportion of the angles *n u m*, *a u s*, could not be preſerved in the ſcheme, by reaſon of the ſun's immenſe diſtance and magnitude with reſpect to the earth.

"Having drawn the line *a t α*, fig. 3. it is obſervable, that all the incident rays, as *a q*, *α κ*, flowing from any one point of the ſun to the circumference of the earth, will be collected to a focus *α*, whoſe diſtance *t α* is leſs than *t m* in the ratio of 62 to 67 nearly; and thus an image of the ſun will be formed at *α β*, whoſe rays will diverge upon the moon. For the angle *t α u* is the difference of the angles *x u α*, *u α t* found above; and *t α* : *tm* : : ang. *tmu* : ang. *t α u* : : 62′—10″ : 67—30″.

"The rays that flow next above *a q* and *aκ*, by paſſing through a thinner part of the atmoſphere, will be united at a point in the axis *a t α* ſomewhat farther from the earth than the laſt focus *α*; and the ſame may be ſaid of the rays that paſs next above theſe, and ſo on; whereby an infinite ſeries of images of the ſun will be formed, whoſe diameters and degrees of brightneſs will increaſe with their diſtances from the earth.

"Hence it is manifeſt why the moon eclipſed in her perigee is obſerved to appear always duller and darker than in her apogee. The reaſon why her colour is always of the copper kind between a dull red and orange, I take to be this. The blue colour of a clear ſky ſhows manifeſtly that the blue-making rays are more copiouſly reflected from pure air than thoſe of any other colour; conſequently they are leſs copiouſly tranſmitted through it among the reſt that come from the ſun, and ſo much the leſs as the tract of air through which they paſs is the longer. Hence the common colour of the ſun and moon is whiteſt in the meridian, and grows gradually more inclined to diluted yellow, orange, and red, as they deſcend lower, that is, as the rays are tranſmitted through a longer tract of air; which tract being ſtill lengthened in paſſing to the moon and back again, cauſes a ſtill greater loſs of the blue-making rays in proportion to the reſt; and ſo the reſulting colour of the tranſmitted rays muſt lie between a dark orange and red, according to Sir Iſaac Newton's rule for finding the reſult of a mixture of colours. We have an inſtance of the reverſe of this caſe in leaf-gold, which appears yellow by reflected and blue by tranſmitted rays. The circular edge of the ſhadow in a partial eclipſe appears red; becauſe the red-making rays are the leaſt refracted of all others, and conſequently are left alone in the conical ſurface of the ſhadow, all the reſt being refracted into it.

§ 8. *Of the Meaſures of Light.*

THAT ſome luminous bodies give a ſtronger, and others a weaker light, and that ſome reflect more light than others, was always obvious to mankind; but no perſon, before M. Bouguer, hit upon a tolerable method of aſcertaining the proportion that two or more lights bear to one another. The methods he moſt commonly uſed were the following.

He took two pieces of wood or paſteboard EC and CD, (Pl. 14. fig. 4.), in which he made two equal holes P and Q, over which he drew pieces of oiled or white paper. Upon theſe holes he contrived that the light of the different bodies he was comparing ſhould fall while he placed a third piece of paſteboard FC, ſo as to prevent the two lights from mixing with one another. Then placing himſelf ſometimes on one ſide and ſometimes on the other, but generally on the oppoſite ſide of this inſtrument, with reſpect to the light, he altered their poſition till the papers in the two holes appeared to be equally enlightened. This being done, he computed the proportion of their light by the ſquares of the diſtances at which the luminous bodies were placed from the obect. If, for inſtance, the diſtances were as three and nine, he concluded that the light they gave were as nine and eighty-one. Where any light was very faint, he ſometimes made uſe of lenſes, in order to condenſe it; and he incloſed them in tubes or not as his particular application of them required.

To meaſure the intenſity of light proceeding from the heavenly bodies, or reflected from any part of the ſky, he contrived an inſtrument which reſembles a kind of portable camera obſcura. He had two tubes, of which the inner was black, faſtened at their lower extremities by a hinge C, (fig. 5.) At the bottom of theſe tubes were two holes, R and S, three or four lines in diameter, covered with two pieces of fine white paper. The two other extremities had each of them a circular aperture, an inch in diameter; and one of the tubes conſiſted of two, one of them ſliding into the other, which produced the ſame effect as varying the aperture at the end. When this inſtrument is uſed, the obſerver has his head, and the end of the inſtrument C, ſo covered, that no light can fall upon his eye, beſides that which comes through the two holes S and R, while an aſſiſtant manages the inſtrument, and draws out or ſhortens the tube DE, as the obſerver directs. When the two holes appear equally illuminated, the intenſity of the lights is judged to be inverſely as the ſquares of the tubes.

In uſing this inſtrument, it is neceſſary that the object ſhould ſubtend an angle larger than the aperture A or D, ſeen from the other end of the tube; for, otherwiſe, the lengthening of the tube has no effect. To avoid, in this caſe, making the inſtrument of an inconvenient length, or making the aperture D too narrow, he has recourſe to another expedient. He conſtructs an inſtrument (repreſented fig. 6) conſiſting of two object-glaſſes, AE and DF, exactly equal, fixed in the ends of two tubes ſix or ſeven feet, or, in ſome caſes, 10 or 12 feet long, and having their foci at the other ends. At the bottom of theſe tubes B, are two holes, three or four lines in diameter, covered with a piece of white paper; and this inſtrument is uſed exactly like the former.

If the two objects to be obſerved by this inſtrument be not equally luminous, the light that iſſues from them muſt be reduced to an equality, by diminiſhing the aperture of one of the object-glaſſes; and then the remaining ſurface of the two

glaſſes will give the proportion of their lights. But for this purpoſe, the central parts of the glaſs muſt be covered in the ſame proportion with the parts near the circumference, leaving the aperture ſuch as is repreſented fig. 7. becauſe the middle part of the glaſs is thicker and leſs tranſparent than the reſt.

If all the objects to be obſerved lie nearly in the ſame direction, our author obſerves, that theſe two long tubes may be reduced into one, the two object-glaſſes being placed cloſe together, and one eye-glaſs ſufficing for them both. The inſtrument will then be the ſame with that of which he publiſhed an account in 1748, and which he called a *heliometer*, or *aſtromeier*.

Our author obſerves, that it is not the abſolute quantity, but only the intenſity of the light, that is meaſured by theſe two inſtruments, or the number of rays, in proportion to the ſurface of the luminous body; and it is of great importance that theſe two things be diſtinguiſhed. The intenſity of light may be very great, when the quantity, and its power of illuminating other bodies, may be very ſmall, on account of the ſmallneſs of its ſurface; or the contrary may be the caſe, when the ſurface is large.

Having explained theſe methods which M. Bouguer took to meaſure the different proportions of light, we ſhall ſubjoin in this place a few miſcellaneous examples of his application of them.

It is obſervable, that when a perſon ſtands in a place where there is a ſtrong light, he cannot diſtinguiſh objects that are placed in the ſhade; nor can he ſee any thing upon going immediately into a place where there is very little light. It is plain, therefore, that the action of a ſtrong light upon the eye, and alſo the impreſſion which it leaves upon it, makes it inſenſible to the effect of a weaker light. M. Bouguer had the curioſity to endeavour to aſcertain the proportion between the intenſities of the two lights in this caſe; and by throwing the light of two equal candles upon a board, he found that the ſhadow made by intercepting the light of one of them, could not be perceived by his eye, upon the place enlightened by the other, at little more than eight times the diſtance; from whence he concluded, that when one light is eight times eight or 64 times leſs than another, its preſence or abſence will not be perceived. He allows, however, that the effect may be different on different eyes; and ſuppoſes that the boundaries in this caſe, with reſpect to different perſons, may lie between 60 and 80.

Applying the two tubes of his inſtrument, mentioned above, to meaſure the intenſity of the light reflected from different parts of the ſky; he found, than when the ſun was 25 degrees high, the light was four times ſtronger at the diſtance of eight or nine degrees from his body, than it was at 31 or 32 degrees. But what ſtruck him the moſt was to find, that when the ſun is 15 or 20 degrees high, the light decreaſes on the ſame parallel to the horizon to 110 or 120 degrees, and then increaſes again to the place exactly oppoſite to the ſun.

The light of the ſun, our author obſerves, is too ſtrong, and that of the ſtars too weak, to determine the variation of their light at different altitudes: but as, in both caſes, it muſt be in the ſame proportion with the diminution of the light of the moon in the ſame circumſtances, he made his obſervations on that luminary, and found, that its light at 19° 16, is to its light at 66° 11′, as 1681 to 2500; that is, the one is nearly two thirds of the other. He choſe thoſe particular altitudes, becauſe they are thoſe of the ſun at the two ſolſtices at Croiſic, where he then reſided. When one limb of the moon touched the horizon of the ſea, its light was 2000 times leſs than at the altitude of 66° 11′. But this proportion he acknowledges muſt be ſubject to many variations, the atmoſphere near the earth varying ſo much in its denſity. From this obſervation he concludes, that at a medium light is diminiſhed in the proportion of about 2500 to 1681, in traverſing 7469 toiſes of denſe air.

Laſtly, our accurate philoſopher applied his inſtrument to the different parts of the ſun's diſk, and found that the centre is conſiderably more luminous than the extremities of it. As near as he could make the obſervation, it was more luminous than a part of the diſk $\frac{1}{4}$ths of the ſemidiameter from it, in the proportion of 35 to 28; which, as he obſerves, is more than in the proportion of the ſines of the angles of obliquity. On the other hand, he obſerves, that both the primary and ſecondary planets are more luminous at their edges than near their centres.

The compariſon of the light of the ſun and moon is a ſubject that has frequently exerciſed the thoughts of philoſophers; but we find nothing but random conjectures, before our author applied his accurate meaſures in this caſe. In general, the light of the moon is imagined to bear a much greater proportion to that of the ſun than it really does; and not only are the imaginations of the vulgar, but thoſe of philoſophers alſo, impoſed upon with reſpect to it. It was a great ſurpriſe to M. de la Hire to find that he could not, by the help of any burning mirror, collect the beams of the moon in a ſufficient quantity to produce the leaſt ſenſible heat. Other philoſophers have ſince made the like attempts with mirrors of greater power, though without any greater ſucceſs; but this will not ſurpriſe us, when we ſee the reſult of M. Bouguer's obſervations on this ſubject.

In order to ſolve this curious problem concerning the compariſon of the light of the ſun and moon, he compared each of them to that of a candle in a dark room, one in the day-time, and the other in the night following, when the moon was at her mean diſtance from the earth; and, after many trials, he concluded that the light of the ſun is about 300,000 times greater than that of the moon; which is ſuch a diſproportion, that, as he obſerves, it can be no wonder that philoſophers have had ſo little ſucceſs in their attempts to collect the light of the moon with burning-glaſſes. For the largeſt of them will not increaſe the light 1000 times; which will ſtill leave the light of the moon, in the focus of the mirror, 300 times leſs than the intenſity of the common light of the ſun.

To this account of the proportion of light which we actually receive from the moon, it cannot be diſpleaſing to the reader, if we compare it with the quantity which would have been tranſmitted to us from that opaque body, if it reflected all the light it receives. Dr. Smith thought that he had proved, from two different conſiderations, that the light of the full moon would be to our day-light as 1 to about 90,90, if no rays were loſt at the moon.

In the firſt place, he ſuppoſes that the moon, enlightened by the ſun, is as luminous as the clouds are at a medium. He therefore ſuppoſed the light of the ſun to be equal to that of a whole hemiſphere of clouds, or as many moons as would cover the ſurface of the heavens. But on this Dr. Prieſtley obſerves, that it is true, the light of the ſun ſhining perpendicularly upon any ſurface would be equal to the light reflected from the whole hemiſphere, if every part reflected all the light that fell upon it; but the light that would in fact be received from the whole hemiſphere (part of it being received obliquely) would be only one-half as much as would be received from the whole hemiſphere, if every part of it ſhone directly upon the ſurface to be illuminated.

In his Remarks, par. 97, Dr. Smith demonſtrates his method of calculation in the following manner.

"Let the little circle *c f d g* (Pl. 14. fig. 8.) repreſent the moon's body half enlightened by the ſun, and the great circle *a e b*, a ſpherical ſhell concentric to the moon, and touching the earth; *a b*, any diameter of that ſhell perpendicular to a great circle of the moon's body, repreſented by its diameter *c d*; *e* the place of the ſhell receiving full moon-light from the bright hemiſphere *f d g*. Now, becauſe the ſurface of the moon is rough

like that of the earth, we may allow that the ſun's rays, incident upon any ſmall part of it, with any obliquity, are reflected from it every way alike, as if they were emitted. And therefore if the ſegment *df* ſhone alone, the points *a*, *e*, would be equally illuminated by it; and likewiſe if the remaining bright ſegment *dg* ſhone alone, the points *be* would be equally illuminated by it. Conſequently, if the light at the point *a* was increaſed by the light at *b*, it would become equal to the full-moon-light at *e*. And conceiving the ſame transfer to be made from every point of the hemiſpherical ſurface *b b i k* to their oppoſite points in the hemiſphere *k a c b*, the former hemiſphere would be left quite dark, and the latter would be uniformly illuminated with full-moon-light; ariſing from a quantity of the ſun's light, which, immediately before its incidence on the moon, would uniformly illuminate a circular plane equal to a great circle of her body, called her *diſk*. Therefore the quantities of light being the ſame upon both ſurfaces, the denſity of the ſun's incident light is to the denſity of full-moon-light, as that hemiſpherical ſurface *b e k* is to the ſaid diſk; that is, as any other hemiſpherical ſurface whoſe centre is at the eye, to that part of it which the moon's diſk appears to poſſeſs very nearly, becauſe it ſubtends but a ſmall angle at the eye: that is, as radius of the hemiſphere to the verſed line of the moon's apparent ſemidiameter, or as 10,000,000 to $1106\frac{2}{3}$ or as 90,400 to 1; taking the moon's mean horizontal diameter to be 16′ 7″.

"Strictly ſpeaking, this rule compares moon-light at the earth with day-light at the moon; the medium of which, at her quadratures, is the ſame as our day-light; but is leſs at her full in the duplicate ratio of 365 to 366, or thereabout, that is, of the ſun's diſtances from the earth and full moon: and therefore full-moon light would be to our day-light as about 1 to 90,900, if no rays were loſt at the moon.

"Secondly, I ſay that full-moon-light is to any other moon-light as the whole diſk of the moon to the part that appears enlightened, conſidered upon a plane ſurface. For now let the earth be at *b*, fig. 9. and let *dl* be perpendicular to *fg*, and *gm* to *cd*: then it is plain, that *gl* is equal to *dm*; and that *gl* is equal to a perpendicular ſection of the ſun's rays incident upon the arch *dg*, which at *b* appears equal to *dm*; the eye being unable to diſtinguiſh the unequal diſtances of its parts. In like manner, conceiving the moon's ſurface to conſiſt of innumerable phyſical circles parallel to *cfdg*, as repreſented at A, the ſame reaſon holds for every one of theſe circles as for *cfdg*. It follows then, that the bright part of the ſurface viſible at *b*, when reduced to a flat as repreſented at B, by the creſcent *p d q m p*, will be equal and ſimilar to a perpendicular ſection of all the rays incident on that part, repreſented at C by the creſcent *p g q l p*. Now the whole diſk being in proportion to this creſcent, as the quantities of light incident upon them; and the light falling upon every rough particle, being equally rarefied in diverging to the eye at *b*, conſidered as equidiſtant from them all; it follows, that full-moon-light is to this moon-light as the whole diſk *p d q c* to the creſcent *p d q m p*.

"Therefore, by compounding this ratio with that in the former remark, day-light is to moon light as the ſurface of an hemiſphere whoſe centre is at the eye, to the part of that ſurface which appears to be poſſeſſed by the enlightened part of the moon."

Mr. Michell made his computation in a much more ſimple and eaſy manner, and in which there is much leſs danger of falling into any miſtake. Conſidering the diſtance of the moon from the ſun, and that the denſity of the light muſt decreaſe in the proportion of the ſquare of that diſtance, he calculated the denſity of the ſun's light at that diſtance, in proportion to its denſity at the ſurface of the ſun; and in this manner he found, that if the moon reflected all the light it receives from the ſun, it would only be the 45,000th part of the light we receive from the greater luminary. Admitting, therefore, that moon-light is only a 300,000th part of the light of the ſun, Mr. Michell concludes, that it reflects no more than between the 6th and 7th part of what falls upon it.

Sect. IV. *Of Aberration.*

The great practical uſe of the ſcience of optics is to aid human ſight; but is has been repeatedly obſerved during the progreſs of this article, that, in conſtructing optical inſtruments for this purpoſe, great difficulties ariſe from the aberration of light. It has been ſhown, page 148, &c. how to determine the concourſe of any refracted ray PF with the ray RVCF′ (figs. 5, 6, &c. Plate 7.) which paſſes through the centre C, and therefore falls perpendicularly on the ſpherical ſurface at the vertex V, and ſuffers no refraction. F′ is the conjugate focus to R for the two rays RF′, RV, and for every other ray flowing from R and falling on the ſurface at an equal diſtance on the oppoſite ſide to P. In ſhort, it is the conjugate focus for all the rays flowing from R and falling on the ſpherical ſurface in the circumference of a circle deſcribed by the revolution of the point P round the axis RVCF; that is, of all the rays which occupy the conical ſurface deſcribed by the revolution of RP, and the refracted rays which occupy the conical ſurface produced by the revolution of PF′.

But no other rays flowing from R are collected at F′. For it appeared in the demonſtration of that propoſition, that the rays incident at a greater diſtance from the axis RC were collected at a point between C and F′; and then the rays which are incident on the whole arch PC, or the ſpherical ſurface generated by its revolution round RC, although they all croſs the axis RC, are diffuſed over a certain portion of it, by what has been called the aberration of figure. It is called alſo (but improperly) the aberration from the geometrical focus, by which is meant the focus of an infinitely ſlender pencil of rays, of which the middle ray (or axis of the pencil) occupies the lens RC, and ſuffers no refraction. But there is no ſuch focus. But if we make mRV$-n$RC : mRV$=$VC : VF, the point F is called the geometrical focus, and is the remoteſt limit from C of all the foci (equally geometrical) of rays flowing from R. The other limit is eaſily determined by conſtructing the problem for the extreme point of the given arch.

It is evident from the conſtruction, that while the point of incidence P is near to V, the line CK increaſes but very little, and therefore CF diminiſhes little, and the refracted rays are but little diffuſed from F; and therefore they are much denſer in its vicinity than any other point of the axis. It will ſoon be evident that they are incomparably denſer. It is on this account that the point F has been called the conjugate focus κατ' εξοχην, to R, and the geometrical focus and the diffuſion has been called *aberration*. A geometrical point R is thus repreſented by a very ſmall circle (or phyſical point as it is improperly called) at F, and F has drawn the chief attention. And as, in the performance of optical inſtruments, it is neceſſary that this extended repreſentation of a mathematical point R be very ſmall, that may not ſenſibly interfere with the repreſentations of the points adjacent to R, and thus cauſe indiſtinct viſion, a limit is thus ſet to the extent of the refracting ſurface which muſt be employed to produce this repreſentation. But this evidently diminiſhes the quantity of light, and renders the viſion *obſcure*, though diſtinct. Artiſts have therefore endeavoured to execute refracting ſurfaces of forms not ſpherical, which collect accurately to one point the light iſſuing from another, and the mathematicians have furniſhed them with forms having this property; but their attempts have been fruitleſs. Spherical ſurfaces are the only ones which can be executed with accuracy. All are done by grinding the refracting ſubſtance in a mould of proper materials. When this

is ſpherical, the two work themſelves, with moderate attention, into an exact ſphere; becauſe if any part is more prominent than another, it is ground away, and the whole gets of neceſſity one curvature. And it is aſtoniſhing to what degree of accuracy this is done. An error of the millioneth part of an inch would totally deſtroy the figure of a mirror of an inch focal diſtance, ſo as to make it uſeleſs for the coarſeſt inſtrument. Therefore all attempts to make other figures are given up. Indeed other reaſons make them worſe than ſpherical, even when accurately executed. They would not collect to accurate focuſes the rays of oblique pencils.

It is evident from theſe obſervations, that the theory of aberrations is abſolutely neceſſary for the ſucceſsful conſtruction of optical inſtruments; and it muſt be acceptable to the reader to have a ſhort account of it in this place. Enough ſhall be ſaid here to ſhow the *general* nature aud effects of it in optical inſtruments, and in ſome of the more curious phenomena of nature; and under the article TELESCOPE the ſubject will be reſumed. What follows will have the advantage of pointing out at the ſame time the maxims of conſtruction of the greateſt part of optical inſtruments, which generally produce their effects by means of pencils of rays which are either out of the axis altogether, or are oblique to it; caſes which are ſeldom conſidered in elementary treatiſes of optics.

Let PVπ (Pl. 15. fig. 1.) be a ſpherical ſurface of a refracting ſubſtance (glaſs for inſtance), of which C is the centre, and let an indefinitely ſlender pencil of rays AP *ap* be incident on it, in a direction parallel to a ray CV paſſing through the centre. It is required to determine the focus *f* of this pencil.

Let AP be refracted into PF. Draw CI, CR the lines of incidence and refraction, and CP the radius. Draw RB perpendicular to CP, and B*f* parallel to AP or CV. I ſay, firſt, *f* is the focus of the indefinitely ſlender pencil, or, more accurately ſpeaking, *f* is the remoteſt limit from P of the concourſe of rays with PF' refracted by points lying without the arch VP, or the neareſt limit for rays incident between V and P.

Draw the radius C*p c'*, the line *pf*; and draw *pg* parallel to P*f*, and P*o* perpendicular to P*f*. It is evident, that if *f* be the focus, *c'pf* is the angle of refraction corresponding to the angle of incidence *ap*C, as C'P*f* is the angle corresponding to APC. Alſo PC*p* is the increment of the angle of incidence, and the angle *c'pg* is equal to the ſum of the angle C'P*f* and C'C*c*, and the angle *gpf* is equal to the angle *pf* P. Therefore *c'pf*=C'P*f*+P,C*p*,+P*fp*. Therefore PC*p*+P*fp* is the correſponding increment of the angle of refraction. Alſo, becauſe RP*o*=CP*p* (being right angles) the angle *p*P*o*=RPC, and P*o* : P*p*=PR : PC.

Therefore, by a preceding Lemma in this article, we have PC*p*+P *fp* : PC*p* = tan. ref.: tan. incid. = T, R : T, I; and P*fp* : PC*p* = T, R—T, I.: T, I,= diff. : T, I; but $Pfp : PCp = \frac{Po}{Pf} : \frac{Pp}{Pc} = \frac{PR}{Pf} : \frac{PC}{PC'}$, = PR : P*f*, = DR : DB (becauſe DP is parallel to B*f* by conſtruction)=tan. CPR—tan. CPI : tan. CPI. Now CPI is the angle of incidence, and therefore CPR is the angle properly corresponding to it as an angle of refraction, and the point *f* is properly determined.

Hence the following rule: As the difference of the tangents of incidence and refraction is to the tangent of incidence, ſo is the radius of the ſurface multiplied by the coſine of refraction to the diſtance of the focus of an infinitely ſlender pencil of parallel incident rays.

N. B. We here conſider the coſine of refraction as a number. This was firſt done by the celebrated Leonhard Euler, and is one of the greateſt improvements in mathematics which this century can boaſt of. The lines, tangents, ſecants, &c. are conſidered as fractional numbers, of which the radius is unity. Thus, CP × ſin. 30°, is the ſame thing with $\frac{1}{2}$CP, or $\frac{CP}{2}$. And in like manner, CB, drawn perpendicular to the axis × ſin. 19° 28′ 16″32‴, is the ſame thing with $\frac{1}{3}$ of CB. Alſo $\frac{CB}{\text{cof. } 60°}$ is the ſame thing with twice CB, &c. In this manner, BE = BC × ſin. BCE, and alſo BE = CE × tan. BCE, and CB = CE × ſec. BCE, &c. &c. This manner of conſidering the lines which occur in geometrical conſtructions is of immenſe uſe in all parts of mixed mathematics; and no where more remarkably than in optics, the moſt beautiful example of them. Of this an important inſtance ſhall now be given.

Corol. 1. The diſtance *f*G of this lateral focus from the axis CV (that is, from the line drawn through the centre parallel to the incident light) is proportional to the cube of the ſemi-aperture PH of the ſpherical ſurface.

For *f*G = BE. Now BE = CB × ſin. BCE, = CB × ſin. CPA; and CB = RC × cof. RCB, = RC × ſin. CPR, and RC = CP × ſin. CPR: Therefore BE = PC × ſin.^{2} CI R × ſin. PCA, = PC × ſin.^{2} refr. × ſin. incid.: but ſin.^{2} refr. = $\frac{m^2}{n^2}$ ſin.^{2} incid. Therefore, finally, BE, or *f*G = PC × $\frac{m^2}{n^2}$ × ſin.^{3} incid.: but PC. ſin. incid. is evidently PH the ſemi-aperture; therefore the propoſition is manifeſt.

Corol. 2. Now let this ſlender pencil of rays be incident at the vertex V. The focus will now be a point F in the axis, determined by making CV : CF = *m*—*n* : *m*. Let the incident pencil gradually recede from the axis CF, ſtill, however, keeping parallel to it. The focus *f* will always be found in a curve line DC'F, ſo conſtituted that the ordinate G will be as the cube of the line PH, perpendicular to the axis intercepted between the axis and that point of the ſurface which is cut by a tangent to the curve in *f*.

All the refracted rays will be tangents to this curve, and the adjacent rays will croſs each other in theſe lateral foci *f*; and will therefore be incomparably more denſe along the curve than any where within its area. This is finely illuſtrated by receiving on white paper the light of the ſun refracted through a globe or cylinder of glaſs filled with water. If the paper is held parallel to the axis of the cylinder, and cloſe to it, the illuminated part will be bounded by two very bright parallel lines, where it is cut by the curve; and theſe lines will gradually approach each other as the paper is withdrawn from the veſſel, till they coaleſce into one very bright line at F, or near it. If the paper be held with its end touching the veſſel, and its plane nearly perpendicular to the axis, the whole progreſs at the curve will be diſtinctly ſeen.

As ſuch globes were uſed for burning glaſſes, the point of greateſt condenſation (which is very near but not exactly in F) was called the *focus*. When theſe curves were obſerved by Mr. Tchirnhauſs, he called them *cauſtics*; and thoſe formed by refraction he called *diacauſtics*, to diſtinguiſh them from the *catacauſtics* formed by reflection.

It is ſomewhat ſurpriſing, that theſe curves have been ſo little ſtudied ſince the time of Tchirnhauſs. The doctrine of aberrations has indeed been conſidered in a manner independent on their properties. But whoever conſiders the progreſs of rays in the eye-piece of optical inſtruments, will ſee that the knowledge of the properties of diacauſtic curves determines directly, and almoſt accurately, the foci and images that are formed there. For, let the object-glaſs of a teleſcope or microſcope be of any dimenſions, the pencils incident on the eye-glaſſes are almoſt all of this evaneſcent bulk. Theſe advantages will be ſhown in their proper places: and we proceed at preſent to extend our knowledge of aberrations in general, firſt conſidering the aberrations of parallel incident rays.

Abiding by the inſtance repreſented by the figure, it is evident that the cauſtic will touch the ſurface in a point φ, ſo ſituated that $c\varphi : \varphi\chi = m : n$. The refracted ray $\varphi\Phi$ will touch the ſurface, and will croſs the axis in Φ, the neareſt limit of diffuſion along the axis. If the ſurface is of ſmaller extent, as PV, the cauſtic begins at *f*, when the extreme refracted ray P*f* touches the cauſtic, and croſſes the axis in F', and the oppoſite branch of the cauſtic in K. If there be drawn an ordinate K O *k* to the cauſtic, it is evident that the whole light incident on the ſurface PVI paſſes through the circle whoſe diameter is K *k*, and that the circle is the ſmalleſt ſpace which receives *all* the refracted light.

It is of great importance to conſider the manner in which the light is diſtributed over the ſurface of this circle of ſmalleſt diffuſion; for this is the repreſentation of one point of the infinitely diſtant radiant object. Each point of a planet, for inſtance, is repreſented by this little circle; and as the circles repreſenting the different adjacent points muſt interfere with each other, an indiſtinctneſs muſt ariſe ſimilar to what is obſerved when we view an object through a pair of ſpectacles which do not fit the eye. The indiſtinctneſs muſt be in proportion to the number of points whoſe circles of diffuſion interfere; that is, to the area of theſe circles, provided that the light is uniformly diffuſed over them: but if it be very rare at the circumference, the impreſſion made by the circles belonging to the adjacent points muſt be leſs ſenſible. Accordingly, Sir Iſaac Newton, ſuppoſing it incomparably rarer at the circumference than towards the centre, affirms, that the indiſtinctneſs of teleſcopes ariſing from the ſpherical figure of the object-glaſs was ſome thouſand times leſs than that ariſing from the unequal refrangibility of light; and therefore, that the attempts to improve them by diminiſhing or removing this aberration were needleſs, while the diſtinctneſs from unequal refrangibility remained. It is ſurpriſing, that a philoſopher ſo eminent for ſagacity and for mathematical knowledge, ſhould have made ſuch a miſtake, and unfortunate that the authority of his great name hindered others from examining the matter, truſting to his aſſertion, that the light was ſo rare at the border of this circle. His miſtake is ſurpriſing, becauſe the very nature of a cauſtic ſhould have ſhowed him, that the light was infinitely denſe at the borders of the circle of ſmalleſt diffuſion. The firſt perſon who detected this overſight of the Britiſh philoſopher was the Abbé Boſcovich, who, in a diſſertation publiſhed at Vienna in 1767, ſhowed, by a very beautiful analyſis, that the diſtribution was extremely different from what Newton had aſſerted, and that the ſuperior indiſtinctneſs ariſing from unequal refrangibility was incomparably leſs than he had ſaid. We ſhall attempt to make this delicate and intereſting matter conceivable by thoſe who have but ſmall mathematical preparation.

Let the curve DVZCI *c z v d* (Pl. 15. fig. 2.) be the cauſtic (magnified), EI its axis, I the focus of central rays, B the focus of extreme rays, and IB the line containing the foci of all the intermediate rays, and CO *c* the diameter of the circle of ſmalleſt diffuſion.

It is plain, that from the centre O there can be drawn two rays OV, O *v*, touching the cauſtic in V, *v*. Therefore the point O will receive the ray EO, which paſſes through the vertex of the refracting ſurface, and all the rays which are incident on the circumference of a circle deſcribed on the refracting ſurface by the extremity of the ray OV, or O *v*. The denſity of the light at O will therefore be indefinitely great.

From the point C there can be drawn two rays; one of them CX touching the cauſtic in C, and the other C, touching it at *d* on the oppoſite ſide. The rays which touch the cauſtic in the immediate vicinity of C *y*, both in the arch CV and the arch CI, will cut OC in points indefinitely near to each other; becauſe their diſtance from each other in the line OC will be to their uniform diſtance on the refracting ſurface as the diſtance between their points of contact with the cauſtic to the diſtance of theſe points from the refracting ſurface. Here therefore at C the denſity of the light will alſo be indefinitely great.

From any point H, lying between O and C, may be drawn three rays. One of them, LHT, P, touching the arch CD of the cauſtic in T, cutting the refracting ſurface in P, and the axis in L: another, *t* H *p*, touching the arch CI of the cauſtic in *t*. The third is H $\tau\pi$, touching the arch *c d* of the oppoſite branch of the cauſtic in τ.

It will greatly aſſiſt our conceptions of this ſubject, if we conſider a ray of light from the refracting ſurface as a thread attached at I of this figure, or at F of fig. 1. Plate 15. and gradually unlapped from the cauſtic DVCI on one ſide, and then lapped on the oppoſite branch I *c v d*; and attend to the point of its interſection with the diameter *c* OC of the circle of ſmalleſt diffuſion.

Therefore, 1. let the ray be firſt ſuppoſed to paſs through the refracting ſurface at F, the right hand extremity of the aperture. The thread is then folded up on the whole right hand branch ICVD of the cauſtic; and if the ſtraight part of it FD be produced, it will cut the diameter of the circle of ſmalleſt diffuſion in the oppoſite extremity *c*. Or ſuppoſe a ruler in place of the thread, applied to the cauſtic at D and to the refracting ſurface at F, the part of it D*c*, which is detached from the cauſtic, cuts CO*c* in the point *c*. 2. Now ſuppoſe the ruler to revolve gradually, its extremity moving acroſs the arch FA*f* of the refracting ſurface while the edge is applied to the cauſtic; the point of contact with the cauſtic will ſhift gradually down the branch DV of the cauſtic, while its edge paſſes acroſs the line *c* C; and when the point of contact arrives at V, the extremity will be at Y on the refracting ſurface, and the interſection of the edge will be at O. 3. Continuing the motion, the point of contact ſhifts from V to Z, the extremity from Y to Q', and the interſection from O to Q, ſo that $OQ^2 = \frac{OC^2}{2}$, as will preſently appear. 4. After this, the point of contact will ſhift from Z to C, the extremity from Q' to X, half way from F to A, as will ſoon be ſhown, and the interſection from Q to C. 5. The point of contact will now ſhift from C down to I, the extremity will paſs from X to A, and the interſection will go back from C to O. 6. The ruler muſt now be applied to the other branch of the cauſtic I *c z v d*, and the point of contact will aſcend from I to *c*, the extremity will paſs from A to *x*, half way to *f* from A, and the interſection from O to *c*. 7. The point of contact will aſcend from C to *z*, the extremity paſſes from *x* to *q'*, and the interſection from C to *q*, Oq^2 being $= \frac{Oc^2}{2}$. 8. While the contact of the ruler and cauſtic ſhifts from *z* to *v*, the extremity ſhifts from *q'* to *y*, and the interſection from *q* to O. 9. The contact riſes from *v* to *d*, the extremity paſſes from *y* to *f*, and the interſection from O to C; and then the motion acroſs the refracting ſurface is completed, the point of contact ſhifting down from D to I, along the branch DVZCI, and then aſcending along the other branch I *c z v d*, while the interſection paſſes from *c* to C, back again from C to *c*, and then back again from *c* to C, where it ends, having thrice paſſed through every intermediate point of *c* C.

We may form a notion of the denſity of the light in any point H, by ſuppoſing the incident light of uniform denſity at the refracting ſurface, and attending to the compoſition of the rays in the circle of ſmalleſt diffuſion. Their vicinity may be eſtimated both in the direction of the radii OH, and in the di-

rection of the circumference described by its extremity H, during its revolution round the axis; and the density must be conceived as proportional to the *number* of originally equidistant rays, which are collected into a spot of given area. These have been collected from a corresponding spot or area of the refracting surface; and as the number of rays is the same in both, the density at H will be to the density of the refracting surface, as the area occupied of the refracting surface to the corresponding area at H. The vicinity of the rays in the direction of the radius depends on the proportion between PT and TH. For the ray adjacent to PTH may be supposed to cross it at the point of contact T; and therefore the uniform distance between them at the surface of that medium is to the distance between the same rays at H as the distance of T from the refracting surface to its distance from H. Therefore the number of rays which occupy a tenth of an inch, for example, of the radius AP, is to the number which would occupy a tenth of an inch at H as TH to TP; and the radial density at P is to the radial density at H also as TH to TP.—In the next place, the circumferential density at P is to that at H as the radius AP to the radius OH. For supposing the figure to turn round its axis AI, the point P of the refracting surface will describe a circumference whose radius is AP, and H will describe a circumference whose radius is OH; and the whole rays which pass through the first circumference pass also through the last; and therefore their circumferential densities will be in the inverse proportion of the spaces into which they are collected. Now the radius AP is to the radius OH as AL to OL; and circumferences have the same proportion with their radii. Therefore the circumferential density at P is to that in H as AL to OL inversely; and it was found that the radial density was as AN to ON inversely, being as TH to TP, which are very nearly in this ratio. Therefore the absolute density (or number of rays collected in a given space) at P will be to that at H, in the ratio compounded of these ratios; that is, in the ratio of $ON \times OL$ to $AN \times AL$. But as NL bears but a very small ratio to AN or AL, $AN \times AL$ may be taken as equal to AO^2 without any sensible error. It never differs from it in telescopes 100th part, and is generally incomparably smaller. Therefore the density at H may be considered as proportional to $ON \times OL$ inversely. And it will afterwards appear that NS is $= 3oL$. Therefore the density at H is inversely as $ON \times NS$.

Now describe a circle on the diameter OS, and draw $NT\phi$ cutting the circumference $N\phi^2 = ON \times NS$, and the density at H is as $N\phi^2$ inversely. This gives us a very easy estimation of the density, *viz.* draw a line from the point of contact of the ray which touches the part VC of the caustic, and the density is in the inverse subduplicate ratio of the part of this line intercepted between the axis and the circumference $S\phi O$. It will afterwards appear that the density corresponding to this ray is one half of the density corresponding to all the three; or a better expression will be had for the density at H by drawing $R\beta$ perpendicular to $R\phi$, and βo perpendicular to $\phi\beta$, making ϕR in o; then ϕo is as $\frac{1}{\phi N^2}$, or is proportional to the density, as is evident.

When H is at O, N is at S, and ϕo is infinite. As H moves from O, N descends, and ϕo diminishes, till H comes to Q, and T to $\varkappa$, and ϕ to ζ, and o to R. When H moves from Q towards C, T descends below $\varkappa$, ϕo again increases, till it is again infinite, when H is at C, T at C, and N at O.

Thus it appears, without any minute consideration, that the light has a density indefinitely great in the centre O; that the density decreases to a minimum in some intermediate point Q, and then increases again to infinity at the margin C. Hence it follows, that the indistinctness arising from the spherical figure of the refracting surfaces is incomparably greater than Newton supposed; and that the valuable discovery of Mr. Dollond of achromatic lenses, must have failed of answering his fond expectations, if his very method of producing them had not, at the same time, enabled him to remove that other indistinctness by employing contrary aberrations. And now, since the discoveries by Dr. Blair of substances which disperse the different colours in the same proportions, but very different degrees, have enabled us to employ much larger portions of the sphere than Mr. Dollond could introduce into his object-glasses, it becomes absolutely necessary to study this matter completely, in order to discover and ascertain the amount of the errors which perhaps unavoidably remain.

This slight sketch of the most simple case of aberration, namely, when the incident rays are parallel, will serve to give a general notion of the subject; and the reader can now see how contrary aberrations may be employed in order to form an ultimate image which shall be as distinct as possible. For let it be proposed to converge parallel rays accurately to the focus F (Pl. 15. fig. 3.) by the refraction of spherical surfaces of which V is the vertex. Let PV be a convex lens of such a form that rays flowing from F and passing through it immediately round the vertex V are collected to the conjugate focus R, while the extreme ray FP, incident on the margin of the lens P, is converged to r, nearer to V, having the longitudinal aberration Rr.

Let pV be a plano-concave lens, of such sphericity that a ray Ap, parallel to the axis CV, and incident on the point p, as far from its vertex V as P in the other lens is from its vertex, is dispersed from r, the distance pV being equal to rV, while the central rays are dispersed from P, as far from V as R is from V. It is evident, that if these lenses be joined as in fig. 4. a ray A$'p$, parallel to the common axis CV, will be collected at the distance VF equal to VF in the fig. 4. and that rays passing through both lenses in the neighbourhood of the axis will be collected at the same point F.

This compound lens is said to be without spherical aberration; and it is true that the central and the extreme rays are collected in the same point F: but the rays which fall on the lens between the centre and margin are a little diffused from F, and it is not possible to collect them all to one point. For in the rules for computing the aberration, quantities are neglected which do not preserve (in different apertures) the same ratio to the quantities retained. The diffusion is least when the aberration is corrected, not for the very extremity, but for a certain intermediate point (varying with the aperture, and having no known ratio to it); and when this is done, the compound lens is in its state of greatest perfection, and the remaining aberration is quite insensible.

This subject will be resumed under the article TELESCOPE, and prosecuted as far as the construction of optical instruments requires.

SECT. IV. *Of Optical Instruments.*

OF the mechanism of optical instruments particular accounts are given in this work under their respective denominations. These it would be improper to repeat; but as it belongs to the science of optics to explain, by the laws of refraction and reflection, the several phenomena which those instruments exhibit, we must in this place enumerate the instruments themselves, omitting entirely, or stating very briefly, such facts as are stated at large in other places. In this enumeration we shall begin with the *multiplying-glass*, not because it is first in importance, but that it may not intervene between instruments more useful, and which have a mutual relation to one another.

§ 1. *The Multiplying-glass.*

THE multiplying-glass is made by grinding down the round side *bik* (Pl. 16. fig. 1.) of a plano-convex glass AB, into several flat surfaces, as *bb*, *bld*, *dk*. An object C will not appear mag-

nified when ſeen through this glaſs by the eye at H; but it will appear multiplied into as many different objects as the glaſs contains plane ſurfaces. For, ſince rays will flow from the object C to all parts of the glaſs, and each plane ſurface will refract theſe rays to the eye, the ſame object will appear to the eye in the direction of the rays which enter it through each ſurface. Thus, a ray *g i* H, falling perpendicularly on the middle ſurface, will go through the glaſs to the eye without ſuffering any refraction; and will therefore ſhew the object in its true place at C: whilſt a ray *a b* flowing from the ſame object, and falling obliquely on the plane ſurface *b b*, will be refracted in the direction *b e*, by paſſing through the glaſs; and, upon leaving it, will go on to the eye in the direction *e* H; which will cauſe the ſame object C to appear alſo at E, in the direction of the ray H *e*, produced in the right line H *e n*. And the ray *c d*, flowing from the object C, and falling obliquely on the plane ſurface *d k*, will be refracted (by paſſing through the glaſs, and leaving it at *f*) to the eye at H; which will cauſe the ſame object to appear at D, in the direction H *f m*.—If the glaſs be turned round the line *g l* H, as an axis, the object C will keep its place, becauſe the ſurface *b l d* is not removed; but all the other objects will ſeem to go round C, becauſe the oblique planes on which the rays *a b c d* fall, will go round by the turning of the glaſs.

§ 2. *Mirrors.*

It has been elſewhere obſerved, that of mirrors there are three principally uſed in optical experiments (See Catoptrics, Sect. I.); the plane mirror, the ſpherical convex mirror, and the ſpherical concave mirror. Of theſe the plane mirror firſt claims our attention, as it is more common, and undoubtedly more ancient, than the other two. It has been ſaid (*ubi ſupra*), that the image reflected by this mirror appears as far behind the ſurface as the object is before it; that the image will appear of the ſame ſize, and in the ſame poſition with the object; that every ſuch mirror will reflect an image of twice its own length and breadth; and that in certain circumſtances it will reflect ſeveral images of the ſame object. For theſe phenomena it is our buſineſs in this place to account by the laws of reflection.

Let AB (Pl. 16. fig. 2.) be an object placed before the reflecting ſurface *g h i* of the plane mirror CD; and let the eye be at *o*. Let A*h* be a ray of light flowing from the top A of the object, and falling upon the mirror at *h*, and *h m* be a perpendicular to the ſurface of the mirror at *h*; the ray A*h* will be reflected from the mirror to the eye at *o*, making an angle *m h o* equal to the angle A *h m*: then will the top of the image E appear to the eye in the direction of the reflected ray *o h* produced to E, where the right line A *p* E, from the top of the object, cuts the right line *o h* E, at E. Let B*i* be a ray of light proceeding from the foot of the object at B to the mirror at *i*; and *n i* a perpendicular to the mirror from the point *i*, where the ray B*i* falls upon it: this ray will be reflected in the line *i o*, making an angle *n i o* equal the angle B *i n*, with that perpendicular, and entering the eye at *o*; then will the foot F of the image appear in the direction of the reflected ray *o i*, produced to F, where the right line BF cuts the reflected ray produced to F. All the other rays that flow from the intermediate points of the object AB, and fall upon the mirror between *b* and *i*, will be reflected to the eye at *o*; and all the intermediate points of the image EF will appear to the eye in the direction of theſe reflected rays produced. But all the rays that flow from the object, and fall upon the mirror above *b*, will be reflected back above the eye at *o*; and all the rays that flow from the object, and fall upon the mirror below *i*, will be reflected back below the eye at *o*; ſo that none of the rays that fall above *b*, or below *i*, can be reflected to the eye at *o*; and the diſtance between *b* and *i* is equal to half the length of the object AB.

Hence it appears, that if a man ſees his whole image in a plane looking-glaſs, the part of the glaſs that reflects his image muſt be juſt half as long and half as broad as himſelf, let him ſtand at any diſtance from it whatever; and that his image muſt appear juſt as far behind the glaſs as he is before it. Thus, the man AB (fig. 3.) viewing himſelf in the plane mirror CD, which is juſt half as long as himſelf, ſees his whole image as at EF, behind the glaſs, exactly equal to his own ſize. For a ray AC proceeding from his eye at A, and falling perpendicularly upon the ſurface of the glaſs at C, is reflected back to his eye, in the ſame line CA; and the eye of his image will appear at E, in the ſame line produced to E, beyond the glaſs. And a ray BD, flowing from his foot, and falling obliquely on the glaſs at D, will be reflected as obliquely on the other ſide of the perpendicular *a b* D, in the direction DA; and the foot of his image will appear at F, in the direction of the reflected ray AD, produced to F, where it is cut by the right line BGF, drawn parallel to the right line ACE. Juſt the ſame as if the glaſs were taken away, and a real man ſtood at F, equal in ſize to the man ſtanding at B: for to his eye at A, the eye of the other man at E would be ſeen in the direction of the line ACE; and the foot of the man at F would be ſeen by the eye A, in the direction of the line ADF.

If the glaſs be brought nearer the man AB, as ſuppoſe to *c l*, he will ſee his image as at CDG: for the reflected ray CA (being perpendicular to the glaſs) will ſhow the eye of the image as at C; and the incident ray B*b*, being reflected in the line *b* A, will ſhow the foot of his image as at G; the angle of reflection *a b* A being always equal to the angle of incidence B *b a*: and ſo of all the intermediate rays from A to B. Hence, if the man AB advances towards the glaſs CD, his image will approach towards it; and if he recedes from the glaſs, his image will alſo recede from it.

If the object be placed before a common looking-glaſs, and viewed obliquely, three, four, or more images of it will appear behind the glaſs.

To explain this, let ABCD (Pl. 11. fig. 11.) repreſent the glaſs; and let EF be the axis of a pencil of rays flowing from E, a point in an object ſituated there. The rays of this pencil will in part be reflected at F, ſuppoſe into the line FG. What remains will (after refraction at F, which we do not conſider here) paſs on to H; from whence (on account of the quickſilver which is ſpread over the ſecond ſurface of glaſſes of this kind to prevent any of the rays from being tranſmitted there) they will be ſtrongly reflected to K, where part of them will emerge and enter an eye at L. By this means one repreſentation of the ſaid point will be formed in the line LK produced, ſuppoſe in M; Again, another pencil, whoſe axis is EN, firſt reflected at N, then at O, and afterwards at P, will form a ſecond repreſentation of the ſame point at Q: and thirdly, another pencil, whoſe axis is ER, after reflection at the ſeveral points R, S, H, T, V, ſucceſſively, will exhibit a third repreſentation of the ſame point at X; and ſo on *in infinitum*. The ſame being true of each point in the object, the whole will be repreſented in the like manner; but the repreſentations will be faint, in proportion to the number of reflections the rays ſuffer, and the length of their progreſs within the glaſs. We may add to theſe another repreſentation of the ſame object in the line LO produced, made by ſuch of the rays as fall upon O, and are from thence reflected to the eye at L.

This experiment may be tried by placing a candle before the glaſs, as at E, and viewing it obliquely, as from L.

2. *Of Concave and Convex Mirrors.* The effects of theſe in magnifying and diminiſhing objects have been already in general explained; but for the better underſtanding the nature of

reflecting teleſcopes, it will ſtill be proper to ſubjoin the following particular deſcription of the effects of concave ones.

When parallel rays (Pl. 16. fig. 4.), as *d f a*, C *m b*, *e l c*, fall upon a concave mirror AB (which is not tranſparent, but has only the ſurface A*b*B of a clear poliſh), they will be reflected back from that mirror, and meet in a point *m*, at half the diſtance of the ſurface of the mirror from C the centre of its concavity; for they will be reflected at as great an angle from a perpendicular to the ſurface of the mirror, as they fell upon it with regard to that perpendicular, but on the other ſide thereof. Thus, let C be the centre of concavity of the mirror A *b* B; and let the parallel rays *d f a*, C *m b*, and *e l c*, fall upon it at the points *a*, *b*, and *c*. Draw the lines C *i a*, C *m b*, and C *h c*, from the centre C to theſe points; and all theſe lines will be perpendicular to the ſurface of the mirror, becauſe they proceed thereto like ſo many radii or ſpokes from its centre. Make the angle C *a h* equal to the angle *d a* C, and draw the line *a m h*, which will be the direction of the ray *d f a*, after it is reflected from the point *a* of the mirror: ſo that the angle of incidence *d a* C is equal to the angle of reflection C *a h*; the rays making equal angles with the perpendicular C *i a* on its oppoſite ſides.

Draw alſo the perpendicular C *h c* to the point *c*, where the ray *e l c* touches the mirror; and having made the angle C *c i* equal to the angle C *c e*, draw the line *c m i*, which will be the courſe of the ray *e l c*, after it is reflected from the mirror.

The ray C *m b* paſſing through the centre of concavity of the mirror, and falling upon it at *b*, is perpendicular to it, and is therefore reflected back from it in the ſame line *b m* C.

All theſe reflected rays meet in the point *m*; and in that point the image of the body which emits the parallel rays *d a*, C *b*, and *e c*, will be formed; which point is diſtant from the mirror equal to half the radius *b m* C of its concavity.

The rays which proceed from any celeſtial object may be eſteemed parallel at the earth; and therefore the image of that object will be formed at *m*, when the reflecting ſurface of the concave mirror is turned directly towards the object. Hence, the focus *m* of parallel rays is not in the centre of the mirror's concavity, but half way between the mirror and that centre.

The rays which proceed from any remote terreſtrial object are nearly parallel at the mirror: not ſtrictly ſo, but come diverging to it, in ſeparate pencils, or as it were bundles of rays, from each point of the ſide of the object next the mirror; and therefore they will not be converged to a point at the diſtance of half the radius of the mirror's concavity from its reflecting ſurface, but into ſeparate points at a little greater diſtance from the mirror. And the nearer the object is to the mirror, the farther theſe points will be from it; and an inverted image of the object will be formed in them, which will ſeem to hang pendant in the air; and will be ſeen by an eye placed beyond it (with regard to the mirror) in all reſpects like the object, and as diſtinct as the object itſelf.

Let A *c* B (fig. 5.) be the reflecting ſurface of a mirror, whoſe centre of concavity is at C; and let the upright object DE be placed beyond the centre C, and ſend out a conical pencil of diverging rays from its upper extremity D, to every point of the concave ſurface of the mirror A *c* B. But to avoid confuſion, we only draw three rays of that pencil, as DA, D*c*, DB.

From the centre of concavity C, draw the three right lines CA, C*c*, CB, touching the mirror in the ſame points where the foreſaid rays touch it; and all theſe lines will be perpendicular to the ſurface of the mirror. Make the angle CA*d* equal to the angle DAC, and draw the right line A *d* for the courſe of the reflected ray DA: make the angle C *c d* equal to the angle D*c*C, and draw the right line *c d* for the courſe of the reflected ray D *d*: make alſo the angle C B *d* equal to the angle DBC, and draw the right line B *d* for the courſe of the reflected ray DB. All theſe reflected rays will meet in the point *d*, where they will form the extremity *d* of the inverted image *e d*, ſimilar to the extremity D of the upright object DE.

If the pencil of rays E*f*, E*g*, E*h*, be alſo continued to the mirror, and their angles of reflection from it be made equal to their angles of incidence upon it, as in the former pencil from D, they will all meet at the point *e* by reflection, and form the extremity *e* of the image *e d*, ſimilar to the extremity E of the object DE.

And as each intermediate point of the object, between D and E, ſends out a pencil of rays in like manner to every part of the mirror, the rays of each pencil will be reflected back from it, and meet in all the intermediate points between the extremities *e* and *d* of the image; and ſo the whole image will be formed, not at *i*, half the diſtance of the mirror from its centre of concavity C, but at a greater diſtance, between *i* and the object DE; and the image will be inverted with reſpect to the object.

This being well underſtood, the reader will eaſily ſee how the image is formed by the large concave mirror of the reflecting teleſcope, when he comes to the deſcription of that inſtrument.

When the object is more remote from the mirror than its centre of concavity C, the image will be leſs than the object, and between the object and mirror: when the object is nearer than the centre of concavity, the image will be more remote and bigger than the object. Thus, if ED be the object, *d e* will be its image: for, as the object recedes from the mirror, the image approaches nearer to it; and as the object approaches nearer to the mirror, the image recedes farther from it; on account of the leſſer or greater divergency of the pencils of rays which proceed from the object: for the leſs they diverge, the ſooner they are converged to points by reflection; and the more they diverge, the farther they muſt be reflected before they meet.

If the radius of the mirror's concavity, and the diſtance of the object from it, be known, the diſtance of the image from the mirror is found by this rule: Divide the product of the diſtance and radius by double the diſtance made leſs by the radius, and the quotient is the diſtance required.

If the object be in the centre of the mirror's concavity, the image and object will be coincident, and equal in bulk.

If a man places himſelf directly before a large concave mirror, but farther from it than its centre of concavity, he will ſee an inverted image of himſelf in the air, between him and the mirror, of a leſs ſize than himſelf. And if he holds out his hand towards the mirror, the hand of the image will come out towards his hand, and coincide with it, of an equal bulk, when his hand is in the centre of concavity; and he will imagine he may ſhake hands with his image. If he reaches his hand farther, the hand of the image will paſs by his hand, and come between his hand and his body: and if he moves his hand towards either ſide, the hand of the image will move towards the other; ſo that whatever way the object moves, the image will move the contrary.

All the while a byſtander will ſee nothing of the image, becauſe none of the reflected rays that form it enter his eyes.

§ 3 *Microſcopes.*

Under the word MICROSCOPE a copious detail has been given of the conſtruction of thoſe inſtruments as they are now made by the moſt eminent artiſts. In that article it fell not within our plan to treat ſcientifically of their magnifying powers: theſe can be explained only by the laws of refraction and reflection, which we ſhall therefore apply to a few micro-

ſcopes, leaving our readers to make the application themſelves to ſuch others as they may chooſe to analyſe by optical principles.

The firſt and ſimpleſt of all microſcopes is nothing more than a very ſmall globule of glaſs, or a convex lens whoſe focal diſtance is extremely ſhort. The magnifying power of this microſcope is thus aſcertained by Dr. Smith. "A minute object *pq* (Pl. 16. figs. 6. 7.) ſeen diſtinctly through a ſmall glaſs AE by the eye put cloſe to it, appears ſo much greater than it would to the naked eye, placed at the leaſt diſtance *q*L from whence it appears ſufficiently diſtinct, as this latter diſtance *q*L is greater than the former *q*E. For having put your eye cloſe to the glaſs EA, in order to ſee as much of the object as poſſible at one view, remove the object *pq* to and fro till it appear moſt diſtinctly, ſuppoſe at the diſtance E*q*. Then conceiving the glaſs AE to be removed, and a thin plate, with a pin-hole in it, to be put in its place, the object will appear diſtinct, and as large as before, when ſeen through the glaſs, only not ſo bright. And in this latter caſe it appears ſo much greater than it does to the naked eye at the diſtance *q*L, either with the pin-hole or without it, as the angle *p*E*q* is greater than the angle *p*L*q*, or as the latter diſtance *q*L is greater than the former *q*E. Since the interpoſition of the glaſs has no other effect than to render the appearance diſtinct, by helping the eye to increaſe the refraction of the rays in each pencil, it is plain that the greater apparent magnitude is entirely owing to a nearer view than could be taken by the naked eye. As the human eye is ſo conſtructed, as, for reaſons already aſſigned, to have diſtinct viſion only when the rays which fall upon it are parallel or nearly ſo; it follows, that if the eye be ſo perfect as to ſee diſtinctly by pencils of parallel rays falling upon it, the diſtance E*q*, of the object from the glaſs is then the focal diſtance of the glaſs. Now, if the glaſs be a ſmall round globule, of about $\frac{1}{15}$th of an inch diameter, its focal diſtance E*q*, being three quarters of its diameter, is $\frac{1}{20}$th of an inch; and if *q*L be eight inches, the diſtance at which we uſually view minute objects, this globule will magnify in the proportion of 8 to $\frac{1}{20}$, or of 160 to 1.

2. *The Double or Compound Microſcope* (fig. 8) conſiſts of an object-glaſs *c d*, and an eye-glaſs *e f*. The ſmall object *a b* is placed at a little greater diſtance from the glaſs *c d* than its principal focus; ſo that the pencils of rays flowing from the different points of the object, and paſſing through the glaſs, may be made to converge, and unite in as many points between *g* and *h*, where the image of the object will be formed: which image is viewed by the eye through the eye-glaſs *e f*. For the eye-glaſs being ſo placed, that the image *g h* may be in its focus, and the eye much about the ſame diſtance on the other ſide, the rays of each pencil will be parallel after going out of the eye-glaſs, as at *e* and *f*, till they come to the eye at *k*, where they will begin to converge by the refractive power of the humours; and after having croſſed each other in the pupil, and paſſed through the cryſtalline and vitreous humours, they will be collected into points on the retina, and form the large inverted image A B thereon.

By this combination of lenſes, the aberration of the light from the figure of the glaſs, which in a globule of the kind above-mentioned is very conſiderable, is in ſome meaſure corrected. This appeared ſo ſenſibly to be the caſe, even to former opticians, that they very ſoon began to make the addition of another lens. The inſtrument, however, receives a conſiderable improvement by the addition of a third lens. For, ſays Mr. Martin, it is not only evident from the theory of this aberration, that the image of any point is rendered leſs confuſed by refraction through two lenſes than by an equal refraction through one; but it alſo follows, from the ſame principle, that the ſame point has its image ſtill leſs confuſed when formed by rays refracted through three lenſes than by an equal refraction through two; and therefore a third lens added to the other two will contribute to make the image more diſtinct, and conſequently the inſtrument more complete. At the ſame time the field of view is amplified, and the uſe of the microſcope rendered more agreeable, by the addition of the other lens. Thus alſo we may allow a ſomewhat larger aperture to the object-lens, and thereby increaſe the brightneſs of objects, and greatly heighten the pleaſure of viewing them. For the ſame reaſon Mr. Martin has propoſed a four-glaſs microſcope, which anſwers the purpoſes of magnifying and of diſtinct viſion ſtill more perfectly.

The magnifying power of double microſcopes is eaſily underſtood, thus: The glaſs L. fig. 9. next the object PQ is very ſmall, and very much convex, and conſequently its focal diſtance LF is very ſhort; the diſtance LQ of the ſmall object PQ is but a little greater than LF: Greater it muſt be, that the rays flowing from the object may converge after paſſing through the glaſs, and, croſſing one another, form an image of the object; and it muſt be but a little greater, that the image *p q* may be at a great diſtance from the glaſs, and conſequently may be much larger than the object itſelf. This picture *p q* being viewed through a convex glaſs AE, whoſe focal diſtance is *q*E, appears diſtinct as in a teleſcope. Now the object appears magnified upon two accounts; firſt, becauſe, if we viewed its picture *p q* with the naked eye, it would appear as much greater than the object, at the ſame diſtance, as it really is greater than the object, or as much as L*q* is greater than LQ: and, ſecondly, becauſe this picture appears magnified through the eye-glaſs as much as the leaſt diſtance at which it can be ſeen diſtinctly with the naked eye, is greater than *q* E, the focal diſtance of the eye-glaſs. For example, if this latter ratio be five to one, and the former ratio of L *q* to LQ be 20 to 1; then, upon both accounts, the object will appear 5 times 20, or 100 times greater than to the naked eye.

Fig. 10. repreſents the ſection of a compound microſcope with three lenſes. By the middle one GK the pencils of rays coming from the object-glaſs are refracted ſo as to tend to a focus at O; but being intercepted by the proper eye glaſs DF, they are brought together at I, which is nearer to that lens than its proper focus at L; ſo that the angle DIF, under which the object now appears, is larger than DLF, under which it would have appeared without this additional glaſs; and conſequently the object is more magnified in the ſame proportion. Dr. Hooke tells us, that, in moſt of his obſervations, he made uſe of a double microſcope with this broad middle-glaſs when he wanted to ſee much of an object at one view, and taking it out when he would examine the ſmall parts of an object more accurately; for the fewer refractions there are, the more bright and clear the object appears.

Having in the hiſtorical part of this article given a practical account of the conſtruction of Dr. Smith's double reflecting microſcope, it may not be improper in this place to aſcertain its magnifying power. This we ſhall do from the author himſelf, becauſe his ſymbols, being general, are applicable to ſuch microſcopes of all dimenſions; and though the mere practical reader may perhaps be at firſt ſight puzzled by them, yet, if he will ſubſtitute any particular numbers for *m* and *n*, &c. he may aſcertain with eaſe the magnifying power of ſuch a microſcope of thoſe particular dimenſions.

Between the centre E, fig. 11, and principal focus T of a concave ſpeculum ABC, whoſe axis is EQTC, place an object PQ; and let the rays flowing from it be reflected from the ſpeculum AB towards an image *p q*; but before they unite in it, let them be received by a convex ſpeculum *a b c*, and thence be reflected, through a hole BC in the vertex of the concave, to a ſecond image *ϖu*, to be viewed through an eye-glaſs *l*.

The object may be ſituated between the ſpecula C, *c*; or,

which is better, between the principal focus t and vertex c of the convex one, a ſmall hole being made in its vertex for the incident rays to paſs through.

In both caſes we have TQ, TE, Tq, continual proportionals in ſome given ratio, ſuppoſe of 1 to n; and alſo tq, tc, $t\varkappa$, continual proportionals in ſome other given ratio, ſuppoſe of 1 to m. Then if d be the uſual diſtance at which we view minute objects diſtinctly with the naked eye, and $\varkappa l$ the focal diſtance of the leaſt eye-glaſs, through which the object appears ſufficiently bright and diſtinct, it will be magnified in the ratio of mnd to $\varkappa l$.

For the object PQ, and its firſt image pq, are terminated on one ſide by the common axis of the ſpecula, and on the other by a line PEp, drawn through the centre E of the concave ABC. Likewiſe the images pq and $\varpi\varkappa$ are terminated by the common axis and by the line epw, drawn through the centre e of the convex abc (Eucl. v. 12.). Hence, by the ſimilar triangles $\varpi\varkappa e$, pqe, and alſo pqE, PQE, we have $\varpi\varkappa : pq :: \varkappa e : qe :: m : 1$, and $pq : PQ :: qE : QE :: n : 1$; and conſequently $\varpi\varkappa : PQ :: mn : 1$, whence $\varpi\varkappa = mn \times PQ$. Now if $l\varkappa$ be the focal diſtance of the eye-glaſs l, the points P, Q, of the object, are ſeen through it by the rays of two pencils emerging parallel to the lines ϖl, $\varkappa l$ reſpectively; that is, PQ appears under an angle equal to $\varpi l\varkappa$, which is as $\frac{\varpi\varkappa}{\varkappa l} = \frac{mn\text{PQ}}{\varkappa l}$; and to the naked eye at the diſtance d from PQ, it appears under an angle PoQ which is as $\frac{\text{PQ}}{d}$, and therefore is magnified in the ratio of theſe angles, that is, of mnd to $\varkappa l$.

Corol. Having the numbers m, n, d, to find an eye-glaſs which ſhall cauſe the microſcope to magnify M times in diameter, take $\varkappa l = \frac{mnd}{\text{M}}$. For the apparent magnitude is to the true as $\text{M} : 1 :: mnd : \varkappa l$.

We ſhall conclude this part of our ſubject with the following eaſy method of aſcertaining the magnifying power of ſuch microſcopes as are moſt in uſe.

The apparent magnitude of any object, as muſt appear from what hath been already delivered, is meaſured by the angle under which it is ſeen; and this angle is greater or ſmaller according as the object is near to or far from the eye; and of conſequence the leſs the diſtance at which it can be viewed, the larger it will appear. The naked eye is unable to diſtinguiſh any object brought exceedingly near it: but looking through a convex lens, however near the focus of that lens be, there an object may be diſtinctly ſeen; and the ſmaller the lens is, the nearer will be its focus, and in the ſame proportion the greater will be its magnifying power. From theſe principles it is eaſy to find the reaſon why the firſt or greateſt magnifiers are ſo extremely minute; and alſo to calculate the magnifying power of any convex lens employed in a ſingle microſcope: For as the proportion of the natural ſight is to the focus, ſuch will be its power of magnifying. If the focus of a convex lens, for inſtance, be at one inch, and the natural ſight at eight inches, which is the common ſtandard, an object may be ſeen through that lens at one inch diſtance from the eye, and will appear in its diameter eight times larger than it does to the naked eye: but as the object is magnified every way, in length as well as in breadth, we muſt ſquare this diameter to know how much it really is enlarged; and we then find that its ſuperficies is magnified 64-times.

Again, ſuppoſe a convex lens whoſe focus is only one-tenth of an inch diſtant from its centre; as in eight inches, the common diſtance of diſtinct viſion with the naked eye, there are 80 ſuch tenths, an object may be ſeen through this glaſs 80 times nearer than with the naked eye. It will, of conſequence, appear 80 times longer, and as much broader, than it does to common ſight; and therefore is 6400 times magnified. If a convex glaſs be ſo-ſmall that its focus is only $\frac{1}{20}$ of an inch diſtant, we find that eight inches contains 160 of theſe twentieth-parts; and of conſequence the length and breadth of any object ſeen through ſuch a lens will be magnified 160 times, and the whole ſurface 25,600 times. As it is an eaſy matter to melt a drop or globule of a much ſmaller diameter than a lens can be ground, and as the focus of a globule is no farther off than a quarter of its own diameter, it muſt of conſequence magnify to a prodigious degree. But this exceſſive magnifying power is much more than counterbalanced by its admitting ſo little light, want of diſtinctneſs, and ſhowing ſuch a minute part of the object to be examined; for which reaſon, theſe globules, through greatly in vogue ſome time ago, are now almoſt entirely rejected. Mr. Leeuwenhoek, as has been already obſerved, made uſe only of ſingle microſcopes conſiſting of convex lenſes, and left to the Royal Society a legacy of 26 of thoſe glaſſes. According to Mr. Folkes's deſcription of theſe, they were all exceedingly clear, and ſhowed the object very bright and diſtinct; "which (ſays Mr. Folkes) muſt be owing to the great care this gentleman took in the choice of his glaſs, his exactneſs in giving it the true figure, and afterwards, among many, reſerving only ſuch for his uſe as upon trial he found to be moſt excellent. Their powers of magnifying are different, as different objects may require: and as on the one hand, being all ground glaſſes, none of them are ſo ſmall, or conſequently magnify to ſo great a degree, as ſome of thoſe drops frequently uſed in other microſcopes; yet, on the other hand, the diſtinctneſs of theſe very much exceeds what I have met with in glaſſes of that ſort. And this was what Mr. Leeuwenhoek ever propoſed to himſelf; rejecting all thoſe degrees of magnifying in which he could not ſo well obtain that end. For he informs us in one of his letters, that though he had above 40 years by him glaſſes of an extraordinary ſmallneſs, he had made but very little uſe of them; as having found, in a long courſe of experience, that the moſt conſiderable diſcoveries were to be made with ſuch glaſſes as, magnifying but moderately, exhibited the object with the greateſt brightneſs and diſtinction."

In a ſingle microſcope, if you want to learn the magnifying power of any glaſs, no more is neceſſary than to bring it to its true focus, the exact place whereof will be known by an object's appearing perfectly diſtinct and ſharp when placed there. Then, with a pair of ſmall compaſſes, meaſure, as nearly as you can, the diſtance from the centre of the glaſs to the object you was viewing, and afterwards applying the compaſſes to any ruler with a diagonal ſcale of the parts of an inch marked on it, you will eaſily find how many parts of an inch the ſaid diſtance is. When that is known, compute how many times thoſe parts of an inch are contained in eight inches, the common ſtandard of ſight, and that will give you the number of times the diameter is magnified: ſquaring the diameter will give the ſuperficies; and, if you would learn the ſolid contents, it will be ſhown by multiplying the ſuperficies by the diameter.

The ſuperficies of one ſide of an object only can be ſeen at one view; and to compute how much that is magnified, is moſt commonly ſufficient: but ſometimes it is ſatisfactory to know how many minute objects are contained in a larger; as ſuppoſe we deſire to know how many animalcules are contained in the bulk of a grain of ſand: and to anſwer this, the cube, as well as the ſurface, muſt be taken into the account. For the greater ſatisfaction of thoſe who are not much verſed in theſe matters we ſhall here ſubjoin the following

TABLE of the MAGNIFYING POWERS of CONVEX GLASSES, employed in *Single Microſcopes*, according to the diſtance of their focus; calculated by the ſcale of an inch divided into 100 parts. Showing how many times the DIAMETER, the SUPERFICIES, and the CUBE of an OBJECT, is magnified, when viewed through ſuch glaſſes, to an eye whoſe natural ſight is at eight inches, or 800 of the 100th-parts of an inch.

The focus of a glaſs at	hundredth-parts of an inch.	Magnifies the Diameter.	Magnifies the Superficies.	Magnifies the Cube of an Object.	Times.
$\frac{1}{2}$, or 50	16	256	4,096		
$\frac{4}{10}$, or 40	20	400	8,000		
$\frac{3}{10}$ or 30	26	676	17,576		
$\frac{1}{5}$,or 20	40	1,600	64,000		
15	53	2,809	148,877		
14	57	3,249	185,193		
13	61	3,721	226,981		
12	66	4,356	287,496		
11	72	5,184	373,248		
$\frac{1}{10}$, or 10	80	6,400	512,000		
9	83	7,744	681,472		
8	100	10,000	1,000,000		
7	114	12,996	1,481,544		
6	133	17,689	2,352,637		
$\frac{1}{20}$, or 5	160	25,600	4,096,000		
4	200	40,000	8,000,000		
3	266	70,756	18,821,096		
$\frac{1}{50}$, or 2	400	160,000	64,000,000		
1	800	640,000	512,000,000		

The greateſt magnifier in Mr. Leeuwenhoek's cabinet of microſcopes preſented to the Royal Society, has its focus, as nearly as can well be meaſured, at one-twentieth of an inch diſtance from its centre; and conſequently magnifies the diameter of an object 160 times, and the ſuperficies 25,600. But the greateſt magnifier in Mr. Wilſon's ſingle microſcopes, as they are now made, has uſually its focus at no farther diſtance than about the 50th part of an inch; whereby it has a power of enlarging the diameter of an object 400, and its ſuperficies 160,000 times.

The magnifying power of the ſolar microſcope muſt be calculated in a different manner; for here the difference between the focus of the magnifier and the diſtance of the ſcreen or ſheet whereon the image of the object is caſt, is the proportion of its being magnified. Suppoſe, for inſtance, the lens made uſe of has its focus at half an inch, and the ſcreen is placed at the diſtance of five feet, the object will then appear magnified in the proportion of five feet to half an inch: and as in five feet there are 120 half inches, the diameter will be magnified 120 times, and the ſuperficies 14,400 times; and, by putting the ſcreen at farther diſtances, you may magnify the object almoſt as much as you pleaſe; but Mr. Baker adviſes to regard diſtinctneſs more than bigneſs, and to place the ſcreen juſt at that diſtance where the object is ſeen moſt diſtinct and clear.

With regard to the double reflecting microſcope, Mr. Baker obſerves, that the power of the object-lens is indeed greatly increaſed by the addition of two eye-glaſſes; but as no object-lens can be uſed with them of ſo minute a diameter, or which magnifies of itſelf near ſo much as thoſe that can be uſed alone, the glaſſes of this microſcope, upon the whole, magnify little or nothing more than thoſe of Mr. Wilſon's ſingle one; the chief advantage ariſing from a combination of lenſes being the ſight of a larger field or portion of an object magnified in the ſame degree.

§ 4. *Teleſcopes.*

I. The REFRACTING TELESCOPE.

After what has been ſaid concerning the ſtructure of the compound microſcope, and the manner in which the rays paſs through it to the eye, the nature of the common aſtronomical teleſcope will eaſily be underſtood: for it differs from the microſcope only in that the object is placed at ſo great a diſtance from it, that the rays of the ſame pencil flowing from thence, may be conſidered as falling parallel to one another upon the object-glaſs; and therefore the image made by that glaſs is looked upon as coincident with its focus or parallel rays.

1. This will appear very plain from the 12th figure, in which AB (pl. 16.) is the object emitting the ſeveral pencils of rays A *c d*, B *c d*, &c. but ſuppoſed to be at ſo great a diſtance from the object-glaſs *c d*, that the rays of the ſame pencil may be conſidered as parallel to each other; they are therefore ſuppoſed to be collected into their reſpective foci at the points *m* and *p*, ſituated at the focal diſtance of the object glaſs *c d*. Here they form an image E, and croſſing each other proceed diverging to the eye glaſs *h g*; which being placed at its own focal diſtance from the points *m* and *p*, the rays of each pencil, after paſſing through that glaſs, will become parallel among themſelves; but the pencils themſelves will converge conſiderably with reſpect to one another, even ſo as to croſs at *e*, very little farther from the glaſs *g h* than its focus; becauſe, when they entered the glaſs, their axes were almoſt parallel, as coming through the object-glaſs at the point *k*, to whoſe diſtance the breadth of the eye-glaſs in a long teleſcope bears very ſmall proportion. So that the place of the eye will be nearly at the focal diſtance of the eye-glaſs, and the rays of each reſpective pencil being parallel among themſelves, and their axes croſſing each other in a larger angle than they would do if the object were to be ſeen by the naked eye, viſion will be diſtinct, and the object will appear magnified.

The power of magnifying in this teleſcope is as the focal length of the object-glaſs to the focal length of the eye-glaſs.

DEM. In order to prove this, we may conſider the angle A*k*B as that under which the object would be ſeen by the naked eye; for in conſidering the diſtance of the object, the length of the teleſcope may be omitted, as bearing no proportion to it. Now the angle under which the object is ſeen by means of the teleſcope is *g e h*, which is to the other A*k*B, or its equal *gkh*, as the diſtance from the centre of the object-glaſs to that of the eye-glaſs. The angle, therefore, under which an object appears to an eye aſſiſted by a teleſcope of this kind, is to that under which it would be ſeen without it, as the focal length of the object-glaſs to the focal length of the eye-glaſs.

It is evident from the figure, that the viſible area, or ſpace which can be ſeen at one view when we look through this teleſcope, depends on the breadth of the eye-glaſs, and not of the object-glaſs; for if the eye-glaſs be too ſmall to receive the rays *g m*, *p h*, the extremities of the object could not have been ſeen at all: a larger breadth of the object-glaſs conduces only to the rendering each point of the image more luminous by receiving a larger pencil of rays from each point of the object.

It is in this teleſcope as in the compound microſcope, where we ſee, when we look through it, not the object itſelf, but only an image of it at CED: now that image being inverted with reſpect to the object, as it is, becauſe the axes of the pencils that flow from the object croſs each other at *k*, objects ſeen through a teleſcope of this kind neceſſarily appear inverted.

This is a circumſtance not at all regarded by aſtronomers: but for viewing objects upon the earth, it is convenient that the teleſcope ſhould repreſent them in their natural poſture; to which uſe the teleſcope with three eye-glaſſes as repreſented pl. 6. fig. 13. is peculiarly adapted, and the progreſs of the rays through it from the object to the eye is as follows:

AB is the object ſending out the ſeveral pencils *Acd*. *Bcd*, &c. which paſſing through the object-glaſs *c d*, are collected into their reſpective foci in CD, where they form an inverted image. From hence they proceed to the firſt eye glaſs *e f*, whoſe focus being at *l*, the rays of each pencil are rendered parallel among themſelves, and their axes, which were nearly parallel before,

are made to converge and croſs each other: the ſecond eye-glaſs *g h*, being ſo placed that its focus ſhall fall upon *m*, renders the axes of the pencils which diverge from thence parallel, and cauſes the rays of each, which were parallel among themſelves, to meet again at its focus EF on the other ſide, where they form a ſecond image, inverted with reſpect to the former, but erect with reſpect to the object. Now this image being ſeen by the eye at *a b* through the eye-glaſs *i k*, affords a direct repreſentation of the object, and under the ſame angle that the firſt image CD would have appeared, had the eye been placed at *l*, ſuppoſing the eye-glaſſes to be of equal convexity; and therefore the object is ſeen equally magnified in this as in the former teleſcope, that is, as the focal diſtance of the object-glaſs to that of any one of the eye-glaſſes, and appears erect.

If a teleſcope exceeds 20 feet, it is of no uſe in viewing objects upon the ſurface of the earth; for if it magnifies above 90 or 100 times, as thoſe of that length uſually do, the vapours which continually float near the earth in great plenty, will be ſo magnified as to render viſion obſcure.

2. *The Gallilean Teleſcope* with the concave eye-glaſs is conſtructed as follows:

AB (Pl. 17. fig. 1.) is an object ſending forth the pencils of rays *g h i*, *k l m*, &c. which, after paſſing through the object-glaſs, *c d*, tend towards *eF f* (where we will ſuppoſe the focus of it to be), in order to form an inverted image there as before; but in their way to it, are made to paſs through the concave glaſs *n o*, ſo placed that its focus may fall upon E, and conſequently the rays of the ſeveral pencils which were converging towards thoſe reſpective focal points *e*, E, *f*, will be rendered parallel among themſelves: but the axes of thoſe pencils croſſing each other at F, and diverging from thence, will be rendered more diverging, as repreſented in the figure. Now theſe rays entering the pupil of an eye, will form a large and diſtinct image *a b* upon the retina, which will be inverted with reſpect to the object, becauſe the axis of the pencils croſs in F. The object of courſe will be ſeen erect, and the angle under which it will appear will be equal to that which the lines *a*F, *b*F, produced back through the eye-glaſs, form at F.

It is evident, that the leſs the pupil of the eye is, the leſs is the viſible area ſeen through a teleſcope of this kind; for a leſs pupil would exclude ſuch pencils as proceed from the extremities of the object AB, as is evident from the figure. This is an inconvenience that renders this teleſcope unfit for many uſes; and is only to be remedied by the teleſcope with the convex eye-glaſſes, where the rays which form the extreme parts of the image are brought together in order to enter the pupil of the eye, as explained above.

It is apparent alſo, that the nearer the eye is placed to the eye-glaſs of this teleſcope, the larger is the area ſeen through it; for, being placed cloſe to the glaſs, as in the figure, it admits rays that come from A and B, the extremities of the object, which it could not if it was placed farther off.

The degree of magnifying in this teleſcope is in the ſame proportion with that in the other, *viz.* as the focal diſtance of the object-glaſs is to the focal diſtance of the eye-glaſs.

For there is no other difference but this, *viz.* that as the extreme pencils in that teleſcope were made to converge and form the angle *g e b* (Pl. 16. fig. 12.), or *i n k* (fig. 13.), theſe are now made to diverge and form the angle *a* F *b* (Pl. 17. fig. 1.); which angles, if the concave glaſs in one has an equal refractive power with the convex one in the other, will be equal, and therefore each kind will exhibit the object magnified in the ſame degree.

There is a defect in all theſe kinds of teleſcopes, not to be remedied in a ſingle lens by any means whatever, which was thought only to ariſe from hence, *viz.* that ſpherical glaſſes do not collect rays to one and the ſame point. But it was happily diſcovered by Sir Iſaac Newton, that the imperfection of this ſort of teleſcope, ſo far as it ariſes from the ſpherical form of the glaſſes, bears almoſt no proportion to that which is owing to the different refrangibility of light. This diverſity in the refraction of rays is about a 28th part of the whole; ſo that the object-glaſs of a teleſcope cannot collect the rays which flow from any one point in the object into a leſs room than the circular ſpace whoſe diameter is about the 56th part of the breadth of the glaſs.

To ſhow this, let AB (Pl. 17. fig. 2.) repreſent a convex lens, and let CDF be a pencil of rays flowing from the point D; let H be the point at which the leaſt refrangible rays are collected to a focus; and I, that where the moſt refrangible concur. Then, if IH be the 28th part of EH, IK will be a proportionable part of EC (the triangles HIK and HEC being ſimilar): conſequently LK will be the 28th part of FC. But MN will be the leaſt ſpace into which the rays will be collected, as appears by their progreſs repreſented in the figure. Now MN is but about half of KL; and therefore it is abont the 56th part of CF: ſo that the diameter of the ſpace into which the rays are collected will be about the 56th part of the breadth of that part of the glaſs through which the rays paſs; which was to be ſhown.

Since therefore each point of the object will be repreſented in ſo large a ſpace, and the centres of thoſe ſpaces will be contiguous, becauſe the points in the object the rays flow from are ſo; it is evident, that the image of an object made by ſuch a glaſs muſt be a moſt confuſed repreſentation, though it does not appear ſo when viewed through an eye-glaſs that magnifies in a moderate degree; conſequently the degree of magnifying in the eye-glaſs muſt not be too great with reſpect to that of the object-glaſs, leſt the confuſion become ſenſible.

Notwithſtanding this imperfection, a dioptrical teleſcope may be made to magnify in any given degree, provided it be of ſufficient length; for the greater the focal diſtance of the object-glaſs is, the leſs may be the proportion which the focal diſtance of the eye-glaſs may bear to that of the object-glaſs, without rendering the image obſcure. Thus, an object-glaſs, whoſe focal diſtance is about four feet, will admit of an eye-glaſs whoſe focal diſtance ſhall be little more than an inch, and conſequently will magnify almoſt 48 times; but an object-glaſs of 40 feet focus will admit of an eye-glaſs of only four inches focus, and will therefore magnify 120 times; and an object-glaſs of 100 feet focus will admit of an eye-glaſs of little more than ſix inches focus, and will therefore magnify almoſt 200 times.

The reaſon of this diſproportion in their ſeveral degrees of magnifying is to be explained in the following manner: Since the diameter of the ſpaces, into which rays flowing from the ſeveral points of an object are collected, are as the breadth of the object-glaſs, it is evident that the degree of confuſedneſs in the image is as the breadth of that glaſs; for the degree of confuſedneſs will only be as the diameters or breadths of thoſe ſpaces, and not as the ſpaces themſelves. Now the focal length of the eye-glaſs, that is, its power of magnifying, muſt be as that degree; for, if it exceeds it, it will render the confuſedneſs ſenſible; and therefore it muſt be as the breadth or diameter of the object-glaſs. The diameter of the object-glaſs, which is as the ſquare root of its aperture or magnitude, muſt be as the ſquare-root of the power of magnifying in the teleſcope; for unleſs the aperture itſelf be as the power of magnifying, the image will want light: the ſquare root of the power of magnifying will be as the ſquare root of the focal diſtance of the object glaſs; and therefore the focal diſtance of the eye-glaſs muſt be only as the ſquare root of that of the object-glaſs. So that in making uſe of an object-glaſs of a longer focus, ſuppoſe, than one that is given, you are not obliged to apply an eye-glaſs of a proportionably longer focus than what would ſuit the given object-glaſs, but ſuch an one only whoſe

focal diſtance ſhall be to the focal diſtance of that which will ſuit the given object-glaſs, as the ſquare root of the focal length of the object-glaſs you make uſe of, is to the ſquare root of the focal length of the given one. And this is the reaſon that longer teleſcopes are capable of magnifying in a greater degree than ſhorter ones, without rendering the object confuſed or coloured.

3. But the inconveniency of very long teleſcopes is ſo great, that different attempts have been made to remove it. Of theſe, the moſt ſucceſsful have been by Dollond and Blair; and the general principles upon which theſe eminent opticians proceeded have been mentioned in the hiſtorical part of this article, and in the preceding ſection. The public will ſoon be favoured with a fuller account of Dr. Blair's diſcovery from his own pen; and of Dollond's, it may be ſufficient to obſerve, in addition to what has been already ſaid, that the object-glaſſes of his teleſcopes are compoſed of three diſtinct lenſes, two convex and one concave; of which the concave one is placed in the middle, as is repreſented in fig. 3, where *a* and *c* ſhow the two convex lenſes, and *bb* the concave one, which is by the Britiſh artiſts placed in the middle. The two convex ones are made of London crown glaſs, and the middle one of white flint glaſs; and they are all ground to ſpheres of different radii, according to the refractive powers of the different kinds of glaſs and the intended focal diſtance of the object-glaſs of the teleſcope. According to Boſcovich, the focal diſtance of the parallel rays for the concave lens is one-half, and for the convex glaſs one-third of the combined focus. When put together, they refract the rays in the following manner. Let *a b*, *a b* (fig. 4.), be two red rays of the ſun's light falling parallel on the firſt convex lens *c*. Suppoſing there was no other lens preſent but that one, they would then be converged into the lines *b e*, *b e*, and at laſt meet in the focus *q*. Let the lines *g b*, *g b*, repreſent two violet rays falling on the ſurface of the lens. Theſe are alſo refracted, and will meet in a focus; but as they have a greater degree of refrangibility than the red rays, they muſt of conſequence converge more by the ſame power of refraction in the glaſs, and meet ſooner in a focus, ſuppoſe at *r*.—Let now the concave lens *d d* be placed in ſuch a manner as to intercept all the rays before they come to their focus. Were this lens made of the ſame materials, and ground to the ſame radius with the convex one, it would have the ſame power to cauſe the rays diverge that the former had to make them converge. In this caſe, the red rays would become parallel, and move on in the line *o o*, *o o*: But the concave lens, being made of flint glaſs, and upon a ſhorter radius, has a greater refractive power, and therefore they diverge a little after they come out of it; and if no third lens was interpoſed, they would proceed diverging in the lines *o p t*, *o p t*; but, by the interpoſition of the third lens *v v*, they are again made to converge, and meet in a focus ſomewhat more diſtant than the former, as at *x*. By the concave lens the violet rays are alſo refracted, and made to diverge: but having a greater degree of refrangibility, the ſame power of refraction makes them diverge ſomewhat more than the red ones; and thus, if no third lens was interpoſed, they would proceed in ſuch lines as *l m n*, *l m n*. Now as the differently coloured rays fall upon the third lens with different degrees of divergence, it is plain, that the ſame power of refraction in that lens will operate upon them in ſuch a manner as to bring them all together to a focus very nearly at the ſame point. The red rays, it is true, require the greateſt power of refraction to bring them to a focus; but they fall upon the lens with the leaſt degree of divergence. The violet rays, though they require the leaſt power of refraction, yet have the greateſt degree of divergence; and thus all meet together at the point *x*, or very nearly ſo.

But though we have hitherto ſuppoſed the refraction of the concave lens to be greater than that of the convex ones, it is eaſy to ſee how the errors occaſioned by the firſt lens may be corrected by it, though it ſhould have even a leſs power of refraction than the convex one. Thus, let *a b*, *a b* (Pl. 17. fig. 5), be two rays of red light falling upon the convex lens *c*, and refracted into the focus *q*; let alſo *g b*, *g b*, be two violet rays converged into a focus at *r*; it is not neceſſary, in order to their convergence into a common focus at *x*, that the concave lens ſhould make them *diverge*: it is ſufficient if the glaſs has a power of diſperſing the violet rays ſomewhat more than the red ones: and many kinds of glaſs have this power of diſperſing ſome kinds of rays, without a very great power of refraction. It is better, however, to have the object-glaſs compoſed of three lenſes; becauſe there is then another correction of the aberration by means of the third lens; and it might be impoſſible to find two lenſes, the errors of which would exactly correct each other. It is alſo eaſy to ſee, that the effect may be the ſame whether the concave glaſs is a portion of the ſame ſphere with the others or not; the effect depending upon a combination of certain circumſtances, of which there is an infinite variety.

By means of this correction of the errors ariſing from the different refrangibility of the rays of light, it is poſſible to ſhorten dioptric teleſcopes conſiderably, and yet leave them equal magnifying powers. The reaſon of this is, that the errors ariſing from the object-glaſs being removed, thoſe which are occaſioned by the eye-glaſs are inconſiderable: for the error is always in proportion to the length of the focus in any glaſs; and in very long teleſcopes it becomes exceedingly great, being no leſs than $\frac{1}{20}$th of the whole; but in glaſſes of a few inches focus it becomes trifling. Refracting teleſcopes, which go by the name of *Dollond's*, are therefore now conſtructed in the following manner. Let AB (fig. 6.) repreſent an object-glaſs compoſed of three lenſes as above deſcribed, and converging the rays 1, 2, 3, 4, &c. to a very diſtant focus as at *x*. By means of the interpoſed lens CD, however, they are converged to one much nearer, as at *y*, where an image of the object is formed. The rays diverging from thence fall upon another lens EF, where the pencils are rendered parallel, and an eye placed near that lens would ſee the object magnified and very diſtinct. To enlarge the magnifying power ſtill more, however, the pencils thus become parallel are made to fall upon another at GH; by which they are again made to converge to a diſtant focus: but, being intercepted by the lens IK, they are made to meet at the nearer one *z*; whence diverging to LM, they are again rendered parallel, and the eye at N ſees the object very diſtinctly.

From an inſpection of the figure it is evident, that Dollond's teleſcope thus conſtructed is in fact two teleſcopes combined together; the firſt ending with the lens EF, and the ſecond with LM. In the firſt we do not perceive the object itſelf, but the image of it formed at *y*; and in the ſecond we perceive only the image of that image formed at *z*. Nevertheleſs ſuch teleſcopes are exceedingly diſtinct, and repreſent objects ſo clearly as to be preferred, in viewing terreſtrial things, even to reflectors themſelves. The latter indeed have greatly the advantage in their powers of magnifying, but they are much deficient in point of light. Much more light is loſt by reflection than by refraction: and as in theſe teleſcopes the light muſt unavoidably ſuffer two reflections, a great deal of it is loſt; nor is this loſs counterbalanced by the greater aperture which theſe teleſcopes will bear, which enables them to receive a greater quantity of light than the refracting ones. The metals of reflecting teleſcopes alſo are very much ſubject to tarniſh, and require much more dexterity to clean them than the glaſſes of refractors; which makes them more troubleſome and expenſive, though for making diſcoveries in the celeſtial regions, they are undoubtedly the only proper inſtruments which have been hitherto conſtructed. If Dr. Blair indeed ſhall be ſo fortunate as diſcover

a vitreous ſubſtance of the ſame powers with the fluid in the compound object-glaſs of his teleſcope (and from his abilities and perſeverance we have every thing to hope), a refracting teleſcope may be conſtructed ſuperior for every purpoſe to the beſt reflector.

II. The Reflecting Telescope.

The inconveniences ariſing from the great length of refracting teleſcopes, before Dollond's diſcovery, are ſufficiently obvious; and theſe, together with the difficulties occaſioned by the different refrangibility of light, induced Sir Iſaac Newton to turn his attention to the ſubject of reflection, and endeavour to realize the ideas of himſelf and others concerning the poſſibility of conſtructing teleſcopes upon that principle.—The inſtrument which he contrived is repreſented, fig. 7. where ABCD is a large tube, open at AD and cloſed at BC, and of a length at leaſt equal to the diſtance of the focus from the metallic ſpherical concave ſpeculum GH placed at the end BC. The rays EG, FH, &c. proceeding from a remote object PR, interſect one another ſomewhere before they enter the tube, ſo that EG, *e g*, are thoſe that come from the lower part of the object, and *f h*, FH from its upper part: theſe rays, after falling on the ſpeculum GH, will be reflected, ſo as to converge and meet in *m n*, where they will form a perfect image of the object.—But as this image cannot be ſeen by the ſpectator, they are intercepted by a ſmall plane metallic ſpeculum KK, interſecting the axis at an angle of 45°, by which the rays tending to *mn* will be reflected towards a hole LL in the ſide of the tube, and the image of the object will thus be formed in *q* S; which image will be leſs diſtinct, becauſe ſome of the rays which would otherwiſe fall on the concave ſpeculum GH, are intercepted by the plane ſpeculum: nevertheleſs it will appear in a conſiderable degree diſtinct, becauſe the aperture AD of the tube, and the ſpeculum GH are large. In the lateral hole LL is fixed a convex lens, whoſe focus is at S *q*; and therefore this lens will refract the rays that proceed from any point of the image, ſo as at their exit they will be parallel, and thoſe that proceed from the extreme points S *q* will converge after refraction, and form an angle at O, where the eye is placed; which will ſee the image S *q*, as if it were an object, through the lens LL; conſequently the object will appear enlarged, inverted, bright, and diſtinct. In LL lenſes of different convexities may be placed, which by being moved nearer to the image or farther from it, would repreſent the object more or leſs magnified, provided that the ſurface of the ſpeculum GH be of a perfectly ſpherical figure. If, in the room of one lens LL, three lenſes be diſpoſed in the ſame manner with the three eye-glaſſes of the refracting teleſcope, the object will appear erect, but leſs diſtinct than when it is obſerved with one lens. On account of the poſition of the eye in this teleſcope, it is extremely difficult to direct the inſtrument towards any object. Huygens, therefore, firſt thought of adding to it a ſmall refracting teleſcope, the axis of which is parallel to that of the reflector. This is called a *finder*, or *director*. The Newtonian teleſcope is alſo furniſhed with a ſuitable apparatus for the commodious uſe of it.

In order to determine the magnifying power of this teleſcope, it is to be conſidered that the plane ſpeculum KK is of no uſe in this reſpect. Let us then ſuppoſe, that one ray proceeding from the object coincides with the axis GLIA (Pl. 17. fig. 8.) of the lens and ſpeculum; let *b b* be another ray proceeding from the lower extreme of the object, and paſſing through the focus I of the ſpeculum KH: this will be reflected in the direction *b i d*, parallel to the axis GLA, and falling on the lens *d* L *d*, will be refracted to G; ſo that GL will be equal to LI, and *d* G = *d* I. To the naked eye the object would appear under the angle I *b i* = *b* I A; but by means of the teleſcope it appears under the angle *d* G L = *d* I L = I *d i*: and the angle I *d i* is to the angle I *b i* :: *b* I : I *d*; conſequently the apparent magnitude by the teleſcope is to that by the naked eye as the diſtance of the focus of the ſpeculum from the ſpeculum, to the diſtance of the focus of the lens from the lens.

The Newtonian teleſcope was ſtill inconvenient. Notwithſtanding the contrivance of Huygens, objects were by it found with difficulty. The teleſcope of Gregory, therefore, ſoon obtained the preference, to which for moſt purpoſes it is juſtly intitled, as the reader will perceive from the following conſtruction.

Let TYYT (fig. 9.) be a braſs tube, in which L *l d* D is a metallic concave ſpeculum, perforated in the middle at X; and EF a leſs concave mirror, ſo fixed by the arm or ſtrong wire RT, which is moveable by means of a long ſcrew on the outſide of the tube, as to be moved nearer to or farther from the larger ſpeculum L *l d* D, its axis being kept in the ſame line with that of the great one. Let AB repreſent a very remote object, from each part of which iſſue pencils of rays e. g. *c d*, C D, from A the upper extreme of the object, and I L, *il*, from the lower part B; the rays IL, CD from the extremes croſſing one another before they enter the tube. Theſe rays, falling upon the larger mirror LD, are reflected from it into the focus KH, where they form an inverted image of the object AB, as in the Newtonian teleſcope. From this image the rays, iſſuing as from an object, fall upon the ſmall mirror EF, the centre of which is at *e*; ſo that after reflection they would meet in their foci at QQ, and there form an erect image. But ſince an eye at that place could ſee but a ſmall part of an object, in order to bring rays from more diſtant parts of it into the pupil, they are intercepted by the plano-convex lens MN, by which means a ſmaller erect image is formed at PV, which is viewed through the meniſcus SS by an eye at O. This meniſcus both makes the rays of each pencil parallel, and magnifies the image PV. At the place of this image all the foreign rays are intercepted by the perforated partition ZZ. For the ſame reaſon the hole near the eye O is very narrow. When nearer objects are viewed by this teleſcope, the ſmall ſpeculum EF is removed to a greater diſtance from the larger LD, ſo that the ſecond image may be always formed in PV; and this diſtance is to be adjuſted (by means of the ſcrew on the outſide of the great tube) according to the form of the eye of the ſpectator. It is alſo neceſſary, that the axis of the teleſcope ſhould paſs through the middle of the ſpeculum EF, and its centre, the centre of the ſpeculum LL, and the middle of the hole X, the centres of the lenſes MN, SS, and the hole near O. As the hole X in the ſpeculum LL can reflect none of the rays iſſuing from the object, that part of the image which correſponds to the middle of the object muſt appear to the obſerver more dark and confuſed than the extreme parts of it. Beſides, the ſpeculum EF will alſo intercept many rays proceeding from the object; and therefore, unleſs the aperture TT be large, the object muſt appear in ſome degree obſcure.

In the beſt reflecting teleſcopes, the focus of the ſmall mirror is never coincident with the focus of the great one, where the firſt image KH is formed, but a little beyond it (with reſpect to the eye), as at *n*; the conſequence of which is, that the rays of the pencils will not be parallel after reflection from the ſmall mirror, but converge ſo as to meet in points about Q *q* Q, where they would form a larger upright image than PV, if the glaſs R was not in their way; and this image might be viewed by means of a ſingle eye-glaſs properly placed between the image and the eye: but then the field of view would be leſs, and conſequently not ſo pleaſant; for which reaſon, the glaſs R is ſtill retained, to enlarge the ſcope or area of the field.

To find the magnifying power of this teleſcope, multiply the focal diſtance of the great mirror by the diſtance of the ſmall mirror from the image next the eye, and multiply the focal

diſtance of the ſmall mirror by the focal diſtance of the eye-glaſs: then divide the product of the former multiplication by the product of the latter, and the quotient will expreſs the magnifying power.

One great advantage of the reflecting teleſcope is, that it will admit of an eye-glaſs of a much ſhorter focal diſtance than a refracting teleſcope will, and conſequently it will magnify ſo much the more; for the rays are not coloured by reflection from a concave mirror, if it be ground to a true figure, as they are by paſſing through a convex glaſs, let it be ground ever ſo true.

The nearer an object is to the teleſcope, the more its pencils of rays will diverge before they fall upon the great mirror, and therefore they will be the longer of meeting in points after reflection; ſo that the firſt image KH will be formed at a greater diſtance from the large mirror, when the object is near the teleſcope, than when it is very remote. But as this image muſt be formed farther from the ſmall mirror than its principal focus *n*, this mirror muſt be always ſet at a greater diſtance from the large one, in viewing near objects, than in viewing remote ones. And this is done by turning the ſcrew on the outſide of the tube, until the ſmall mirror be ſo adjuſted that the object (or rather its image) appears perfect.

In looking through any teleſcope towards an object, we never ſee the object itſelf, but only that image of it which is formed next the eye in the teleſcope. For if a man holds his finger or a ſtick between his bare eye and an object, it will hide part (if not the whole) of the object from his view: But if he ties a ſtick acroſs the mouth of a teleſcope before the object glaſs, it will hide no part of the imaginary object he ſaw through the teleſcope before, unleſs it covers the whole mouth of the tube: for all the effect will be, to make the object appear dimmer, becauſe it intercepts part of the rays. Whereas, if he puts only a piece of wire acroſs the inſide of the tube, between the eye-glaſs and his eye, it will hide part of the object which he thinks he ſees; which proves, that he ſees not the real object, but its image. This is alſo confirmed by means of the ſmall mirror EF, in the reflecting teleſcope, which is made of opaque metal, and ſtands directly between the eye and the object towards which the teleſcope is turned; and will hide the whole object from the eye at O, if the two glaſſes ZZ and SS are taken out of the tube.

Great improvements have been lately made in the conſtruction of both reflecting and refracting teleſcopes, as well as in the method of applying thoſe inſtruments to the purpoſes for which they are intended. Theſe, however, fall not properly under the ſcience of optics, as fitter opportunities occur of giving a full account of them, as well as of the magic lantern, camera obſcura, &c. under other articles of our multifarious work. See CATOPTRICS, DIOPTRICS, SPECULUM, and TELESCOPE. We ſhall conclude this article with ſome obſervations,

On the different Merits of Microſcopes and Teleſcopes, compared with one another; how far we may reaſonably depend on the Diſcoveries made by them, and what hopes we may entertain of further Improvements.

THE advantages ariſing from the uſe of microſcopes and teleſcopes depend, in the firſt place, upon their property of magnifying the minute parts of objects, ſo that they can by that means be more diſtinctly viewed by the eye; and, ſecondly, upon their throwing more light into the pupil of the eye than what is done without them. The advantages ariſing from the magnifying power would be extremely limited, if they were not alſo accompanied by the latter: for if the ſame quantity of light is ſpread over a large portion of ſurface, it becomes proportionably diminiſhed in force; and therefore the objects, though magnified, appear proportionably dim. Thus, though any magnifying glaſs ſhould enlarge the diameter of the object 10 times, and conſequently magnify the ſurface 100 times, yet if the focal diſtance of the glaſs was about eight inches (provided this was poſſible), and its diameter only about the ſize of the pupil of the eye, the object would appear 100 times more dim when we looked through the glaſs, than when we beheld it with our naked eyes; and this even on a ſuppoſition that the glaſs tranſmitted all the light which fell upon it, which no glaſs can do. But if the focal diſtance of the glaſs was only four inches, though its diameter remained as before, the inconvenience would be vaſtly diminiſhed, becauſe the glaſs could then be placed twice as near the object as before, and conſequently would receive four times as many rays as in the former caſe, and therefore we ſhould ſee it much brighter than before. Going on thus, ſtill diminiſhing the focal diſtance of the glaſs, and keeping its diameter as large as poſſible, we ſhall perceive the object more and more magnified, and at the ſame time very diſtinct and bright. It is evident, however, that, with regard to optical inſtruments of the microſcopic kind, we muſt ſooner or later arrive at a limit which cannot be paſſed. This limit is formed by the following particulars. 1. The quantity of light loſt in paſſing through the glaſs. 2. The diminution of the glaſs itſelf, by which it receives only a ſmall quantity of rays. 3. The extreme ſhortneſs of the focal diſtance of great magnifiers, whereby the free acceſs of the light to the object which we wiſh to view is impeded, and conſequently the reflection of the light from it is weakened. 4. The aberrations of the rays, occaſioned by their different refrangibility.

To underſtand this more fully, as well as to ſee how far theſe obſtacles can be removed, let us ſuppoſe the lens made of ſuch a dull kind of glaſs that it tranſmits only one-half of the light which falls upon it. It is evident that ſuch a glaſs, of four inches focal diſtance, and which magnifies the diameter of an object twice, ſtill ſuppoſing its own breadth equal to that of the pupil of the eye, will ſhow it four times magnified in ſurface, but only half as bright as if it was ſeen by the naked eye at the uſual diſtance; for the light which falls upon the eye from the object at eight inches diſtance, and likewiſe the ſurface of the object in its natural ſize, being both repreſented by 1, the ſurface of the magnified object will be 4, and the light which makes that magnified object viſible only 2; becauſe, though the glaſs receives four times as much light as the naked eye does at the uſual diſtance of diſtinct viſion, yet one half is loſt in paſſing through the glaſs. The inconvenience in this reſpect can therefore be removed only as far as it is poſſible to increaſe the clearneſs of the glaſs, ſo that it ſhall tranſmit nearly all the rays which fall upon it; and how far this can be done, hath not yet been aſcertained.

The ſecond obſtacle to the perfection of microſcopic glaſſes is the ſmall ſize of great magnifiers, by which, notwithſtanding their near approach to the object, they receive a ſmaller quantity of rays than might be expected. Thus, ſuppoſe a glaſs of only $\frac{1}{10}$th of an inch focal diſtance; ſuch a glaſs would increaſe the viſible diameter 80 times, and the ſurface 6400 times. If the breadth of the glaſs could at the ſame time be preſerved as great as that of the pupil of the eye, which we ſhall ſuppoſe $\frac{2}{10}$ths of an inch, the object would appear magnified 6400 times, at the ſame time that every part of it would be as bright as it appears to the naked eye. But if we ſuppoſe that this magnifying glaſs is only $\frac{1}{20}$th of an inch in diameter, it will then receive only $\frac{1}{4}$th of the light which otherwiſe would have fallen upon it; and therefore, inſtead of communicating to the magnified object a quantity of illumination equal to 6400, it would communicate only one equal to 1600, and the magnified object would appear four times as dim as it does to the naked eye. This inconvenience, however, is ſtill

capable of being removed, not indeed by increaſing the diameter of the lens, becauſe this muſt be in proportion to its focal diſtance, but by throwing a greater quantity of light on the object. Thus, in the above-mentioned example, if four times the quantity of light which naturally falls upon it could be thrown upon the object, it is plain that the reflection from it would be four times as great as in the natural way; and conſequently the magnified image, at the ſame time that it was as many times magnified as before, would be as bright as when ſeen by the naked eye. In tranſparent objects this can be done very effectually by a concave ſpeculum, as in the reflecting microſcope already deſcribed: but in opaque objects the caſe is ſomewhat more doubtful; neither do the contrivances for viewing theſe objects ſeem entirely to make up for the deficiencies of the light from the ſmallneſs of the lens and ſhortneſs of the focus.—When a microſcopic lens magnifies the diameter of an object 40 times, it hath then the utmoſt poſſible magnifying power, without diminiſhing the natural brightneſs of the object.

The third obſtacle ariſes from the ſhortneſs of the focal diſtance in large magnifiers: but in tranſparent objects, where a ſufficient quantity of light is thrown on the object from below, the inconvenience ariſes at laſt from ſtraining the eye, which muſt be placed nearer the glaſs than it can well bear; and this entirely ſuperſedes the uſe of magnifiers beyond a certain degree.

The fourth obſtacle ariſes from the different refrangibility of the rays of light, and which frequently cauſes ſuch a deviation from truth in the appearances of things, that many people have imagined themſelves to have made ſurpriſing diſcoveries, and have even publiſhed them to the world; when in fact they have been only as many optical deceptions, owing to the unequal refractions of the rays. For this there ſeems to be no remedy, except the introduction of achromatic glaſſes into microſcopes as well as teleſcopes. How far this is practicable, hath not yet been tried; but when theſe glaſſes ſhall be introduced (if ſuch introduction is practicable), microſcopes will then undoubtedly have received their ultimate degree of perfection.

With regard to teleſcopes, thoſe of the refracting kind have evidently the advantage of all others, where the aperture is equal, and the aberrations of the rays are corrected according to Mr. Dollond's method; becauſe the image is not only more perfect, but a much greater quantity of light is tranſmitted than what can be reflected from the beſt materials hitherto known. Unluckily, however, the imperfections of the glaſs ſet a limit to theſe teleſcopes, as hath already been obſerved, ſo that they cannot be made above three feet and an half long. On the whole, therefore, the reflecting teleſcopes are preferable in this reſpect, that they may be made of dimenſions greatly ſuperior; by which means they can both magnify to a greater degree, and at the ſame time throw much more light into the eye.

With regard to the powers of teleſcopes, however, they are all of them exceedingly leſs than what we would be apt to imagine from the number of times which they magnify the object. Thus, when we hear of a teleſcope which magnifies 200 times, we are apt to imagine, that, on looking at any diſtant object through it, we ſhould perceive it as diſtinctly as we would with our naked eye at the 200th part of the diſtance. But this is by no means the caſe; neither is there any theory capable of directing us in this matter: we muſt therefore depend entirely on experience.

The beſt method of trying the goodneſs of any teleſcope is by obſerving how much farther off you are able to read with it than you can with the naked eye. But that all deception may be avoided, it is proper to chooſe ſomething to be read where the imagination cannot give any aſſiſtance, ſuch as a table of logarithms, or ſomething which conſiſts entirely of figures; and hence the truly uſeful power of the teleſcope is eaſily known. In this way Mr. Short's large teleſcope, which magnifies the diameter of objects 1200 times, is yet unable to afford ſufficient light for reading at more than 200 times the diſtance at which we can read with our naked eye.

With regard to the form of reflecting teleſcopes, it is now pretty generally agreed, that when the Gregorian ones are well conſtructed, they have the advantage of thoſe of the Newtonian form. One advantage evident at firſt ſight is, that with the Gregorian teleſcope an object is perceived by looking directly through it, and conſequently is found with much greater eaſe than in the Newtonian teleſcope, where we muſt look into the ſide. The unavoidable imperfection of the ſpecula common to both, alſo gives the Gregorian an advantage over the Newtonian form. Nothwithſtanding the utmoſt care and labour of the workmen, it is found impoſſible to give the metals either a perfectly ſpherical or a perfectly parabolical form. Hence ariſes ſome indiſtinctneſs of the image formed by the great ſpeculum, which is frequently corrected by the little one, provided they are properly matched. But if this is not done, the error will be made much worſe; and hence many of the Gregorian teleſcopes are far inferior to the Newtonian ones; namely, when the ſpecula have not been properly adapted to each other. There is no method by which the workman can know the ſpecula which will fit one another without a trial; and therefore there is a neceſſity for having many ſpecula ready made of each ſort, that in fitting up a teleſcope thoſe may be choſen which beſt ſuit each other.

The brightneſs of any object ſeen through a teleſcope, in compariſon with its brightneſs when ſeen by the naked eye, may in all caſes be eaſily found by the following formula. Let n repreſent the natural diſtance of a viſible object, at which it can be diſtinctly ſeen; and let d repreſent its diſtance from the object-glaſs of the inſtrument. Let m be the magnifying power of the inſtrument; that is, let the viſual angle ſubtended at the eye by the object when at the diſtance n, and viewed without the inſtrument, be to the viſual angle produced by the inſtrument as 1 to m. Let a be the diameter of the object-glaſs, and p be that of the pupil. Let the inſtrument be ſo conſtructed, that no parts of the pencils are intercepted for want of ſufficient apertures of the intermediate glaſſes. Laſtly, let the light loſt in reflection or refraction be neglected.

The brightneſs of viſion through the inſtrument will be expreſſed by the fraction $\left|\frac{a\,n}{m\,p\,d}\right|^2$, the brightneſs of natural viſion being 1. But although this fraction may exceed unity, the viſion through the inſtrument will not be brighter than natural viſion. For, when this is the caſe, the pupil does not receive all the light tranſmitted through the inſtrument.

In microſcopes, n is the neareſt limits of diſtinct viſion, nearly 8 inches. But a difference in this circumſtance, ariſing from a difference in the eye, makes no change in the formula, becauſe m changes in the ſame proportion with n.

In teleſcopes, n and d may be accounted equal, and the formula becomes $\frac{a^2}{mp^2}$

OPTIMATES, one of the divifions of the Roman people oppofed to *populares*. It is not eafy to afcertain the characteriftic differences betwixt thefe two parties. Some fay the optimates were warm fupporters of the dignity of the chief magiftrate, and promoters of the grandeur of the ftate, who cared not if the inferior members fuffered, provided the commanding powers were advanced: whereas the populares boldly ftood up for the rights of the people, pleaded for larger privileges, and laboured to bring matters nearer to a level. In fhort, they refembled, according to this account, the court and country parties amongft the people of this ifland. Tully fays, that the optimates were the beft citizens, who wifhed to deferve the approbation of the better fort; and that the populares courted the favour of the populace, not fo much confidering what was right, as what would pleafe the people and gratify their own thirft of vain glory and empty applaufe.

OPTIO, an officer in the Roman army, being an affiftant or lieutenant to every centurion. The *optio* was fo called becaufe he was the choice or option of the centurion in later times; at firft, however, he had been chofen by the tribune, or chief commander of the legion. Thefe *optiones* are alfo fometimes called *fuccenturiones* and *terd'ductores*; the laft name was given them becaufe their poft was in the rear of the company. Some authors make mention of *fub-optiones* or fub-lieutenants. It is proper, however, to add, that *optiones* were not peculiar to the camp, but were alfo ufed in a variety of other offices of life.

OPTION, the power or faculty of wifhing, or chooſing; or the choice a perfon makes of any thing. When a new fuffragan bifhop is conſecrated, the archbifhop of the province, by a cuftomary prerogative, claims the collation of the firft vacant benefice, or dignity, in that fee, according as he fhall chooſe; which choice is called the archbifhop's *option*. But in cafe the bifhop dies, or is tranſlated, before the prefent incumbent of the promotion chofen by the archbifhop fhall die or be removed, it is generally fuppofed that the option is void; inafmuch as the granter, fingly and by himfelf, could not convey any right or title beyond the term of his continuance in that fee. And if the archbifhop dies before the avoidance fhall happen, the right of filling up the vacancy fhall go to his executors or adminiftrators.

OPUNTIA, a fpecies of cactus; fee CACTUS. The fruit of the opuntia is remarkable for colouring the juices of living animals, though it appears not to be poifonous or even hurtful to the body. In a letter from Charleftown in South Carolina, which was publifhed in the 50th volume of the Philofophical Tranſactions, the author writes thus:—"As you defired, I tried the effects of the prickly pear in clearing the urine. A few days after your letter, I went down to one of the iſlands, and gathered fome of the fruit, and gave four of the pears to a child of three years of age, and fix pears to one of five. The next morning I examined the urine of both, and it appeared of a very lively red colour, as if tart-wine had been mixed with water. I gave likewife fix pears to a negro-wench, who was fuckling an infant, and ftrickly forbade her to put the child to her breaft for fix or eight hours; and then taking fome of her milk in a tea-cup, and fetting it by for fome hours, the cream had a reddifh luftre, though it was very faint." From the fame letter we learn, that the prickly pear grows in great abundance about Carolina; and alfo that the cochineal infects are found upon it, though no attempt, that we know of, has hitherto been made to cure them for ufe, as the Spaniards do.

OR, the French word for gold, by which this metal is expreſſed in heraldry. In engraving it is denoted by fmall points all over the field or bearing. It may be fuppofed to fignify of itſelf, *generoſity*, *ſplendor*, or *ſolidity*; according to G. Leigh, if it is compounded with—

Gul.	it ſignifies	Courage.
Azu.		Truſt.
Vor.		Joy.
Pur.		Charity.
Sab.		Conſtancy.

ORA, in antiquity, was a term equivalent to an ounce; but it has been much debated among our antiquaries, whether the ora, the mention of which ſo often occurs, was a coin, or only money of account. Dr. Hickes obſerves, that the mode of reckoning money by marks and oras was never known in England till after the Daniſh ſettlements; and by examining the old numinulary eſtimates among the principal Gothic ſtates upon the Baltic, it appears, that the ora and ſolidus were ſynonymous terms, and that the ora was the eighth part of the mark. From ſeveral of the Daniſh laws, it likewiſe appears, that the Daniſh ora, derived by corruption from *aureus*, was the ſame as the Frank ſolidus of twelve pence. As a weight the ora was regarded as the uncia or unit, by which the Daniſh mark was divided; and in Doomſday-book the ora is uſed for the ounce, or the twelfth part of the nummulary Saxon pound, and the fifteenth of the commercial: as a coin, it was an aureus, or the Frank ſolidus of twelve pence. And from the accidental coincidence of the Frank aureus with the eighth part of their mark, the Danes probably took occaſion to give it the new name of *ora*. There was another ora mentioned in the rolls of the 27th of Henry III. the value of which was ſixteen pence; and this was probably derived from the half mancus of the Saxons. Such, in all appearance, was the original of theſe two oras; as there were no aurei of that period, to which theſe two denominations of money of ſixteen and twelve pence can poſſibly be aſcribed. It is obſerved farther, that the name *ora* diſtinguiſhes the gold coins in ſeveral parts of Europe to this day. The Portugueſe moidore is nothing elſe but *moeda d'oro*, from the Latin *moneta de auro*; the French *Louis d'ores* come from the ſame uſe of the word, and owe their appellation to the ora. See Clarke on Coins.

ORACH. See ATRIPLEX.

Wild ORACH. See CHENOPODIUM.

ORACLE, among the heathens, was the anſwer which the gods were ſuppoſed to give to thoſe who conſulted them upon any affair of importance. It is alſo uſed for the god who was thought to give the anſwer, and for the place where it was given.

The credit of oracles was ſo great, that in all doubts and diſputes their determinations were held ſacred and inviolable: whence vaſt numbers flocked to them for advice about the management of their affairs; and no buſineſs of any conſequence was undertaken, ſcarce any peace concluded, any war waged, or any new form of government inſtituted, without the advice and approbation of ſome oracle. The anſwers were uſually given by the intervention of the prieſt or prieſteſs of the god who was conſulted; and generally expreſſed in ſuch dark and unintelligible phraſes, as might be eaſily wreſted to prove the truth of the oracle, whatever was the event. It is not, therefore, to be wondered at, that the prieſts who delivered them were in the higheſt credit and eſteem, and that they managed this reputation ſo as greatly to promote their own particular advantage. They accordingly allowed no man to conſult the gods, before he had offered coſtly ſacrifices, and made rich preſents to them. And to keep up the veneration for their oracles, and to prevent their being taken unprepared, they admitted perſons to conſult the gods only at certain ſtated times; and ſometimes they were ſo cautious, that the greateſt perſonage could obtain no anſwer at all. Thus Alexander himſelf was peremptorily denied by the Pythia, or prieſteſs of Apollo, till ſhe was by downright force obliged to aſcend the tripos; when, being unable to reſiſt any longer, ſhe cried out, *Thou art invincible!* and theſe words were accepted inſtead of a farther oracle.

Of the ambiguity of oracles, the following, out of a great many examples, may be mentioned. Crœſus having received from the Pythoneſs this anſwer, That by paſſing the river Halys, he would deſtroy a great empire; he underſtood it to be the empire of his enemy, whereas he deſtroyed his own.—The oracle conſulted by Pyrrhus gave him an anſwer, which might be equally underſtood of the victory of Pyrrhus, and the victory of the Romans his enemies: "*Aio te, Æacida, Romanos vincere poſſe.*" The equivocation lies in the conſtruction of the Latin tongue, which cannot be rendered in Engliſh.—The Pythoneſs adviſed Crœſus to guard againſt the mule. The king of Lydia underſtood nothing of the oracle, which denoted Cyrus deſcended from two different nations; from the Medes, by Mandana his mother, the daughter of Aſtyages; and from the Perſians, by his father Cambyſes, whoſe race was by far leſs grand and illuſtrious.—Nero had for anſwer, from the oracle of Delphos, that ſeventy-three might prove fatal to him. He believed he was ſafe from all danger till that age; but, finding himſelf deſerted by every one, and hearing Galba proclaimed emperor, who was 73 years of age, he was ſenſible of the deceit of the oracle.

When men began to be better inſtructed by the lights philoſophy had introduced into the world, the falſe oracles inſenſibly loſt their credit. Chryſippus filled an entire volume with falſe or doubtful oracles. Oenomaus, to be revenged of ſome oracle that had deceived him, made a compilation of oracles, to ſhow their ridiculous vanity. Euſebius has preſerved ſome fragments of this criticiſm on oracles by Oenomaus. "I might (ſays Origen) have recourſe to the authority of Ariſtotle and the Peripatetics, to make the Pythoneſs much ſuſpected; I might extract from the writings of Epicurus and his ſectators an abundance of things to diſcredit oracles; and I might ſhow that the Greeks themſelves made no great account of them."

The reputation of oracles was greatly leſſened when they became an artifice of politics. Themiſtocles, with a deſign of engaging the Athenians to quit Athens, and to embark, in order to be in a better condition to reſiſt Xerxes, made the Pythoneſs deliver an oracle, commanding them to take refuge in wooden walls. Demoſthenes ſaid, that the Pythoneſs *Philippiſed*; to ſignify that ſhe was gained over by Philip's preſents.

The ceſſation of oracles is atteſted by ſeveral profane authors; as Strabo, Juvenal, Lucan, and others. Plutarch accounts for it, by ſaying, that the benefits of the gods are not eternal as themſelves are; or that the genii, who preſided over oracles, are ſubject to death; or that the exhalations of the earth had been exhauſted. It appears that the laſt reaſon had been alleged in the time of Cicero, who ridicules it in his ſecond book of Divination, as if the ſpirit of prophecy, ſuppoſed to be excited by ſubterraneous effluvia, had evaporated by length of time, as wine or pickle by being long kept.

Suidas, Nicephorus, and Cedrenus, relate, that Auguſtus, having conſulted the oracle of Delphos, could obtain no other anſwer but this: "The Hebrew child whom all the gods obey, drives me hence, and ſends me back to hell: get out of this temple without ſpeaking one word." Suidas adds, that Auguſtus dedicated an altar in the Capitol, with this inſcription, "To the eldeſt Son of God." Notwithſtanding theſe teſtimonies, the anſwer of the oracle of Delphos to Auguſtus ſeems very ſuſpicious. Cedrenus cites Euſebius for this oracle, which is not now found in his works; and Auguſtus's perigrination into Greece was 18 years before the birth of Chriſt.

Suidas and Cedrenus give an account alſo of an ancient oracle delivered to Thulis, a king of Egypt, which they ſay is well authenticated. The king having conſulted the oracle of Serapis, to know if there ever was, or would be, one ſo great as himſelf, received this anſwer: "Firſt, God, next the Word, and the Spirit with them. They are equally eternal, and make but one whoſe power will never end. But thou, mortal, go hence, and think that the end of the life of man is uncertain."

Van Dale, in his treatiſe of oracles, does not believe that they ceaſed at the coming of Chriſt. He relates ſeveral examples of oracles conſulted till the death of Theodoſius the Great. He quotes the laws of the emperors Theodoſius, Gratian, and Valentinian, againſt thoſe who conſulted oracles, as a certain proof that the ſuperſtition of oracles ſtill ſubſiſted in the time of thoſe emperors.

According to others, the opinion of thoſe who believe that dæmons had no ſhare in the oracles, and that the coming of the Meſſiah made no change in them, and the contrary opinion of thoſe who pretend that the incarnation of the Word impoſed a general ſilence on all oracles, ſhould be equally rejected. They allege, that two ſorts of oracles ought to be diſtinguiſhed: the one dictated by the ſpirits of darkneſs, who deceived men by their obſcure and doubtful anſwers; the other, the pure artifice and cheat of the prieſts of falſe divinities. As to the oracles given out by dæmons, the reign of Satan was deſtroyed by the coming of the Saviour; truth ſhut the mouth of lies; but Satan continued his old craft among idolaters. All the devils were not forced to ſilence at the ſame time by the coming of the Meſſiah; it was on particular occaſions that the truth of Chriſtianity, and the virtue of Chriſtians, impoſed ſilence on the devils. St. Athanaſius tells the Pagans, that they have been witneſſes themſelves that the ſign of the croſs puts the devils to flight, ſilences oracles, and diſſipates enchantments. This power of ſilencing oracles, and putting the devils to flight, is alſo atteſted by Arnobius, Lactantius, Prudentius, Minutius Felix, and ſeveral others. Their teſtimony is a certain proof that the coming of the Meſſiah had not impoſed a general ſilence on oracles.

Plutarch relates, that the pilot Thamus heard a voice in the air, crying out, "The great Pan is dead;" whereupon Euſebius obſerves, that the accounts of the death of the dæmons were frequent in the reign of Tiberius, when Chriſt drove out the wicked ſpirits.

The ſame judgment, it is ſaid, may be paſſed on oracles as on *poſſeſſions*. It was on particular occaſions, by the divine permiſſion, that the Chriſtians caſt out devils, or ſilenced oracles, in the preſence, and even by the confeſſion, of the Pagans themſelves. And thus it is we ſhould, it ſeems, underſtand the paſſages of St. Jerom, Euſebius, Cyril, Theodoret, Prudentius, and other authors, who ſaid that the coming of Chriſt had impoſed ſilence on the oracles.

As to the ſecond ſort of oracles, which were pure artifices and cheats of the prieſts of falſe divinities, and which probably exceeded the number of thoſe that immediately proceeded from dæmons, they did not ceaſe till idolatry was aboliſhed, though they had loſt their credit for a conſiderable time before the coming of Chriſt. It was concerning this more common and general ſort of oracles that Minutius Felix ſaid, they began to diſcontinue their reſponſes, according as men began to be more polite. But, however oracles were decried, impoſtors always found dupes, the groſſeſt cheats having never failed.

Daniel diſcovered the impoſture of the prieſts of Bel, who had a private way of getting into the temple to take away the offered meats, and who made the king believe that the idol conſumed them.—Mundus, being in love with Paulina, the eldeſt of the prieſteſſes of Iſis, went and told her, that the god Anubis, being paſſionately fond of her, commanded her to give him a meeting. She was afterwards ſhut up in a dark room, where her lover Mundus, whom ſhe believed to be the god Anubis, was concealed. This impoſture having been diſcovered, Tiberius ordered thoſe deteſtable prieſts and prieſteſſes to be crucified, and with them Idea, Mundus's free-woman, who had conducted the whole intrigue. He alſo commanded the temple

of Iſis to be levelled with the ground, and her ſtatue to be thrown into the Tiber; and, as to Mundus, he contented himſelf with ſending him into baniſhment.

Theophilus, biſhop of Alexandria, not only deſtroyed the temples of the falſe gods, but diſcovered the cheats of the prieſts, by ſhowing that the ſtatues, ſome of which were of braſs, and others of wood, were hollow within, and led into dark paſſages made in the wall.

Lucian, in diſcovering the impoſtures of the falſe prophet Alexander, ſays, that the oracles were chiefly afraid of the ſubtilties of the Epicureans and Chriſtians. The falſe prophet Alexander ſometimes feigned himſelf ſeized with a divine fury, and by means of the herb ſopewort, which he chewed, frothed at the mouth in ſo extraordinary a manner, that the ignorant people attributed it to the ſtrength of the god he was poſſeſſed by. He had long before prepared a head of a dragon made of linen, which opened and ſhut its mouth by means of a horſe-hair. He went by night to a place where the foundations of a temple were digging; and having found water, either of a ſpring, or rain that had ſettled there, he hid in it a gooſe-egg, in which he had incloſed a little ſerpent that had been juſt hatched. The next day, very early in the morning, he came quite naked into the ſtreet, having only a ſcarf about his middle, holding in his hand a ſcythe, and toſſing about his hair as the prieſts of Cybele; then getting a-top of a high altar, he ſaid that the place was happy to be honoured by the birth of a god. Afterwards, running down to the place where he had hid the gooſe egg, and going into the water, he began to ſing the praiſes of Apollo and Æſculapius, and to invite the latter to come and ſhow himſelf to men. With theſe words, he dips a bowl into the water, and takes out a myſterious egg, which had a god incloſed in it; and when he had it in his hand, he began to ſay that he held Æſculapius. Whilſt all were eager to have a ſight of this fine myſtery, he broke the egg, and the little ſerpent ſtarting out, twiſted itſelf about his fingers

Theſe examples ſhow clearly, that both Chriſtians and Pagans were ſo far agreed as to treat the *greater number* of oracles as purely human impoſtures.—That, in fact, ALL of them were ſo, will be concluded by thoſe who give equal credit to dæmoniacal *inſpiration*, and dæmoniacal *poſſeſſion*. The moſt ancient oracle was that of Dodona (ſee DODONA); but the moſt famous was that of Delphi, to which article we alſo refer for further particulars on this ſubject, ſo famous in Pagan antiquity. Another celebrated one was the oracle of Trophonius, in the neighbourhood of Lebadea, a city of Bœotia, which was held in high eſtimation. It received its name from Trophonius, brother of Agamedes, who lived in a ſubterraneous dwelling near Lebadia, and pretended to the faculty of foretelling future events. He died in his cave, and was deified as an oracular god. This oracle owed its reputation to one Saon.

Thoſe who repaired to this cave for information, were required to offer certain ſacrifices, to anoint themſelves with oil, and to bathe in a certain river: They were then clothed in a linen robe, took a honeyed cake in their hands, and deſcended into the ſubterraneous chamber by a narrow paſſage. Here it was that futurity was unfolded to them, either by viſions or extraordinary ſounds. The return from the cave was by the ſame paſſage, but the perſons conſulting were obliged to walk backwards. They generally came out aſtoniſhed, melancholy, and dejected; hence the proverb, εις Τροφωνιου μαντευεσθαι. The prieſts on their return placed them on an elevated ſeat, called *the ſeat of Mnemoſyne*, where an account was taken of what they had ſeen and heard. They were then conducted to the chapel of good Genius by their companions, where, by degrees, they recovered their uſual compoſure and cheerfulneſs.

Beſides theſe three principal oracles of Greece, it is proper to take notice of that of Amphiaraus at Oropius in Attica. It was ſo called from Amphiaraus, the ſon of Oicleus, a man ſkilled in magic, the interpretation of dreams, &c. and who after his death was deified and delivered oracles in a temple erected to his divinity. (See AMPHIARAUS.) They who applied to him for information, were to purify themſelves, offer ſacrifice, faſt twenty-four hours, abſtain from wine two days, and make an offering of a ram to Amphiaraus; on the ſkin of which they were to ſleep, and ſee their deſtiny in a dream. Near the temple was Amphiaraus's fountain, which was ſacred, and the waters of it forbidden to be uſed for ordinary purpoſes.

At Delos alſo there was an oracle of the Delian Apollo: in Mileſia was that of the Branchidæ, with others of leſs note, which require not a particular deſcription, ſuch as that of the camps at Lacedæmon, that of Nabarcha, that of Chryſopolis, that of Claros in Ionia, that of Mallos, that of Patarea, that of Pella, that of Phaſellides, that of Sinope, that of Orpheus's head, &c.

Though the Romans conſulted the Grecian oracles upon many occaſions, and had few oracles in their own country; yet we muſt not omit mentioning the Cumæan oracles, which were delivered by the Sibyl of Cumæ. For an account of the Sibyls, ſee the article SIBYL. See alſo DÆMON and DÆMONIAC.

We have hitherto only conſidered the oracles of falſe gods, of which there was a far greater number than our limits permit us to obſerve, and before either Greeks or Romans had riſen to any diſtinction. Oracle is in ſacred hiſtory ſometimes uſed for the mercy-ſeat, or the cover of the ark of the covenant; and by others it is taken for the ſanctuary, or for the moſt holy place, wherein the ark was depoſited.

Among the Jews we may diſtinguiſh ſeveral ſorts of *real* oracles. They had firſt oracles that were delivered *viva voce*; as when God ſpake to Moſes face to face, and as one friend ſpeaks to another, (Numb. xii. 8.) Secondly, Prophetical dreams ſent by God; as the dreams which God ſent to Joſeph, and which foretold his future greatneſs, (Gen. xxxvii. 5, 6.) Thirdly, Viſions; as when a prophet in an ecſtaſy, being neither properly aſleep nor awake, had ſupernatural revelations, (Gen. xv. 1. xlvi. 2.) Fourthly, The oracle of Urim and Thummim, which was accompanied with the ephod or the pectoral worn by the high-prieſt, and which God had endued with the gift of foretelling things to come, (Numb. xii. 6. Joel. ii. 28.) This manner of inquiring of the Lord was often made uſe of, from Joſhua's time to the erection of the temple at Jeruſalem. Fifthly, After the building of the temple, they generally conſulted the prophets, who were frequent in the kingdoms of Judah and Iſrael. From Haggai, Zachariah, and Malachi, who are the laſt of the prophets that have any of their writings remaining, the Jews pretend that God gave them what they call *Bathcol*, the daughter of the voice, which was a ſupernatural manifeſtation of the will of God, which was performed either by a ſtrong inſpiration or internal voice, or elſe by a ſenſible and external voice, which was heard by a number of perſons ſufficient to bear teſtimony of it. For example, ſuch was the voice that was heard at the baptiſm of Jeſus Chriſt, ſaying, This is my beloved ſon, &c. (Matt. iii. 17.)

The ſcripture affords us examples likewiſe of profane oracles. Balaam, at the inſtigation of his own ſpirit, and urged on by his avarice, fearing to loſe the recompenſe that he was promiſed by Balak king of the Moabites, ſuggeſts a diabolical expedient to this prince, of making the Iſraelites fall into idolatry and fornication (Numb. xxiv. 14. xxxi. 16.), by which he aſſures him of a certain victory, or at leaſt of conſiderable advantage againſt the people of God.

Micaiah the ſon of Imlah, a prophet of the Lord, ſays (1 Kings xxii. 21, &c.), that he ſaw the Almighty ſitting upon his throne, and all the hoſt of heaven round about him; and the Lord ſaid, Who ſhall tempt Ahab king of Iſrael, that he may go to war with Ramoth-gilead, and fall in the battle? One anſwered after one manner, and another in another. At the ſame time an evil ſpirit preſented himſelf before the Lord and ſaid, I will ſeduce him. And the Lord aſked him, How? To which Satan anſwered, I will go and be a lying ſpirit in the mouth of his prophets. And the Lord ſaid, Go, and thou ſhalt prevail. This dialogue clearly proves theſe two things, *firſt*, that the devil could do nothing by his own power; and, *ſecondly*, that with the permiſſion of God, he could inſpire the falſe prophets, ſorcerers, and magicians, and make them deliver falſe oracles.

Reſpecting the ceſſation of profane oracles there have been a variety of opinions; ſome of which we have already remarked. It has been generally held, indeed, that oracles ceaſed at the birth of Jeſus Chriſt: Yet ſome have endeavoured to maintain the contrary, by ſhowing that they were in being in the days of Julian, commonly called *the Apoſtate*, and that this emperor himſelf conſulted them; nay, farther, ſay they, hiſtory makes mention of ſeveral laws publiſhed by the Chriſtian emperors Theodoſius, Gratian, and Valentinian, to puniſh perſons who interrogated them, even in their days; and that the Epicureans were the firſt who made a jeſt of this ſuperſtition, and expoſed the roguery of its prieſts to the people. As we ſuſpect moſt of the facts, here aſſerted ſhould be underſtood in a qualified ſenſe, we ſhall endeavour to diſcuſs this point of controverſy in as few words as poſſible, although it is undoubtedly a matter of ſome conſequence.

1*ſt*, The queſtion, properly ſtated, is not, Whether oracles became extinct *immediately upon the birth of Chriſt*, or from the very moment he was born? but, If they fell gradually into diſeſteem and ceaſed, as Chriſt and his goſpel became known to mankind? And that they did ſo, is moſt certain from the concurrent teſtimonies of the fathers, which, whoever would endeavour to invalidate, may equally give up the moſt reſpectable traditions and relations of every kind.

2*dly*, But did not Julian, the apoſtate, conſult theſe oracles? we anſwer in the negative: he had indeed recourſe to magical operations, but it was becauſe oracles had already ceaſed; for he bewailed the loſs of them, and aſſigned pitiful reaſons for it; which St. Cyrill has vigorouſly refuted, adding, that *he never could have offered ſuch, but from an unwillingneſs to acknowledge, that when the world had received the light of Chriſt, the dominion of the devil was at an end.*

3*dly*, The Chriſtian emperors do indeed ſeem to condemn the ſuperſtition and idolatry of thoſe who were ſtill for conſulting oracles; but the edicts of thoſe princes do not prove that oracles actually exiſted in their times, any more than that they ceaſed in conſequence of their laws. It is certain that they were for the moſt part extinct before the converſion of Conſtantine.

4*thly*, Some Epicureans might *make a jeſt of this ſuperſtition:* however the Epicurean philoſopher Celſus, in the ſecond century of the church, was for crying up the excellency of ſeveral oracles, as appears at large from Origen's ſeventh book againſt him.

ORÆA, certain ſolemn ſacrifices of fruits which were offered in the four ſeaſons of the year, in order to obtain mild and temperate weather. They were offered to the goddeſſes who preſided over the ſeaſons, who attended upon the ſun, and who received divine worſhip at Athens.

ORAL, ſomething delivered by word of mouth, without being committed to writing; in which ſenſe we ſay oral law, oral tradition, &c.

ORAN, a very ſtrong and important town of Africa, in Barbary, and in the kingdom of Tremecen, with ſeveral forts, and an excellent harbour. It is ſeated partly on the ſide of a hill, and partly on a plain, about a ſtone-caſt from the ſea, almoſt oppoſite to Carthagena in Spain. It is about a mile and an half in circumference, and well fortified, but commanded by the adjacent hills. It was taken by the Spaniards in 1509, and retaken by the Algerines in 1708; but in 1732 the Spaniards became maſters of it, and have continued ſo ever ſince. E. lon. 0. 8. N. lat. 36. 2.

ORANG OUTANG. See SIMIA. Alſo COMPARATIVE ANATOMY ch. 1. ſect. 2.

ORANGE, an ancient city of France, in the department of Drome and late province of Dauphiny. It was an important place in the time of the Romans. A triumphal arch, 200 paces from the town, was formerly within its limits; and here are alſo the remains of a fine amphitheatre, ſome aqueducts, &c. which eſcaped the fury of the Goths and Saracens. The fortreſs was demoliſhed by Lewis XIV. in 1682. Orange is the capital of a principality of the ſame name, 17 miles long and 12 broad. It was given by Charlemagne, in 793, to William au Cornet, as a reward for his military ſervices. Poſſeſſed ſucceſſively by the houſes of Beaux and Chalons, it devolved, in 1531, on that of Naſſau; and was poſſeſſed by William III. king of England, who dying in 1702, Frederic-William, king of Pruſſia, claimed this principality as his heir. Lewis XIV. had ſeized it during the war with king William. He exchanged it, however, in 1713, with the king of Pruſſia, for the town of Gueldres; but ſubject to a compenſation to the prince of Naſſau-Dietz, whom king William had named his heir. The city of Orange was an epiſcopal ſee before the late revolution. It is ſeated in a fine plain, on the river Aigues, 12 miles N. of Avignon, and 50 N. E. of Montpellier. E. lon. 4. 49. N. lat. 44. 9.

ORANGE-*Tree*, in botany. See the article CITRUS.—Orange-flowers are juſtly eſteemed one of the fineſt perfumes; though little uſed in medicine. The fruit is cooling, and good in feveriſh diſorders, and particularly in diarrhœas. Orange-peel is an agreeable aromatic, proper to repair and ſtrengthen the ſtomach, and gives a very grateful flavour to any infuſions or tinctures into whoſe compoſitions it enters. It is particularly uſeful in preparations of the bark; gives an agreeable warmth to the infuſion; and, according to Dr. Percival, conſiderably increaſes its virtue. In the Philoſophical Tranſactions n° 114, there is a very remarkable account of a tree ſtanding in a grove near Florence, having an *orange* ſtock, which had been ſo grafted upon, that it became in its branches, leaves, flower, and fruit, three-formed: ſome emulating the orange, ſome the lemon or citron, and ſome partaking of both forms in one; and what was very remarkable, was, that theſe mixed fruits never produced any perfect ſeeds; ſometimes there were no ſeeds at all in them, and ſometimes only a few empty ones. See CITRUS.

ORANGE-*Dew*, a kind of dew which falls in the ſpring-time from the leaves of orange and lemon-trees, which is extremely fine and ſubtile. M. de la Hire obſerving this, placed ſome flat pieces of glaſs under the leaves to receive it; and having procured ſome large drops of it, was deſirous of diſcovering what it was. He ſoon found that it was not a merely aqueous fluid, becauſe it did not evaporate in the air; and that it was not a reſin, becauſe it readily and perfectly mixed with water: it was natural then to ſuppoſe it a liquid gum; but neither did this, on examination, prove to be the caſe; for being laid on paper, it did not dry as the other liquid gums do. Its anſwering to none of theſe characters, and its being of the conſiſtence of honey, and of a ſweet ſugar-like taſte, gave a ſuſ-

picion of its being a kind of manna; and whatever in the other trials had proved it not a reſin, a gum, &c. all equally tends to prove that it is this ſubſtance.

ORANGE-*Sea*, in natural hiſtory, a name given by Count Marſigli to a very remarkable ſpecies of marine ſubſtance, which he denominates a *plant*. It is tough and firm in its ſtructure, and in many things reſembles the common fucus; but inſtead of growing into the branched form which the generality of thoſe ſubſtances have, it is round and hollow, and in every reſpect reſembles the ſhape of an orange. It has, by way of root, ſome exceeding fine filaments, which faſten themſelves to the rocks, or to ſhells, ſtones, or any thing elſe that comes in the way. From theſe there grows no pedicle; but the body of the orange, as it is called, is faſtened by them to the rock, or other ſolid ſubſtance. The orange itſelf is uſually of about three or four inches in diameter; and while in the ſea, is full of water, and even retains it when taken up. In this ſtate it frequently weighs a pound and a half; but when the water is let out, and it is dried, it becomes a mere membrane, weighing ſcarce any thing. It is beſt preſerved, by ſtuffing it with cotton as ſoon as the water is let out of it, and then hanging it up to dry. Its ſurface is irregular and rough, and its colour a duſky green on the outſide, and a clearer but ſomewhat bluiſh green within; and its thickneſs is about an eighth part of an inch. When viewed by the microſcope, it is ſeen to be all over covered with ſmall glandules, or rather compoſed of them; for they ſtand ſo thick one by another as to leave no ſpace between, and ſeem to make up the whole ſubſtance; ſo that it appears very like the rough ſhagreen ſkin uſed to cover toys. Theſe are indeed ſo many hollow ducts, through which the ſea-water finds a paſſage into the globe formed by this ſkin, and by this means it is kept always full and diſtended; on cutting it with a pair of ſciſſars, the water immediately runs out, and the ſkins collapſe; but there is ſomething extremely remarkable in this, for the whole ſubſtance near the wounded place, is in motion, and ſeems as if alive, and ſenſible of the wound. The glandules are found full of water, and reſembling ſmall tranſparent bottles; and what goes to the ſtructure of the plant beſide theſe, is an aſſemblage of a vaſt number of filaments, all which are likewiſe hollow, and filled with a clear and tranſparent fluid.

There is another ſubſtance of this kind, mentioned and deſcribed by Count Marſigli, Triumfetti, and others, and called the *ramoſe* or branched orange. This is very much of the nature of the former; but, inſtead of conſiſting of one round globule, it is formed of ſeveral oblong ones, all joined together, and repreſenting the branches of ſome of the fucuſes, only they are ſhorter; and theſe are all hollow and full of water, in the ſame manner as the ſingle globes of the common kind. This has, by way of root, certain fine and ſlender filaments, which faſten it to the ſtones or ſhells near which it is produced; and it is of a duſky greeniſh colour on the ſurface, and of a fine bluiſh green within. The ſurface, viewed by the microſcope, appears rough, as in the other, and the glandules are of the ſame kind, and are always found full of clear water. See CORALLINES.

ORATION, in rhetoric, a ſpeech or harangue, compoſed according to the rules of oratory, but ſpoken in public. Orations may be reduced to three kinds, viz. the demonſtrative, deliberative, and judicial. To the demonſtrative kind belong panegyrics, genethliaca, epithalamia, congratulations, &c. To the deliberative kind belong perſuaſion, exhortation, &c. And to the judicial kind belong accuſation, confutation, &c.

Funeral ORATION. See FUNERAL *Oration*.

ORATOR, among the Romans, differed from a *patronus*: The latter was allowed only to plead cauſes on behalf of his clients; whereas the former might quit the forum and aſcend the roſtra or tribunal, to harangue the ſenate or the people. The orators had rarely a profound knowledge of the law, but they were eloquent, and their ſtile was generally correct and conciſe. They were employed in cauſes of importance, inſtead of the common patrons. Orators, in the violence of elocution, uſed all the warmth of geſture, and even walked backwards and forwards with great heat and emotion. This it was which occaſioned a witticiſm of Flavius Virginius, who aſked one of thoſe walking orators, *Quot millia paſſuum declamaſſet?* "How many MILES he had declaimed?" Similar to the Roman orators were the Grecian *Rhetores*. See RHETORES.

Public ORATOR, an office of very conſiderable dignity, and of ſome emolument in the Engliſh univerſities. The public orator is the principal, and in many caſes the only oſtenſible, agent for the univerſity in all thoſe matters or forms which are merely external. He carries on or ſuperintends all correſpondences which are calculated to promote the dignity, or raiſe the utility, of the ſeminary which conſtitutes him. He has little to do, indeed, with the internal government of the body, for which a variety of officers in different departments are appointed; but in all public affairs he is, as it were, the mouth of the whole; putting their deliberations into proper form, and communicating or publiſhing them, according to the intention of the univerſity. Thus, if the whole univerſity, or a committee appointed by them, or by ſtatute, or by the will of any particular benefactor, have, after a comparative trial, adjudged a prize to any perſon or perſons, it is the buſineſs of the public orator to inform the ſucceſsful parties of the iſſue of the trial. Again, if for ſingular learning, or for any remarkable *good will* ſhown to the univerſity by any perſon or perſons, the *ſenate* or *convocation* are pleaſed to declare their grateful ſenſe of it, either by conferring degrees, or otherwiſe as they think fit, the public orator is to notify this intention to the perſon or perſons concerned; and ſo in other caſes.

Another part of the public orator's buſineſs, is to preſent young noblemen, or thoſe who take *honorary* degrees, *tanquam nobiles*, to the vice-chancellor: this he does in a latin ſpeech, which, according to circumſtances, is either ſhort or long; and of which the ſubject is generally a defence of that particular ſtatute which allows the ſons of noblemen, and ſome few others, to proceed to degrees before what is called the *ſtatutable time*. In doing this, encomiums, often ſtronger than juſt, are made upon the learning and virtue of the noble candidate; a view is taken of the dignity of his ancient houſe; the honour is mentioned which has accrued to the univerſity from the acceſſion of ſuch a member; and the oration concludes with promiſing great credit from his future conduct, as well as benefit from the influence of his rank in the ſtate. Theſe circumſtances are deemed ſufficient grounds for exempting the ſons of noblemen from that tedious courſe of ſtudy through which the duller ſons of commoners muſt all paſs before they be thought worthy of academical honours.

ORATORIO, in the Italian muſic, a ſort of ſacred drama of dialogues; containing recitativos, ductos, trios, ritornellos, choruſes, &c. The ſubjects of thoſe pieces are uſually taken from ſcripture, or the life of ſome ſaint, &c. The muſic for the oratorios ſhould be in the fineſt taſte and beſt choſen ſtrains. Theſe oratorios are greatly uſed at Rome in the time of Lent, and of late in England. Meneſtrier attributes the origin of oratorios to the cruſades, and ſays that the pilgrims returning from Jeruſalem and the Holy Land, &c. compoſed ſongs, reciting the life and death of the Son of God, and the myſteries of the Chriſtian faith, and celebrating the achievements and conſtancy of ſaints and martyrs. Others, with more probability, obſerve, that the oratorio was an avowed imitation of the opera, with only this difference, that the foundation of it was always ſome religious, or at leaſt ſome moral ſubject. Creſcimbeni aſcribes its origin to San Filippo Neri, who was born at Florence

in 1515, and who, in his chapel, after ſermons, and other devotions, in order to allure young people to pious offices, had hymns, pſalms, and ſuch like prayers, ſung by one or more voices. Among theſe ſpiritual ſongs were dialogues; and theſe entertainments becoming more frequent, and improving every year, were the occaſion that in the ſeventeenth century oratorios were firſt invented, ſo called from the place of their origin. See *Hawkins's Hiſtory of Muſic.*

ORATORY;

The art of ſpeaking well upon any ſubject, in order to perſuade.

INTRODUCTION.

THE invention of oratory is by the Egyptians, and the fables of the poets, aſcribed to Mercury. And it is well known, that the Greeks made their deities the authors likewiſe of other arts, and ſuppoſed that they preſided over them. Hence they gave Mercury the titles of Λογιος and Ερμης, both which names come from words that ſignify "to ſpeak." And Ariſtides calls eloquence *the gift of Mercury*; and for the ſame reaſon anciently the tongue was conſecrated to him. He was likewiſe ſaid to be the interpreter or meſſenger of the gods; which office very well ſuited him, as he excelled in eloquence. Hence we read in the Sacred Writings, that when the people of Lyſtra took Barnabas and Paul for gods in human ſhape, becauſe of that ſudden and ſurpriſing cure which was wrought upon the lame man, they called Barnabas *Jupiter*, and Paul *Mercury*; for this reaſon, as the inſpired writer tells us, 'becauſe he was the chief ſpeaker,' that is (as the ſpectators then thought), the interpreter or ſpokeſman of Barnabas.

But to paſs over theſe fictions of the heathen deities, let us hear what Quintilian ſays of the *origin* of this art; who ſeems to give a very probable account of it in the following paſſage. "The faculty of ſpeech (ſays he) we derive from nature; but the art from obſervation. For as in phyſic, men, by ſeeing that ſome things promote health and others deſtroy it, formed the art upon thoſe obſervations; in like manner, by perceiving that ſome things in diſcourſe are ſaid to advantage, and others not, they accordingly marked thoſe things, in order to imitate the one and avoid the other. They alſo added ſome things from their own reaſon and judgment, which being confirmed by uſe, they began to teach others what they knew themſelves." But no certain account can be given when, or by whom, this method of obſervation firſt began to take place. And Ariſtotle ſuppoſes, not without reaſon, that the firſt lineaments of the art were very rude and imperfect. Pauſanias, indeed, in his *Deſcription of Greece*, tells us, that Pittheus, the uncle of Theſeus, taught it at Trezene, a city of Peloponneſus, and wrote a book concerning it; which he read himſelf, as it was publiſhed by one of Epidaurus. But as Pittheus lived about 1000 years before Pauſanias, who flouriſhed in the time of the emperor Hadrian, ſome are of opinion that he might be impoſed upon by the Epidaurian, who publiſhed this book under the name of *Pittheus*. But be that as it will, it is very reaſonable to believe, that the Greeks had the principles of this art ſo early as the time of Pittheus. For Theſeus his nephew lived not long before the taking of Troy, which, according to Sir Iſaac Newton, happened 904 years before the birth of Chriſt; at which time Cicero thought it was in much eſteem among them. "Homer (ſays he) would never have given Ulyſſes and Neſtor in the Trojan wars ſo great commendations on account of their ſpeeches (to one of whom he attributes force, and to the other ſweetneſs of expreſſion), if eloquence had not in thoſe times been in great repute." And leſt any one ſhould imagine, that in thoſe days they made uſe only of ſuch helps as nature and practice could afford them, the ſame poet informs us, that Peleus ſent Phœnix with his ſon Achilles to the Trojan war, to inſtruct him not only in the art of war, but likewiſe of eloquence. But who were the profeſſors of this art for ſome ages following is not known. For Quintilian ſays, that afterwards Empedocles is the firſt upon record who attempted any thing concerning it. And he, by Sir Iſaac Newton's account, flouriſhed about 500 years after Troy was taken. At which time, as Cicero obſerves, men being now ſenſible of the powerful charms of oratory, and the influence it had upon the mind, there immediately aroſe ſeveral maſters of it; the chief of whom are mentioned by Quintilian, who tells us, that 'the oldeſt writers upon this art are Corax and Tiſias, both of Sicily. After them came Gorgias of Leontium in the ſame iſland, who is ſaid to have been the ſcholar of Empedocles, and by reaſon of his great age, (for he lived to be 109 years old) had many cotemporaries. Thraſymachus of Chalcedon, Pròdicus of Cea, Protagoras of Abdera, Hippias of Elis, and Alcidamus of Elea lived in his time; as likewiſe Antiphon, who firſt wrote orations, and alſo upon the art, and is ſaid to have ſpoken admirably well in his own defence; and beſides theſe, Polycrates, and Theodore of Byzantium.' Theſe perſons contributed different ways towards the improvement of the art. Corax and Tiſias gave rules for methodizing a diſcourſe, and adjuſting its particular parts; as may be conjectured from Cicero's account of them, who ſays, "Though ſome had ſpoke well before their time, yet none with order and method." But Gorgias ſeems to have excelled all the reſt in fame and reputation: for he was ſo highly applauded by all Greece, that a golden ſtatue was erected to him at Delphos, which was a diſtinguiſhing honour conferred upon him only. And he is ſaid to have been ſo great a maſter of oratory, that in a public aſſembly he would undertake to declaim immediately upon any ſubject propoſed to him. He wrote, as Cicero informs us, in the demonſtrative or laudatory way; which requires moſt of the ſublime, and makes what Diodorus Siculus ſays of him the more probable, that "he firſt introduced the ſtrongeſt figures, members of periods oppoſite in ſenſe, of an equal length, or ending with a like ſound, and other ornaments of that nature." And hence thoſe figures, which give the greateſt force and luſtre to a diſcourſe were anciently called by his name. Cicero tells us further, that Thraſymachus and Gorgias were the firſt who introduced numbers into proſe, which Iſocrates afterwards brought to perfection. Quintilian likewiſe mentions Protagoras, Gorgias, Prodicus, and Thraſymachus, as the firſt who treated of common places, and ſhewed the uſe of them for the invention of arguments. Nor muſt we omit Plato, whoſe elegant dialogue upon this ſubject is ſtill extant which he intitles *Gorgias*. For though he does not lay down the common rules of the art; yet he very well explains the nature of it, and maintains its true end and uſe againſt the generality of its profeſſors, who had greatly perverted the original deſign of it. Thus, by the ſtudy and induſtry of ſo many ingenious and great men, the art of oratory was then carried to a conſiderable height among the Grecians. Though many of thoſe who profeſſed it in thoſe times employed their ſkill rather to promote their own reputa-

tion and applauſe, than to ſerve the real intereſts of truth and virtue. "For they propoſed in an arrogant manner (as Cicero ſays) to teach how a bad cauſe might be ſo managed, as to get the better of a good one." That is, they would undertake to charm the ears and ſtrike the paſſions of their hearers in ſo powerful a manner, by ſophiſtical reaſonings, turns of wit, and fine language, as to impoſe falſehood upon them for truth: than which nothing could be either more diſingenuous in itſelf, or prejudicial to ſociety.

But thoſe who ſucceeded them ſeem to have conſulted better, both for their own honour, and that of their profeſſion. Iſocrates was the moſt renowned of all Gorgias's ſcholars, whom Cicero frequently extols with the higheſt commendations, as the greateſt maſter and teacher of oratory; "whoſe ſchool (as he ſays) like the Trojan horſe, ſent forth abundance of great men." Ariſtotle was chiefly induced to engage in this province from an emulation of his glory; and would often ſay in a verſe of Sophocles, ſomewhat varied to his purpoſe,

To be ſilent it is a ſhame;
While Iſocrates gets ſuch fame.

Quintilian ſays they both wrote upon the art, though there is no ſyſtem of the former now extant. But that of Ariſtotle is eſteemed the beſt and moſt complete of any in the Greek language. In this age the Grecian eloquence appeared in its higheſt perfection. Demoſthenes was an hearer both of Iſocrates and Plato, as alſo of Iſæus (ten of whoſe orations are yet extant); and by the aſſiſtance of a ſurpriſing genius, joined with indefatigable induſtry, made that advantage of their precepts, that he has been always eſteemed by the beſt judges the prince of Grecian orators. His great adverſary and rival Æſchines, after his baniſhment, is ſaid to have gone to Rhodes, and employed his time there in teaching of rhetoric. Theodectes and Theophraſtus, both of them ſcholars of Ariſtotle, imitated their maſter in writing upon the art. And from that time the philoſophers, eſpecially the ſtoics and peripatetics applied themſelves to lay down the rules of oratory; which Socrates had before ſeparated from the province of a philoſopher. And there is yet preſerved a treatiſe upon this ſubject, which ſome have aſcribed to Demetrius Phalereus the peripatetic, and ſcholar of Theophraſtus, though others more probably to Dionyſius of Halicarnaſſus. Quintilian mentions ſeveral other famous rhetoricians in the following ages, who were likewiſe writers; as Hermagoras, Athenæus, Apollonius Molon, Areus Cæcilius, Dionyſius of Halicarnaſſus, Apollonius of Pergamus, and Theodore of Gadara. But of theſe nothing now remains upon the ſubject of oratory, except ſome tracts of Dionyſius, who flouriſhed in the reign of Auguſtus Cæſar. Nor have there been wanting ſome eminent writers of this kind among the Greeks ſince the time of Quintilian; two of whom we cannot omit to mention, Hermogenes, and Longinus the author of the incomparable treatiſe *Of the Sublime*, a book which can ſcarce be too much commended or too often read.

It was long before Rome received this art, and not without difficulty at firſt. The reaſon was, becauſe the Romans were for ſeveral ages wholly addicted to military affairs, and to enlarge their territories; ſo that they not only neglected to cultivate learning, but thought that the purſuit of it a thing of ill tendency, by diverting the minds of their youth from the cares and toils of war, to a more ſoft and indolent kind of life. Therefore ſo late as the year of their city 592, when by the induſtry of ſome Grecians the liberal arts began to flouriſh in Italy, a decree paſſed the ſenate, by which all philoſophers and rhetoricians were ordered to depart out of Rome. But in a few years after, when Carneades, Critolaus, and Diogenes, who were not only philoſophers but orators, came ambaſſadors from Athens to Rome, the Roman youth were ſo charmed with the eloquence of their harangues, that they could no longer be ſtopt from purſuing the ſtudy of oratory. And by a farther acquaintance with the Greeks, it ſoon gained ſuch eſteem, that perſons of the firſt quality employed their time and pains to acquire it. And a young gentleman who was ambitious to advance himſelf in the ſervice of his country, could have little hopes of ſucceſs, unleſs he had laid the foundation of his future proſpects in that ſtudy.

Seneca tell us, that Lucius Plotius, a Gaul, was the firſt who taught the art of oratory at Rome in Latin; which Cicero ſays, was while he was a boy; and when the moſt ſtudious perſons went to hear him, he lamented that he could not go with them; being prevented by the regard he paid to the opinion of ſome of his friends, who thought that greater improvements were made by exerciſes in the Greek language under Grecian maſters. Seneca adds, that this profeſſion continued for ſome time in the hands of freedmen; and that the firſt Roman who engaged in it was Blandus of the equeſtrian order, who was ſucceeded by others; ſome of whoſe lives are yet extant, written by Suetonius, as many of the Grecians' are by Philoſtratus and Eunapius. Quintilian likewiſe gives us the names of thoſe among the Romans, who wrote upon the art. "The firſt (ſays he), as far as I can learn, who compoſed any thing upon this argument, was M. Cato the cenſor. After him Antony the orator began upon the ſubject, which is the only work he left, and that imperfect. Then followed ſome of leſs note. [illegible] who carried eloquence to its higheſt pitch among us, was Cicero; who has likewiſe by his rules given the beſt plan both to practiſe and teach the art. After whom modeſty would require us to mention no more, had he not told us himſelf, that his books of rhetoric ſlipt out of his hands, while he was but a youth. And thoſe leſſer things which many perſons want, he has purpoſely omitted in his diſcourſes of oratory. Cornificius wrote largely upon the ſame ſubject; Stertinius and Gallio the father, each of them ſomething. But Celſus and Lenas were more accurate than Gallio; and in our times Virginius, Pliny, and Rutilius. And there are at this day ſome celebrated authors of the ſame kind, who, if they had taken in every thing, might have ſaved my pains." Time has ſince deprived us of moſt of the writers mentioned here by Quintilian. But we have the leſs reaſon to regret this loſs, ſince it has preſerved to us Cicero's treatiſes upon this ſubject; which we may well ſuppoſe to have been chiefly owing to their own excellency, and the great eſteem they have always had in the world. Beſides his *Two Books of Invention*, which Quintilian here calls his *Books of Rhetoric*, they are extant of his, *Three Books of an Orator*; one *Of famous Orators*; and another, which is called *The Orator*; as alſo his *Topics*, a preface *Concerning the beſt ſort of Orators*, and a treatiſe *Of the parts of Oratory*. Each of which treatiſes, whether we regard the juſtneſs and delicacy of the thoughts, the uſefulneſs of the rules, or the elegance and beauty of the ſtyle, deſerves to be frequently peruſed by all who are lovers eloquence. For who can be thought ſo well qualified to give the rules of any art, as he who excelled all mankind in the practice of them? But thoſe *Four books to Herennius*, which are publiſhed among Cicero's works, ſeem with good reaſon to be attributed to Cornificius, whom Quintilian here mentions. And Celſus is by ſome affirmed to have taught oratory, whom he alſo places among the rhetoricians, and whoſe *Eight books of Medicine* are yet extant, written in ſo beautiful a ſtyle, as plainly ſhows him to be a maſter of eloquence. But Quintilian himſelf outdid all who went before him in diligence and accuracy as a writer. His *Inſtitutions* are ſo comprehenſive, and written with ſuch great exactneſs and judgment, that they are generally allowed to be the moſt perfect work of the kind. With this excellent author we ſhall finiſh the account of the Latin rhetoricians.

There were indeed ſome others in the following ages, whoſe works are yet extant; but as they contain nothing of moment which is not to be found in thoſe already mentioned, we ſhall

forbear to name them. Much leſs ſhall we deſcend to that numerous body of writers, who ſince the revival of learning have treated upon this ſubject, for the ſame reaſon. And the archbiſhop of Cambray has given it as his opinion, that the method of forming the beſt ſyſtem of oratory, is to collect it from the fineſt precepts of Ariſtotle, Cicero, Quintilian, Longinus, and other celebrated authors; with proper examples taken from the choiceſt parts of the pureſt antiquity. And this is the method attempted to be purſued in the following treatiſe.

Of the Nature of Oratory.

The buſineſs of oratory is to teach us to ſpeak well; which, as Cicero explains it, is to ſpeak *juſtly*, *methodically*, *floridly*, and *copiouſly*.

Now, in order to ſpeak *juſtly*, or pertinently, a perſon muſt be maſter of his ſubject, that he may be able to ſay all that is proper, and avoid whatever may appear foreign and trifling. And he muſt clothe his thoughts with ſuch words and expreſſions as are moſt ſuited to the nature of the argument, and will give it the greateſt force and evidence.

And as it teaches to ſpeak juſtly, ſo likewiſe *methodically*. This requires, that all the parts of a diſcourſe be placed in their proper order, and with ſuch juſt connection, as to reflect a light upon each other, and thereby to render the whole both clear in itſelf, and eaſy to be retained. But the ſame method is not proper for all diſcourſes. And very frequently a different manner is convenient in handling the ſame ſubject. For it is plain, that art, as well as nature, loves variety; and it diſcovers the ſpeaker's judgment, when the diſpoſition of his diſcourſe is ſo framed, as to appear eaſy and natural, rather than the effect of induſtry and labour.

To ſpeak *floridly*, is ſo peculiar a property of this art, that ſome have wholly confined it to the pomp and ornaments of language. But that it extends farther, and reſpects things as well as words, we ſhall have occaſion to ſhow hereafter. It contains indeed the whole ſubject of elocution, but does not wholly conſiſt in it. True and ſolid eloquence requires not only the beauties and flowers of language, but likewiſe the beſt ſenſe and cleareſt reaſoning. Beſides, rhetoric gives rules for the ſeveral ſorts of ſtyle, and directs the uſe of them agreeably to the nature of the ſubject.

But the force of oratory appears in nothing more than a *copiouſneſs* of expreſſion, or a proper manner of enlargement, ſuited to the nature of the ſubject; which is of great uſe in perſuaſion, and forms the laſt property, required by Cicero, of ſpeaking well. A ſhort and conciſe account of things is often attended with obſcurity, from an omiſſion of ſome neceſſary circumſtances relating to them. Or, however, where that is not the caſe, yet for want of proper embelliſhments to enliven the diſcourſe, and thereby to excite and fix the hearers' attention, it is apt to ſlip through their minds without leaving any impreſſion. But where the images of things are drawn in their full proportion, painted in their proper colours, ſet in a clear light, and repreſented in different views, with all the ſtrength and beauties of eloquence, they captivate the minds of the audience with the higheſt pleaſure, engage their attention, and by an irreſiſtible force move and bend them to the deſign of the ſpeaker.

The principal end and deſign of oratory is to perſuade: for which reaſon it is frequently called the *art of perſuaſion*. Indeed the orator has often other ſubordinate views: as when he endeavours either to delight his hearers with what is pleaſant and agreeable, or to conciliate their good opinion by a ſmooth and artful addreſs: but ſtill both theſe are in order to perſuade and excite them to action.

An objection may, perhaps, hence be formed againſt eloquence, as an art which may be employed for perſuading to ill as well as to good. There is no doubt that it may; and ſo reaſoning may alſo be, and too often is, employed for leading men into error. But who would think of forming an argument from this againſt the cultivation of our reaſoning powers? Reaſon, eloquence, and every art which ever has been ſtudied among mankind, may be abuſed, and may prove dangerous in the hands of bad men; but it were perfectly childiſh to contend, that upon this account they ought to be aboliſhed.

While the orator employs his art in purſuing only thoſe ends for which it was at firſt deſigned, the perſuading men to good and virtuous actions, and diſſuading them from every thing that is ill and vicious, nothing can be more commendable in itſelf, or uſeful to human ſocieties.

Of the Diviſion of Oratory.

Oratory conſiſts of four parts; *invention*, *diſpoſition*, *elocution*, and *pronunciation*. This will appear by conſidering the nature of each of them, and what it contributes in forming an orator. Every one who aims to ſpeak well and accurately upon any ſubject, does naturally in the firſt place inquire after and purſue ſuch thoughts as may ſeem moſt proper to explain and illuſtrate the thing upon which he deſigns to diſcourſe. And if the nature of it requires that he ſhould bring reaſons to confirm what he ſays, he not only ſeeks the ſtrongeſt, and ſuch as are like to be beſt received; but alſo prepares to anſwer any thing which may be offered to the contrary. This is *invention*. —After this he deliberates with himſelf in what method to diſpoſe of thoſe things which have occurred to his mind, that they may appear in the plaineſt light, and not loſe their force by diſorder and confuſion. This is the buſineſs of *diſpoſition*.—His next concern is to give his thoughts an agreeable dreſs; by making choice of the fitteſt words, cleareſt expreſſions, ſmooth and harmonious periods, with other ornaments of ſtyle, as may beſt ſuit the nature of his ſubject, brighten his diſcourſe, and render it moſt entertaining to his hearers. And this is called *elocution*.—The laſt thing he attends to, is to deliver what he has thus compoſed, with a juſt and agreeable *pronunciation*. And daily experience convinces us, how much this contributes both to engage the attention and impreſs what is ſpoken upon the mind. This then is the method to which nature directs, in order to qualify ourſelves for diſcourſing to the beſt advantage: though by cuſtom and habit theſe things become ſo familiar to us, that we do not always attend to them ſeparately in their natural order. However, it is the buſineſs of art to follow nature, and to treat of things in that manner which ſhe dictates.

Part I. Of INVENTION.

Chap. I. *Of Invention in general; and particularly of Common Places, and State of a Cauſe.*

Invention, conſidered in general, is the diſcovery of ſuch things as are proper to perſuade. And in order to attain this end, the orator propoſes to himſelf three things: To prove or illuſtrate the ſubject upon which he treats; to conciliate the minds of his hearers; and to engage their paſſions in his favour. And as theſe require different kinds of arguments or motives, invention furniſhes him with a ſupply for each of them, as will be ſhown in their order.

An argument as defined by Cicero, is a reaſon which induces us to believe what before we doubted of.

And as different kinds of diſcourſes require different arguments, rhetoricians have conſidered them two ways; in general, under certain heads, as a common fund for all ſubjects; and in a more particular manner, as they are ſuited to *demonſtrative*, *deliberative*, or *judicial* diſcourſes. At preſent we ſhall treat only upon the former of theſe. And now, that one thing may receive proof and confirmation from another, it is neceſſary that there be ſome relation between them; for all things are not equally adapted to prove one another. Thus, in meaſuring the quantity of two things which we would ſhow to be either equal or unequal, if they are of ſuch a nature that one cannot be applied to the other, then we take a third thing, which may be applied to them both; and that muſt be equal at leaſt to one of the two, which if applied to the other, and found equal to that alſo, we preſently conclude that theſe two things are equal; but if it be unequal to the other, we ſay that theſe two things are unequal. Becauſe it is the certain and known property of all quantities, that whatſoever two things are equal to a third, are equal to one another; and where one of any two things is equal to a third, and the other unequal, thoſe two things are unequal to one another. What has been ſaid of quantities, will hold true in all other caſes, that ſo far as any two things or ideas agree to a third, ſo far they agree to one another. So likewiſe, on the contrary, as far as one of any two things or ideas does agree to a third, and the other does not, ſo far they diſagree with one another; in which reſpect, one of them cannot be truly affirmed of the other. Since, therefore, in every propoſition, one thing is ſpoken of another, if we would find out whether the two ideas agree to each other or not, where this is not evident of itſelf, we muſt find out ſome third thing, the idea of which agrees to one of them; and then that being applied to the other, as it does agree or diſagree with it, ſo we may conclude, that the two things propoſed do agree or diſagree with one another. This will be made more clear by an example or two. Should it be inquired, *Whether virtue is to be loved*; the agreement between virtue and love might be found by comparing them ſeparately with happineſs, as a common meaſure to both. For ſince the idea of happineſs agrees to that of love, and the idea of virtue to that of happineſs; it follows, that the ideas of virtue and love agree to one another: and therefore it may be affirmed, *That virtue is to be loved*. But on the contrary, becauſe the idea of miſery diſagrees with that of love, but the idea of vice agrees to that of miſery, the two ideas of vice and love muſt conſequently diſagree with one another; and therefore it would be falſe to aſſert, *That vice is to be loved*. Now, this third thing logicians call the *medium* or *middle term*, becauſe it does as it were connect two extremes; that is, both parts of a propoſition. But rhetoricians call it an *argument*, becauſe it is ſo applied to what was before propoſed, as to become the inſtrument of procuring our aſſent to it. Thus far as to the nature and uſe of arguments. We ſhall next explain by what methods they are to be ſought.

A lively imagination, and readineſs of thought, are undoubtedly a very great help to invention. Some perſons are naturally endowed with that quickneſs of fancy, and penetration of mind, that they are ſeldom at a loſs for arguments either to defend their own opinions, or to attack their adverſaries. However, theſe things being the gift of nature, and not to be gained by art, do not properly fall under our preſent conſideration.

It will be readily granted, that great learning and extenſive knowledge are a noble fund for invention. An orator therefore ſhould be furniſhed with a ſtock of important truths, ſolid maxims of reaſon, and a variety of knowledge, collected and treaſured up both from obſervation and a large acquaintance with the liberal arts; that he may not only be qualified to expreſs himſelf in the moſt agreeable manner, but likewiſe to ſupport what he ſays with the ſtrongeſt and cleareſt arguments.

But becauſe all are not born with a like happy genius, and have not the ſame opportunity to cultivate their minds with learning and knowledge; and becauſe nothing is more difficult than to dwell long upon the conſideration of one thing, in order to find out the ſtrongeſt arguments which may be offered for and againſt it; upon theſe accounts, art has preſcribed a method to leſſen, in ſome meaſure, theſe difficulties, and help every one to a ſupply of arguments upon any ſubject. And this is done by the contrivance of *common places*, which Cicero calls the *ſeats* or *heads of arguments*, and by a Greek name *topics*. They are of two ſorts, *internal* and *external*.

I. *Internal topics*. Though things, with regard to their nature and properties, are exceedingly various, yet they have certain common relations, by means whereof the truth of what is either affirmed or denied concerning them in any reſpect may be evinced. The ancient Greek rhetoricians therefore reduced theſe relations to ſome general heads, which are termed *loci* or *common places*; becauſe the reaſons or arguments ſuited to prove any propoſition are repoſited in them, as a common fund or receptacle. And they are called *internal heads*, becauſe they ariſe from the ſubject upon which the orator treats; and are therefore diſtinguiſhed from others named *external*, which he fetches from without, and applies to his preſent purpoſe, as will be ſhown hereafter. Cicero and Quintilian make them 16; three of which comprehend the whole thing they are brought to prove, namely, *definition*, *enumeration*, and *notation*: of the remaining 13, ſome contain a part of it, and the reſt its various properties and circumſtances, with other conſiderations relating to it; and theſe are, *genus*, *ſpecies*, *antecedents*, *conſequents*, *adjuncts*, *conjugates*, *cauſe*, *effect*, *contraries*, *oppoſites*, *ſimilitude*, *diſſimilitude*, and *compariſon*.

Definition explains the nature of the thing defined, and ſhows what it is. And to whatſoever the definition agrees, the thing defined does ſo likewiſe. If therefore Socrates be a rational creature, he is a man; becauſe it is the definition of a man, that he is a rational creature.

Enumeration takes in all the parts of a thing. And from this we prove, that what agrees to all the parts agrees to the whole; and what does not agree to any one or more parts, does not agree to the whole: As when Cicero proves to Piſo that all the Roman ſtate hated him, by enumerating the ſeveral ranks and orders of Roman citizens who all did ſo.

Notation, or etymology, explains the meaning or ſignification of a word. From which we reaſon thus: "If he cannot pay his debts, he is inſolvent;" for that is the meaning of the word *inſolvent*.

Genus is what contains under it two or more ſorts of things, differing in nature. From this head logicians reaſon thus: "Becauſe every animal is mortal, and man is an animal, therefore man is mortal." But orators make a further uſe of this argument, which they call *aſcending from the hypotheſis to the theſis*; that is, from a particular to a general: As ſhould a perſon, when ſpeaking in praiſe of juſtice, take occaſion from thence to commend and ſhow the excellency of virtue in general, with a view to render that particular virtue more amiable. For ſince every ſpecies contains in it the whole nature of the genus to which it relates, beſides what is peculiar to itſelf, whereby it is diſtinguiſhed from it; what is affirmed of the genus, muſt of neceſſity be applicable to the ſpecies.

Species is that which comprehends under it all the individuals of the ſame nature. From hence we may argue, "He is a man, therefore he has a rational ſoul." And orators ſometimes take occaſion from this head to deſcend from the theſis to the

hypotheſis; that is, in treating upon what is more general, to introduce ſome particular contained under it, for the greater illuſtration of the general.

Antecedents are ſuch things, as, being once allowed, others neceſſarily, or very probably, follow. From this head an inſeparable property is proved from its ſubject: as, It is material, and therefore corruptible.

Conſequents are ſuch things as, being allowed, neceſſarily or very probably infer their antecedents. Hence the ſubject is proved from an inſeparable property, in this manner: It is corruptible, and therefore material.

Adjuncts are ſeparable properties of things, or circumſtances that attend them. Theſe are very numerous, and afford a great variety of arguments, ſome of which uſually occur in every diſcourſe. They do not neceſſarily infer their ſubject; but, if fitly choſen, render a thing credible, and are a ſufficient ground for aſſent. The way of reaſoning from them we ſhall ſhow preſently.

Conjugates are words deduced from the ſame origin with that of our ſubject. By theſe the habit is proved from its acts: as, He who does juſtly is juſt. He does not act wiſely, therefore he is not wiſe. But this inference will not hold, unleſs the actions appear continued and conſtant.

A *cauſe* is that, by the force of which a thing does exiſt. There are four kinds of cauſes, matter, form, efficient, and end, which afford a great variety of arguments. The way of reaſoning from them is to infer the effect from the cauſe: as, Man is endowed with reaſon, therefore he is capable of knowledge.

An *effect* is that which ariſes from a cauſe, therefore the cauſe is proved by it: as, He is endowed with knowledge, therefore with reaſon.

Contraries are things, which, under the ſame genus, are at the utmoſt diſtance from each other; ſo that what we grant to the one, we utterly deny the other: as, Virtue ought to be embraced, therefore vice ſhould be avoided.

Oppoſites are ſuch things, which, though repugnant to each other, yet are not directly contradictory: as, To love and to injure, to hate and to commend. They differ from contraries in this, that they do not abſolutely exclude one another. An argument is drawn from things repugnant, thus: He will do a man a miſchief, therefore he does not love him. He loves a man, therefore he will not reproach him.

Similitude is an agreement of things in quality. Thus Cicero proves, that pernicious citizens ought to be taken out of the ſtate; by the likeneſs they bear to corrupted members, which are cut off to prevent further damage to the body.

Diſſimilitude is a diſagreement of things in quality. From this head Cicero ſhows the preference of his own exile to Piſo's government of Macedonia; by the difference between their conduct, and the people's eſteem of them.

Compariſon is made three ways: for either a thing is compared with a greater, with a leſs, or with its equal. This place, therefore, differs from that of ſimilitude on this account, that the quality was conſidered in that, but here the quantity. An argument from the greater is thus drawn: If five legions could not conquer the enemy, much leſs will two.

We ſhall juſt give one example of the manner of reaſoning from theſe heads, whereby the uſe of them may further appear. If any one, therefore, ſhould have endeavoured to perſuade Cicero not to accept of his life upon the condition offered him by Antony, That he would burn his Philippic orations which had been ſpoken againſt him, he might be ſuppoſed to uſe ſuch arguments as theſe; partly taken from the adjuncts of Cicero, partly from thoſe of Antony, and partly from the thing itſelf. And firſt with regard to Cicero, it might be ſaid, That ſo great a man ought not to purchaſe his life at ſo dear a price as the loſs of that immortal honour which by ſo great pains and labour he had acquired. And this might be confirmed by another argument, That now he was grown old, and could not expect to live much longer. And from the character of Antony he might argue thus: That he was very crafty and deceitful; and only deſigned, by giving him hopes of life, to have the Philippics firſt burnt, which otherwiſe he knew would tranſmit to poſterity an eternal brand of infamy upon him; and then he would take off the author. And this might be ſhown by compariſon. For ſince he would not ſpare others, who had not ſo highly exaſperated him, and from whom he had not ſo much to fear; certainly he would not forgive Cicero, ſince he knew well enough, that ſo long as he lived, he himſelf could never be in ſafety. And, laſtly, an argument might alſo be fetched from the nature of the thing itſelf, in the following manner: That Cicero by this action would ſhamefully betray the ſtate, and the cauſe of liberty, which he had through his whole life moſt courageouſly defended, with ſo great honour to himſelf, and advantage to the public. Upon ſuch an account, a perſon might have uſed theſe or the like arguments with Cicero, which ariſe from the forementioned heads.

From this account of common places, it is eaſy to conceive what a large field of diſcourſe they open to the mind upon every ſubject. At the ſame time, though we have mentioned them from our reſpect for the orators of Greece and Rome, we heartily ſubſcribe to the opinion of a celebrated modern, who gives of them the following account.

"The Grecian ſophiſts were the firſt inventors of this artificial ſyſtem of Oratory; and they ſhowed a prodigious ſubtilty and fertility in the contrivance of theſe loci. Succeeding rhetoricians, dazzled by the plan, wrought them into ſo regular a ſyſtem, that one would think they meant to teach how a perſon might mechanically become an orator, without any genius at all. They gave him receipts for making ſpeeches on all manner of ſubjects. At the ſame time, it is evident, that though this ſtudy of common places might produce very ſhowy academical declamations, it could never produce uſeful diſcourſes on real buſineſs. The loci indeed ſupplied a moſt exuberant fecundity of matter. One who had no other aim, but to talk copiouſly and plauſibly, by conſulting them on every ſubject, and laying hold of all that they ſuggeſted, might diſcourſe without end; and that, too, though he had none but the moſt ſuperficial knowledge of his ſubject. But ſuch diſcourſe could be no other than trivial. What is truly ſolid and perſuaſive, muſt be drawn *ex viſceribus cauſæ*, from a thorough knowledge of the ſubject, and a profound meditation on it. They who would direct ſtudents of oratory to any other ſources of argumentation, only delude them; and by attempting to render rhetoric too perfect an art, they render it, in truth, a trifling and childiſh ſtudy."

II. *Of external topics.* When the orator reaſons from ſuch topics as do not ariſe from his ſubject, but from things of a different nature, theſe are called *external*. They are all taken from authorities, and are by one general name called *Teſtimonies*.

Now a teſtimony may be expreſſed by writing, ſpeech, or any other ſign proper to declare a perſon's mind. And all teſtimonies may be diſtinguiſhed into two ſorts, divine and human. A divine teſtimony, when certainly known to be ſuch, is inconteſtable, and admits of no debate, but ſhould be acquieſced in without heſitation. Indeed the ancient Greeks and Romans eſteemed the pretended oracles of their deities, the anſwers of their augurs, and the like fallacies, divine teſtimonies: but with us no one can be ignorant of their true notion, though they do not ſo directly come under our preſent conſideration. Human

teſtimonies, conſidered as furniſhing the orator with arguments, may be reduced to three heads; *writings*, *witneſſes*, and *contracts*.

1. By *Writings*, here, are to be underſtood written laws, wills, or other legal inſtruments expreſſed and conveyed in that manner. And it is not ſo much the force and validity of ſuch teſtimonies, conſidered in themſelves, that is here intended, as the occaſion of diſpute which may at any time ariſe concerning their true deſign and import, when produced in proof upon either ſide of a controverſy. And theſe are five; Ambiguity, Diſagreement between the words and intention, Contrariety, Reaſoning, and Interpretation.

A writing is then ſaid to be ambiguous, when it is capable of two or more ſenſes, which makes the writer's deſign uncertain. Now ambiguity may ariſe either from ſingle words, or the conſtruction of ſentences. From ſingle words; as when either the ſenſe of a word, or the application of it, is doubtful. As, ſhould it be queſtioned, whether ready money ought to be included under the appellation of chattels left by a will; or, if a teſtator bequeath a certain legacy to his nephew Thomas, and he has two nephews of that name. But ambiguity is alſo ſometimes occaſioned from the conſtruction of a ſentence; as when ſeveral things or perſons having been already mentioned, it is doubtful to which of them that which follows ought to be referred. For example, a perſon writes thus in his will: 'Let my heir give as a legacy to Titius an horſe out of my ſtable, which he pleaſes.' Here it may be queſtioned, whether the word *he* refers to the heir or to Titius; and conſequently, whether the heir be allowed to give Titius which horſe he pleaſes, or Titius may chooſe which he likes beſt. Now as to controverſies of this kind, in the firſt caſe above-mentioned, the party who claims the chattels may plead, that all moveable goods come under that name, and therefore that he has a right to the money. This he will endeavour to prove from ſome inſtances where the word has been ſo uſed. The buſineſs of the oppoſite party is to refute this, by ſhowing that money is not there included. And if either ſide produce precedents in his favour, the other may endeavour to ſhow that the caſes are not parallel. As to the ſecond caſe, ariſing from an ambiguity in the name, if any other words or expreſſions in the will ſeem to countenance either of the claimants, he will not fail to interpret them to his advantage. So likewiſe, if any thing ſaid by the teſtator, in his lifetime, or any regard ſhown to either of theſe nephews more than the other, may help to determine which of them was intended, a proper uſe may be made of it. And the ſame may be ſaid with regard to the third caſe. In which the legatee may reaſon likewiſe from the common uſe of language, and ſhow that in ſuch expreſſions it is uſual to make the reference to the laſt or next antecedent; and from thence plead, that it was the deſign of the teſtator to give him the option. But in anſwer to this, it may be ſaid, that allowing it to be very often ſo, yet in this inſtance it ſeems more eaſy and natural to repeat the verb *give* after *pleaſes*, and ſo to ſupply the ſentence, *which he pleaſes to give him*, referring it to the heir; than to bring in the verb *chooſe*, which was not in the ſentence before; and ſo, by ſupplying the ſenſe, *which he pleaſes to chooſe*, to give the option to Titius. But where controverſies of this kind ariſe from a law, recourſe may be had to other laws where the ſame thing has been expreſſed with greater clearneſs; which may help to determine the ſenſe of the paſſage in diſpute.

A ſecond controverſy from writings is, when one party adheres to the words, and the other to what he aſſerts was the writer's intention. Now he who oppoſes the literal ſenſe, either contends, that what he himſelf offers is the ſimple and plain meaning of the writing, or that it muſt be ſo underſtood in the particular caſe in diſpute. An inſtance of the former is this, as we find it in Cicero. A perſon who died without children, but left a widow, had made this proviſion in his will: "If I have a ſon born to me, he ſhall be my heir." And a little after: "If my ſon die before he comes of age, let Curius be my heir." There is no ſon born: Curius therefore ſues for the eſtate, and pleads the intention of the teſtator, who deſigned him for his heir, if he ſhould have no ſon who arrived at age; and ſays, there can be no reaſon to ſuppoſe he did not intend the ſame perſon for his heir if he had no ſon, as if he ſhould have one who afterwards died in his minority. But the heir at law inſiſts upon the words of the will; which, as he ſays, require, that firſt a ſon ſhould be born, and afterwards die under age, before Curius can ſucceed to the inheritance; and there being no ſon, a ſubſtituted heir, as Curius was, can have no claim where the firſt heir does not exiſt, from whom he derives his pretenſion, and was to ſucceed by the appointment of the will.—Of the latter caſe, rhetoricians give this example: "It was forbidden by a law to open the city-gates in the night. A certain perſon notwithſtanding, in time of war, did open them in the night, and let in ſome auxiliary troops, to prevent their being cut off by the enemy, who was poſted near the town." Afterwards, when the war was over, this perſon is arraigned, and tried for his life on account of this action. Now, in ſuch a caſe, the proſecutor founds his charge upon the expreſs words of the law; and pleads, that no ſufficient reaſon can be aſſigned for going contrary to the letter of it, which would be to make a new law, and not to execute one already made. The defendant, on the other hand, alleges, That the fact he is charged with cannot, however, come within the intention of the law; ſince he either could not, or ought not, to have complied with the letter of it in that particular caſe, which muſt therefore neceſſarily be ſuppoſed to have been excepted in the deſign of that law when it was made. But to this the proſecutor may reply, That all ſuch exceptions as are intended by any law, are uſually expreſſed in it: and inſtances may be brought of particular exceptions expreſſed in ſome laws; and if there be any ſuch exception in the law under debate, it ſhould eſpecially be mentioned. He may further add, That to admit of exceptions not expreſſed in the law itſelf, is to enervate the force of all laws, by explaining them away, and in effect to render them uſeleſs. And this he may further corroborate, by comparing the law under debate with others, and conſidering its nature and importance, and how far the public intereſt of the ſtate is concerned in the due and regular execution of it; from whence he may infer, that ſhould exceptions be admitted in other laws of leſs conſequence, yet, however, they ought not in this. Laſtly, he may conſider the reaſon alleged by the defendant, on which he founds his plea, and ſhow there was not that neceſſity of violating the law in the preſent caſe, as is pretended. And this is often the more requiſite, becauſe the party who diſputes againſt the words of the law, always endeavours to ſupport his allegations from the equity of the caſe. If, therefore, this plea can be enervated, the main ſupport of the defendant's cauſe is removed. For as the former arguments are deſigned to prevail with the judge, to determine the matter on this ſide the queſtion from the nature of the caſe; ſo the intention of this argument is to induce him to it, from the weakneſs of the defence made by the oppoſite party. But the defendant will, on the contrary, uſe ſuch arguments as may beſt demonſtrate the equity of his cauſe, and endeavour to vindicate the fact from his good deſign and intention in doing it. He will ſay, That the laws have allotted puniſhments for the commiſſion of ſuch facts as are evil in themſelves, or prejudicial to others; neither of which can be charged upon the action for which he is accuſed: That no law can be rightly executed, if more regard be had to the words and ſyllables of the writing, than to the intention of the legiſlator. To which purpoſe, he may allege that direction of the law itſelf, which ſays, "The law ought not to be too rigorouſly interpreted, nor

the words of it ſtrained; but the true intention and deſign of each part of it duly conſidered." As alſo that ſaying of Cicero, "What law may not be weakened and deſtroyed, if we bend the ſenſe to the words, and do not regard the deſign and view of the legiſlator?" Hence he may take occaſion to complain of the hardſhip of ſuch a procedure, that no difference ſhould be made between an audacious and wilful crime, and an honeſt or neceſſary action, which might happen to diſagree with the letter of the law, though not with the intent of it. And as it was obſerved before to be of conſiderable ſervice to the accuſer, if he could remove the defendant's plea of equity; ſo it will be of equal advantage to the defendant, if he can fix upon any words in the law, which may in the leaſt ſeem to countenance his caſe, ſince this will take off the main force of the charge.

The third controverſy of this kind is, when two writings happen to claſh with each other, or at leaſt ſeem to do ſo. Of this Hermogenes gives the following inſtance. One law enjoins: "He who continues alone in a ſhip during a tempeſt, ſhall have the property of the ſhip." Another law ſays, "A diſinherited ſon ſhall enjoy no part of his father's eſtate." Now a ſon, who had been diſinherited by his father, happens to be in his father's ſhip in a tempeſt, and continues there alone, when every one elſe had deſerted it. He claims the ſhip by the former of theſe laws, and his brother tries his right with him by the latter. In ſuch caſes, therefore, it may firſt be conſidered, "Whether the two laws can be reconciled." And if that cannot be done, then, Which of them appears more equitable. Alſo, Whether one be poſitive, and the other negative: becauſe prohibitions are a ſort of exceptions to poſitive injunctions. Or, If one be a general law, and the other more particular, and come nearer to the matter in queſtion. Likewiſe, Which was laſt made: ſince former laws are often abrogated, either wholly or in part, by ſubſequent laws; or at leaſt were deſigned to be ſo. Laſtly, it may be obſerved, Whether one of the laws be not plain and expreſs; and the other more dubious, or has any ambiguity in it. All, or any of which things, that party will not omit to improve for his advantage whoſe intereſt is concerned in it.

The fourth controverſy is *reaſoning*. As when ſomething, not expreſsly provided for by a law, is inferred by a ſimilitude, or parity of reaſon, from what is contained in it. Quintilian mentions this inſtance of it. "There was a law made at Tarentum, to prohibit the exportation of wool; but a certain perſon exports ſheep." In this caſe, the proſecutor may firſt compare the thing which occaſions the charge, with the words of the law, and ſhow their agreement, and how unneceſſary it was that particular thing ſhould have been expreſsly mentioned in the law, ſince it is plainly contained in it, or at leaſt an evident conſequence from it. He may then plead, that many things of a like nature are omitted in other laws for the ſame reaſon. And, laſtly, he may urge the reaſonableneſs and equity of the procedure. The defendant, on the other hand, will endeavour to ſhow the deficiency of the reaſoning, and the difference between the two caſes. He will inſiſt upon the plain and expreſs words of the law, and ſet forth the ill tendency of ſuch inferences and concluſions drawn from ſimilitudes and compariſons, ſince there is ſcarce any thing but in ſome reſpect may bear a reſemblance to another.

The laſt controverſy under this head is *interpretation*, in which the diſpute turns upon the true meaning and explication of the law in reference to that particular caſe. We have the following inſtance of this in the Pandects: "A man who had two ſons, both under age, ſubſtitutes Titius as heir to him who ſhould die laſt, provided both of them died in their minority. They both periſh together at ſea before they came to age. Here ariſes a doubt, whether the ſubſtitution can take place, or whether the inheritance devolves to the heir at law." The latter pleads, That as neither of them can be ſaid to have died laſt, the ſubſtitution cannot take place; which was ſuſpended, upon the condition that one died after the other. But to this it may be ſaid, It was the intention of the teſtator, that if both died in their nonage, Titius ſhould ſucceed to the inheritance; and therefore it makes no difference whether they died together, or one after the other; and ſo the law determines it.

2. The *ſecond* head of external arguments are *Witneſſes*. Theſe may either give their evidence, when abſent, in writing ſubſcribed with their name; or preſent, by word of mouth. And what both of them teſtify, may either be from hearſay; or what they ſaw themſelves, and were preſent at the time it was done. As the weight of the evidence may be thought greater or leſs on each of theſe accounts, either party will make ſuch uſe of it as he finds for his advantage. The characters of the witneſſes are alſo to be conſidered; and if any thing be found in their lives or behaviour that is juſtly exceptionable, to invalidate their evidence, it ought not to be omitted. And how they are affected to the contending parties, or either of them, may deſerve conſideration; for ſome allowances may be judged reaſonable in caſe of friendſhip, or enmity, where there is no room for any other exception. But regard ſhould chiefly be had to what they teſtify, and how far the cauſe is affected by it. Cicero is very large upon moſt of theſe heads in his defence of Marcus Fonteius, with a deſign to weaken the evidence of the Gauls againſt him. And where witneſſes are produced on one ſide only, as orators ſometimes attempt to leſſen the credit of this kind of proof, by pleading that witneſſes are liable to be corrupted, or biaſſed by ſome prevailing intereſt or paſſion, to which arguments taken from the nature and circumſtances of things are not ſubject; it may be anſwered on the other hand, that ſophiſtical arguments and falſe colourings are not expoſed to infamy or puniſhment, whereas witneſſes are reſtrained by ſhame and penalties, nor would the law require them if they were not neceſſary.

3. The *third* and laſt head of external arguments are *Contracts*; which may be either public or private. By public are meant the tranſactions between different ſtates, as leagues, alliances, and the like, which depend upon the laws of nations, and come more properly under deliberative diſcourſes, to which we ſhall refer them. Thoſe are called *private*, which relate to leſſer bodies or ſocieties of men, and ſingle perſons; and may be either written or verbal. And it is not ſo much the true meaning and purport of them that is here conſidered, as their force and obligation. And, as the Roman law declares, "Nothing can be more agreeable to human faith, than that perſons ſhould ſtand to their agreements." Therefore, in controverſies of this kind, the party whoſe intereſt it is that the contract ſhould be maintained, will plead, that ſuch covenants have the force of private laws, and ought religiouſly to be obſerved, ſince the common affairs of mankind are tranſacted in that manner; and therefore to violate them, is to deſtroy all commerce and ſociety among men. On the other ſide it may be ſaid, that juſtice and equity are chiefly to be regarded, which are immutable; and beſides, that the public laws are the common rule to determine ſuch differences, which are deſigned to redreſs thoſe who are aggrieved. And, indeed, where a compact has been obtained by force or fraud, it is in itſelf void, and has no effect either in law or reaſon. But on the other hand, the Roman lawyers ſeem to have very rightly determined, that all ſuch obligations as are founded on natural equity, though not binding by national laws, and are therefore called *nuda pacta*, ought, however, in honour and conſcience to be performed.

III. *Of the State of a Controverſy*. The ancients, obſerving that the principal queſtion or point of diſpute in all controverſies might be referred to ſome particular head, reduced thoſe heads to a certain number, that both the nature of the queſtion might by that means be better known, and the arguments ſuited to

it be discovered with greater ease. And these heads they call *states*.

By the state of a controversy, then, we are to understand the principal point in dispute between contending parties, upon the proof of which the whole cause or controversy depends. We find it expressed by several other names in ancient writers: as the *constitution of the cause*, the *general head*, and the *chief question*. And as this is the principal thing to be attended to in every such discourse; so it is what first requires the consideration of the speaker, and should be well fixed and digested in his mind, before he proceeds to look for arguments proper to support it. Thus Anthony, the Roman orator, speaking of his own method in his pleading, says: "When I understand the nature of the cause, and begin to consider it, the first thing I endeavour to do is, to settle with myself what that is to which all my discourse relating to the matter in dispute ought to be referred: then I diligently attend to these other two things, How to recommend myself, or those for whom I plead, to the good esteem of my hearers; and how to influence their minds, as may best suit my design." This way of proceeding appears very agreeable to reason and prudence. For what can be more absurd, than for a person to attempt the proof of any thing, before he has well settled in his own mind a clear and distinct notion what the thing is which he would endeavour to prove? Quintilian describes it to be, 'That kind of question which arises from the first conflict of causes.' In judicial cases, it immediately follows upon the charge of the plaintiff, and plea of the defendant. Our common law expresses it by one word, namely the *issue*. Which interpreters explain by describing it to be, "That point of matter depending in suit, whereupon the parties join, and put their cause to the trial." Examples will further help to illustrate this, and render it more evident. In the cause of Milo, the charge of the Clodian party is, *Milo killed Clodius*. Milo's plea or defence, *I killed him, but justly*. From hence arises this grand question or state of the cause, *Whether it was lawful for Milo to kill Clodius?* And that Clodius was lawfully killed by Milo, is what Cicero in his defence of Milo principally endeavours to prove. This is the main subject of that fine and beautiful oration. The whole of his discourse is to be considered as centering at last in this one point. Whatever different matters are occasionally mentioned, will, if closely attended to, be found to have been introduced some way or other the better to support and carry on this design. Now in such cases, where the fact is not denied, but something is offered in its defence, the state of the cause is taken from the defendant's plea, who is obliged to make it good: As in the instance here given, the chief point in dispute was the lawfulness of Milo's action, which it was Cicero's business to demonstrate. But when the defendant denies the fact, the state of the cause arises from the accusation; the proof of which then lies upon the plaintiff, and not, as in the former case, upon the defendant. So in the cause of Roscius, the charge made against him is, *That he killed his father*. But he denies the fact. The grand question therefore to be argued is, *Whether or not he killed his father?* The proof of this lay upon his accusers. And Cicero's design in his defence of him is to show, that they had not made good their charge. But it sometimes happens, that the defendant neither absolutely denies the fact, nor attempts to justify it, but only endeavours to qualify it, by denying that it is a crime of that nature, or deserves that name, by which it is expressed in the charge. We have an example of this proposed by Cicero: "A person is accused of sacrilege, for taking a thing that was sacred out of a private house. He owns the fact, but denies it to be sacrilege; since it was committed in a private house, and not in a temple." Hence this question arises, *Whether to take a sacred thing out of a private house, is to be deemed sacrilege, or only simple theft?* It lies upon the accuser to prove what the other denies; and therefore the state of the cause is here also, as well as in the preceding case, taken from the indictment.

But besides the principal question, there are other subordinate questions, which follow upon it in the course of a dispute, and should be carefully distinguished from it. Particularly that which arises from the reason, or argument, which is brought in proof of the principal question. For the principal question itself proves nothing, but is the thing to be proved, and becomes at last the conclusion of the discourse. Thus, in the cause of Milo, his argument is, *I killed Clodius justly, because he assassinated me*. Unless the Clodian party be supposed to deny this, they give up their cause. From hence therefore this subordinate question follows, *Whether Clodius assassinated Milo?* Now Cicero spends much time in the proof of this, as the hinge on which the first question, and consequently the whole cause, depended. For if this was once made to appear, the lawfulness of Milo's killing Clodius, which was the grand question or thing to be proved, might be inferred as an allowed consequence from it. This will be evident, by throwing Milo's argument, as used by Cicero, into the form of a syllogism.

An assassin is lawfully killed:
Clodius was an assassin:
Therefore he was lawfully killed by Milo, whom he assassinated.

If the minor proposition of this syllogism was granted, no one would deny the conclusion: for the Roman law allowed of self-defence. But as Cicero was very sensible this would not be admitted, so he takes much pains to bring the court into the belief of it. Now where the argument brought in defence of the second question is contested, or the orator supposes that it may be so, and therefore supports that with another argument, this occasions a third question consequent upon the former; and in like manner he may proceed to a fourth. But be they more or fewer, they are to be considered but as one chain of subordinate questions dependent upon the first. And though each of them has its particular state, yet none of these is what rhetoricians call *The State of the Cause*, which is to be understood only of the principal question. And if, as it frequently happens, the first or principal question is itself directly proved from more than one argument; this makes no other difference, but that each of these arguments, so far as they are followed by others to support them, become a distinct series of subordinate questions, all dependent upon the first. As when Cicero endeavours to prove that Roscius, did not kill his father from two reasons or arguments: *Because he had neither any cause to move him to such a barbarous action, nor any opportunity for it.*

Moreover, besides these subordinate questions, there are also incidental ones often introduced, which have some reference to the principal question, and contribute towards the proof of it, though they are not necessarily connected with it, or dependent upon it. And each of these also has its state, though different from that of the cause. For every question, or point of controversy, must be stated before it can be made the subject of disputation. And it is for this reason that every new argument advanced by an orator is called a *question*; because it is considered as a fresh matter of controversy. In Cicero's defence of Milo, we meet with several of this sort of questions, occasioned by some aspersions which had been thrown out by the Clodian party to the prejudice of Milo. As, "That he was unworthy to see the light, who owned he had killed a man:" For Milo, before his trial, had openly confessed he killed Clodius. So likewise, "That the senate had declared the killing of Clodius was an illegal action." And further, "That Pompey, by making a new law to settle the manner of Milo's trial, had given his judgment against Milo." Now to each of these Cicero replies, before he proceeds to the principal question. And therefore, though the question, in which the state of a controversy consists, is said by Quintilian to arise from "the first conflict of

cauſes," yet we find, by this inſtance of Cicero, that it is not always the firſt queſtion in order, upon which the orator treats.

But it ſometimes happens, that the ſame cauſe or controverſy contains in it more than one ſtate. Thus in judicial cauſes, every diſtinct charge occaſions a new ſtate. All Cicero's orations againſt Verres relate to one cauſe, founded upon a law of the Romans againſt unjuſt exactions made by their governors of provinces upon the inhabitants; but as that proſecution is made up of as many charges as there are orations, every charge, or indictment, has its different ſtate. So likewiſe his oration in defence of Cœlius has two ſtates, in anſwer to a double charge made againſt him by his adverſaries: one, "for borrowing money of Clodia, in order to bribe certain ſlaves to kill a foreign ambaſſador;" and the other, "for an attempt afterward to poiſon Clodia herſelf." Beſides which, there were ſeveral other matters of a leſs heinous nature, which had been thrown upon him by his accuſers, with a deſign very likely to render the two principal charges more credible; to which Cicero firſt replies, in the ſame manner as in his defence of Milo.

Though all the examples we have hitherto brought to illuſtrate this ſubject have been taken from judicial caſes; yet not only theſe, but very frequently diſcourſes of the deliberative kind, and ſometimes thoſe of the demonſtrative, are managed in a controverſial way. And all controverſies have their ſtate. And therefore Quintilian very juſtly obſerves, that "ſtates belong both to general and particular queſtions; and to all ſorts of cauſes, demonſtrative, deliberative, and judicial." In Cicero's oration for the Manilian law, this is the main point in diſpute between him and thoſe who oppoſed that law: "Whether Pompey was the fitteſt perſon to be entruſted with the management of the war againſt Mithridates? This is a ſubject of the deliberative kind. And of the ſame nature was that debate in the ſenate concerning the demolition of Carthage. For the matter in diſpute between Cato, who argued for it, and thoſe who were of the contrary opinion, ſeems to have been this: "Whether it was for the intereſt of the Romans to demoliſh Carthage?" And ſo likewiſe in thoſe two fine orations of Cato and Cæſar, given us by Salluſt, relating to the conſpirators with Catiline, who were then in cuſtody, the controverſy turns upon this: "Whether thoſe priſoners ſhould be puniſhed with death, or perpetual impriſonment?" Examples of the demonſtrative kind are not ſo common; but Cicero's oration concerning the 'Anſwers of the ſoothſayers' may afford us an inſtance of it. Several prodigies had lately happened at Rome; upon which the ſoothſayers being conſulted, aſſigned this as the reaſon of them, Becauſe ſome places conſecrated to the gods had been afterwards converted to civil uſes. Clodius charged this upon Cicero; whoſe houſe was rebuilt at the public expence, after it had been demoliſhed by Clodius, and the ground conſecrated to the goddeſs Liberty. Cicero in this oration retorts the charge; and ſhows that the prodigies did not reſpect him, but Clodius. So that the queſtion in diſpute was, "To which of the two thoſe prodigies related?" This oration does not appear to have been ſpoken in a judicial way, and muſt therefore belong to the demonſtrative kind. His invective againſt Piſo is likewiſe much of the ſame nature, wherein he compares his own behaviour and conduct with that of Piſo.

As to the number of theſe ſtates, both Cicero and Quintilian reduce them to three. "We muſt (ſays Quintilian) agree with thoſe, whoſe authority Cicero follows, who tells us, that three things may be inquired into in all diſputes: Whether a thing is; what it is; and how it is. And this is the method which nature preſcribes. For, in the firſt place, it is neceſſary that the thing ſhould exiſt about which the diſpute is; becauſe no judgment can be made either of its nature or quality till its exiſtence be manifeſt; which is therefore the firſt queſtion. But though it be manifeſt that a thing is, it does not preſently appear what it is; and when this is known, the quality yet remains: and after theſe three are ſettled, no farther inquiry is neceſſary." Now the firſt of theſe three ſtates is called the *conjectural ſtate*; as if it be inquired, "Whether one perſon killed another?" This always follows upon the denial of a fact, by one of the parties; as was the caſe of Roſcius. And it receives its name from hence, that the judge is left, as it were, to conjecture, whether the fact was really committed or not, from the evidence produced on the other ſide. The ſecond is called the *definitive ſtate*, when the fact is not denied; but the diſpute turns upon the nature of it, and what name it is proper to give it; as in that example of Cicero, "Whether to take a ſacred thing out of a private houſe be theft, or ſacrilege?" For in this caſe it is neceſſary to ſettle the diſtinct notion of thoſe two crimes, and ſhow their difference. The third is called the *ſtate of quality*; when the contending parties are agreed both as to the fact, and the nature of it; but the diſpute is, "Whether it be juſt or unjuſt, profitable or unprofitable, and the like;" as in the cauſe of Milo.

From what has been ſaid upon this ſubject, the uſe of it may in a good meaſure appear. For whoever engages in a controverſy, ought in the firſt place to conſider with himſelf the main queſtion in diſpute, to fix it well in his mind, and keep it conſtantly in his view; without which he will be very liable to ramble from the point, and bewilder both himſelf and his hearers. And it is no leſs the buſineſs of the hearers principally to attend to this; by which means they will be helped to diſtinguiſh and ſeparate from the principal queſtion what is only incidental, and to obſerve how far the principal queſtion is affected by it; to perceive what is offered in proof, and what is only brought in for illuſtration; not to be miſled by digreſſions, but to diſcern when the ſpeaker goes of from his ſubject, and when he returns to it again; and, in a word, to accompany him through the whole diſcourſe, and carry with them the principal chain of reaſoning upon which the cauſe depends, ſo as to judge upon the whole, whether he has made out his point, and the concluſion follows from the premiſes.

Chap. II. *Of Arguments ſuited to Demonſtrative Diſcourſes.*

These conſiſt either in praiſe or diſpraiſe; and, agreeably to the nature of all contraries, one of them will ſerve to illuſtrate the other.

Now we either praiſe *perſons* or *things*.

I. In praiſing or diſpraiſing *perſons*, rhetoricians preſcribe two methods. One is, to the follow the order in which every thing happened that is mentioned in the diſcourſe; the other is, to reduce what is ſaid under certain general heads, without a ſtrict regard to the order of time.

1. In purſuing the former method, the diſcourſe may be very conveniently divided into three periods. The firſt of which will contain what preceded the perſon's birth; the ſecond, the whole courſe of his life; and the third, what followed upon his death.

Under the firſt of theſe may be comprehended what is proper to be ſaid concerning his country or family. And therefore, if theſe were honourable, it may be ſaid to his advantage, that he nowiſe diſgraced them, but acted ſuitably to ſuch a deſcent. But if they were not ſo, they may be either wholly omitted; or it may be ſaid, that, inſtead of deriving thence any advantage to his character, he has conferred a laſting honour upon them; and that it is not of ſo much moment where, or from whom, a perſon derives his birth, as how he lives.

In the ſecond period, which is that of his life, the qualities both of his mind and body, with his circumſtances in the world, may be ſeparately conſidered. Though, as Quintilian rightly obſerves, "all external advantages are not praiſes for themſelves, but according to the uſe that is made of them. For riches, and power, and intereſt, as they have great influence, and may be applied either to good or bad purpoſes, are a proof of the temper of our minds; and therefore we are either made better or worſe by them." But things are a juſt ground for commendation, when they are the reward of virtue or induſtry. Bodily

endowments are health, ſtrength, beauty, activity, and the like; which are more or leſs commendable, according as they are employed. And where theſe, or any of them, are wanting, it may be ſhown, that they are abundantly compenſated by the more valuable endowments of the mind. Nay, ſometimes a defect in theſe may give an advantageous turn to a perſon's character; for any virtue appears greater, in proportion to the diſadvantages the perſon laboured under in exerting it. But the chief topics of praiſe are taken from the virtues and qualifications of the mind. And here the orator may conſider the diſpoſition, education, learning, and ſeveral virtues, which ſhone through the whole courſe of the perſon's life. In doing which, the preference ſhould always be given to virtue above knowledge or any other accompliſhment. And in actions, thoſe are moſt conſiderable, and will be heard with greateſt approbation, which a perſon either did alone, or firſt, or wherein he had feweſt aſſociates; as likewiſe thoſe which exceeded expectation, or were done for the advantage of others rather than his own. And further, as the laſt ſcene of a man's life generally commands the greateſt regard, if any thing remarkable at that time was either ſaid or done, it ought particularly to be mentioned. Nor ſhould the manner of his death, or cauſe of it, if accompanied with any commendable circumſtances, be omitted; as, if he died in the ſervice of his country, or in the purſuit of any other laudable deſign.

The third and laſt period relates to what followed after the death of the perſon. And here the public loſs, and public honours conferred upon the deceaſed, are proper to be mentioned. Sepulchres, ſtatues, and other monuments to perpetuate the memory of the dead, at the expence of the public, were in common uſe both among the Greeks and Romans. But in the earlieſt times, as theſe honours were more rare, ſo they were leſs coſtly. For as in one age it was thought a ſufficient reward for him who died in the defence of his country, to have his name cut in a marble inſcription, with the cauſe of his death; ſo in others it was very common to ſee the ſtatues of gladiators, and perſons of the meaneſt rank, erected in public places. And therefore a judgment is to be formed of theſe things from the time, cuſtom, and circumſtances, of different nations; ſince the frequency of them renders them leſs honourable, and takes off from their evidence as the rewards of virtue. But, as Quintilian ſays, "Children are an honour to their parents, cities to their founders, laws to thoſe who compiled them, arts to their inventors, and uſeful cuſtoms to the authors of them."

And this may ſuffice for the method of praiſing perſons, when we propoſe to follow the order of time, as Iſocrates has done in his funeral oration upon Evagoras king of Salamis, and Pliny in his panegyric upon the emperor Trajan. But as this method is very plain and obvious, ſo it requires the more agreeable dreſs to render it delightful; leſt otherwiſe it ſeem rather like a hiſtory than an oration: For which reaſon, we find, that epic poets, as Homer, Virgil, and others, begin with the middle of their ſtory, and afterwards take a proper occaſion to introduce what preceded, to diverſify the ſubject, and give the greater pleaſure and entertainment to their readers.

2. The other method above hinted was, to reduce the diſcourſe to certain general heads without regarding the order of time. As if any one, in praiſing the elder Cato, ſhould propoſe to do it, by ſhewing that he was a moſt prudent ſenator, an excellent orator, and moſt valiant general; all which commendations are given him by Pliny. In like manner, the character of a good general may be compriſed under four heads; ſkill in military affairs, courage, authority, and ſucceſs: from all which Cicero commends Pompey. And agreeably to this method Suetonius has written the lives of the firſt twelve Cæſars.

But in the praiſing of perſons, care ſhould always be taken to ſay nothing that may ſeem fictitious or out of character, which may call the orator's judgment or integrity in queſtion. It was not without cauſe, therefore, that Lyſippus the ſtatuary, as Plutarch tells us, blamed Apelles for painting Alexander the Great with thunder in his hand; which could never ſuit his character as a man, however he might boaſt of his divine deſcent: for which reaſon Lyſippus himſelf made an image of him holding a ſpear, as the ſign of a warrior. Light and trivial things in commendations are likewiſe to be avoided, and nothing mentioned but what may carry in it the idea of ſomething truly valuable, and which the hearers may be ſuppoſed to wiſh for, and is proper to excite their emulation. Theſe are the principal heads of praiſe with relation to men. In diſpraiſe, the heads contrary to theſe are requiſite; which being ſufficiently clear from what has been ſaid, need not be particularly inſiſted on.

II. We proceed therefore to the other part of the diviſion, which reſpects *things*, as diſtinguiſhed from perſons. By which we are to underſtand all beings inferior to man, whether animate or inanimate; as likewiſe the habits and diſpoſitions of men, either good or bad, when conſidered ſeparately, and apart from their ſubjects, as arts and ſciences, virtues and vices, with whatever elſe may be a proper ſubject for praiſe or diſpraiſe. Some writers indeed, have, for their own amuſement and the diverſion of others, diſplayed their eloquence in a jocoſe manner upon ſubjects of this kind. So Lucian has written in praiſe of a fly, and Syneſius an elegant encomium upon baldneſs. Others, on the contrary, have done the like in a ſatyrical way. Such is Seneca's apotheoſis or conſecration of the emperor Claudius; and the Myſopogon or beard-hater, written by Julian the emperor. Not to mention ſeveral modern authors, who have imitated them in ſuch ludicrous compoſitions. But as to theſe things, and all of the like nature, the obſervation of Antony in Cicero ſeems very juſt: "That it is not neceſſary to reduce every ſubject we diſcourſe upon to rules of art." For many are ſo trivial, as not to deſerve it: and others ſo plain and evident of themſelves, as not to require it. But ſince it frequently comes in the way both of orators and hiſtorians to deſcribe countries, cities, and facts, we ſhall briefly mention the principal heads of invention proper to illuſtrate each of theſe.

Countries, then, may be celebrated from the pleaſantneſs of their ſituation, the clemency and wholeſomeneſs of the air, and goodneſs of the ſoil; to which laſt may be referred the ſprings, rivers, woods, plains, mountains, and minerals. And to all theſe may be added their extent, cities, the number and antiquity of the inhabitants; their policy, laws, cuſtoms, wealth, character for cultivating the arts both of peace and war; their princes, and other eminent men they have produced. Thus Pacatus has given us a very elegant deſcription of Spain, in his panegyric upon the emperor Theodoſius, who was born there.

Cities are praiſed from much the ſame topics as countries. And here, whatever contributes either to their defence or ornament ought particularly to be mentioned; as the ſtrength of the walls and fortifications, the beauty and ſplendor of the buildings, whether ſacred or civil, public or private. We have in Herodotus a very fine deſcription of Babylon, which was once the ſtrongeſt, largeſt, and moſt regular city in the world. And Cicero has accurately deſcribed the city of Syracuſe, in the iſland of Sicily, in one of his orations againſt Verres.

But facts come much oftener under the cognizance of an orator. And theſe receive their commendation from their honour, juſtice, or advantage. But in deſcribing them, all the circumſtances ſhould be related in their proper order; and that in the moſt lively and affecting manner, ſuited to their different nature. Livy has repreſented the demolition of Alba by the Roman army, which was ſent thither to deſtroy it, through the whole courſe of that melancholy ſcene, in a ſtyle ſo moving and pathetic, that one can hardly forbear condoling with the inhabitants reading his account.

But in diſcourſes of this kind, whether of praiſe or diſpraiſe, the orator ſhould (as he ought indeed upon all occaſions) well conſider where, and to whom, he ſpeaks. For wiſe men often think very differently both of perſons and things from the common people. And we find that learned and judicious men are frequently divided in their ſentiments, from the ſeveral ways of thinking to which they have been accuſtomed. Beſides, different opinions prevail, and gain the aſcendant, at different times. While the Romans continued a free nation, love of their country, liberty, and public ſpirit, were principles in the higheſt eſteem among them. And therefore, when Cato killed himſelf, that he might not fall into the hands of Cæſar, and ſurvive the liberty of his country, it was thought an inſtance of the greateſt heroic virtue: but afterwards, when they had been accuſtomed to an arbitrary government, and the ſpirit of liberty was now loſt, the poet Martial could venture to ſay, "*Death to avoid 'tis madneſs ſure to die.*" A prudent orator therefore will be cautious of oppoſing any ſettled and prevailing notions of thoſe whom he addreſſes; unleſs it be neceſſary, and then he will do it in the ſofteſt and moſt gentle manner.

Chap. III. *Of Arguments ſuited to Deliberative Diſcourſes.*

This kind of diſcourſes muſt certainly have been very ancient; ſince, doubtleſs, from the firſt beginning of men's converſing together, they deliberated upon their common intereſt, and offered their advice to each other. But neither thoſe of the laudatory nor judicial kind could have been introduced, till mankind were ſettled in communities, and found it neceſſary to encourage virtue by public rewards, and bring vice under the reſtraint of laws. The early practice of ſuaſory diſcourſes appears from Sacred Writ, where we find, that when Moſes was ordered upon an embaſſy into Egypt, he would have excuſed himſelf for want of eloquence. And Homer repreſents the Greeks at the ſiege of Troy, as flocking like a ſwarm of bees to hear their generals harangue them. Nor is this part of oratory leſs conſpicuous for its uſefulneſs to mankind, than for its antiquity; being highly beneficial either in councils, camps, or any ſocieties of men. How many inſtances have we upon record, where the fury of an enraged multitude has been checked and appeaſed by the prudent and artful perſuaſion of ſome particular perſon? The ſtory of Agrippa Menenius, when the commons of Rome withdrew from the ſenators, and retired out of the city, is too well known to need reciting. And how often have armies been animated and fired to the moſt dangerous exploits, or recalled to their duty, when ready to mutiny, by a moving ſpeech of their general? many inſtances of which we find in hiſtory.

All deliberation reſpects ſomething future, for it is in vain to conſult about what is already paſt. The ſubject-matter of it is, either things public or private, ſacred or civil; indeed all the valuable concerns of mankind, both preſent and future, come under its regard. And the end propoſed by this kind of diſcourſes is chiefly profit or intereſt. But ſince nothing is truly profitable, but what is in ſome reſpect good; and every thing which is good in itſelf may not in all circumſtances be for our advantage; properly ſpeaking, what is both good and profitable, or beneficial good, is the end here deſigned. And therefore, as it ſometimes happens, that what appears profitable may ſeem to interfere with that which is ſtrictly juſt and honourable; in ſuch caſes it is certainly moſt adviſeable to determine on the ſafer ſide of honour and juſtice, notwithſtanding ſome plauſible things may be offered to the contrary. But where the diſpute lies apparently between what is truly honeſt, and ſome external advantage propoſed in oppoſition to it, all good men cannot but agree in favour of honeſty. Such was the caſe of Regulus, who, being taken priſoner by the Carthaginians, was permitted to go to Rome upon giving his oath, that unleſs he could perſuade the ſenate to ſet at liberty ſome young Carthaginian noblemen, then priſoners at Rome, in exchange for him, he ſhould return again to Carthage. But Regulus, when he came to Rome, was ſo far from endeavouring to prevail with the ſenate to comply with the deſire of the Carthaginians, that he uſed all his intereſt to diſſuade them from hearkening to the propoſal. Nor could the moſt earneſt intreaties of his neareſt relations and friends, nor any arguments they were able to offer, engage him to continue at Rome, and not return again to Carthage. He had then plainly in his view, on the one ſide, eaſe, ſecurity, affluence, honours, and the enjoyment of his friends; and on the other, certain death, attended with cruel torments. However, thinking the former not conſiſtent with truth and juſtice, he choſe the latter. And he certainly acted as became an honeſt and brave man, in chooſing death rather than to violate his oath. Though whether he did prudently in perſuading the ſenate not to make the exchange, or they in complying with him, we ſhall leave others to determine. Now, when it proves to be a matter of debate, whether a thing upon the whole be really beneficial or not; as here ariſe two parts, advice and diſſuaſion, they will each require proper heads of argument. But as they are contrary to each other, he who is acquainted with one, cannot well be ignorant of the other. We ſhall therefore chiefly mention thoſe proper for advice, from whence ſuch as are ſuited to diſſuade will eaſily be perceived. Now the principal heads of this kind are theſe following, which are taken from the nature and properties of the the thing itſelf under conſideration.

1. *Pleaſure* often affords a very cogent argument in diſcourſes of this nature. Every one knows what an influence this has upon the generality of mankind. Though, as Quintilian remarks, pleaſure ought not of itſelf to be propoſed as a fit motive for action in ſerious diſcourſes, but when it is deſigned to recommend ſomething uſeful, which is the caſe here. So, would any one adviſe another to the purſuit of polite literature, Cicero has furniſhed him with a very ſtrong inducement to it from the pleaſure which attends that ſtudy, when he ſays, "If pleaſure only was propoſed by theſe ſtudies, you would think them an entertainment becoming a man of ſenſe and a gentleman. For other purſuits neither agree with all times, all ages, nor all places; but theſe ſtudies improve youth, delight old age, adorn proſperity, afford a refuge and comfort in adverſity, divert us at home, are no hinderance abroad, ſleep, travel, and retire with us into the country."

2. *Profit*, or advantage. This has no leſs influence upon many perſons than the former; and when it reſpects things truly valuable, it is a very juſt and laudable motive. Thus Cicero, when he ſends his *Books of Offices* to his ſon, which he wrote in Latin for his uſe, adviſes him to make the beſt advantage both of his tutor's inſtructions, and the converſation at Athens, where he then was; but withal to peruſe his philoſophical treatiſes, which would be doubly uſeful to him, not only upon the account of the ſubjects, but likewiſe of the language, as they would enable him to expreſs himſelf upon thoſe arguments in Latin, which before had only been treated of in Greek.

3. *Honour*; than which no argument will ſooner prevail with generous minds, or inſpire them with greater ardour. Virgil has very beautifully deſcribed Hector's ghoſt appearing to Æneas the night Troy was taken, and adviſing him to depart, from this motive of honour:

> O goddeſs-born, eſcape by timely flight
> The flames and horrors of this fatal night.
> The foes already have poſſeſs'd the wall;
> Troy nods from high, and totters to her fall.
> Enough is paid to Priam's royal name;
> More than enough to duty and to fame.
> If by a mortal hand my father's throne
> Cou'd be defended, 'twas by mine alone.

The argument here made uſe of to perſuade Æneas to leave

Troy immediately, is, that he had done all that could be expected from him, either as a good ſubject or brave ſoldier, both for his king and country; which were ſufficient to ſecure his honour: and now there was nothing more to be expected from him when the city was falling, and impoſſible to be ſaved; for could it have been preſerved by human power, he himſelf had done it.

But although a thing conſidered in itſelf appear beneficial if it could be attained, yet the expediency of undertaking it may ſtill be queſtionable: in which caſe the following heads, taken from the circumſtances which attend it, will afford proper arguments to engage in it.

(1.) The *poſſibility* of ſucceeding may ſometimes be argued, as one motive to this end. So Hannibal endeavoured to convince king Antiochus, that it was poſſible for him to conquer the Romans, if he made Italy the ſeat of the war; by obſerving to him, not only that the Gauls had formerly deſtroyed their city, but that he had himſelf defeated them in every battle he fought with them in that country.

(2.) But an argument founded upon *probability* will be much more likely to prevail. For in many affairs of human life, men are determined either to proſecute them or not, as the proſpect of ſucceſs appears more or leſs probable. Hence Cicero, after the fatal battle at Pharſalia, diſſuades thoſe of Pompey's party, with whom he was engaged, from continuing the war any longer againſt Cæſar; becauſe it was highly improbable, after ſuch a defeat, by which their main ſtrength was broken, that they ſhould be able to ſtand their ground, or meet with better ſucceſs than they had before.

(3.) But further, ſince probability is not a motive ſtrong enough with many perſons to engage in the proſecution of a thing which is attended with conſiderable difficulties, it is often neceſſary to repreſent the facility of doing it, as a farther reaſon to induce them to it. And therefore Cicero makes uſe of this argument to encourage the Roman citizens in oppoſing Mark Antony (who upon the death of Cæſar had aſſumed an arbitrary power), by repreſenting to them, that his circumſtances were then deſperate, and that he might eaſily be vanquiſhed.

(4.) Again, if the thing adviſed can be ſhewn to be in any reſpect neceſſary, this will render the motive ſtill much ſtronger for undertaking it. And therefore Cicero joins this argument with the former, to prevail with the Roman citizens to oppoſe Antony, by telling them, that "The conſideration before them was, not in what circumſtances they ſhould live, but whether they ſhould live at all, or die with ignominy and diſgrace." This way of reaſoning will ſometimes prevail, when others prove ineffectual. For ſome perſons are not to be moved, till things are brought to an extremity, and they find themſelves reduced to the utmoſt danger.

(5.) To theſe heads may be added the conſideration of the *event*, which in ſome caſes carries great weight with it. As when we adviſe the doing of a thing from this motive, That, whether it ſucceed or not, it will yet be of ſervice to undertake it. So after the great victory gained by Themiſtocles over the Perſian fleet at the ſtraits of Salamis, Mardonius adviſed Xerxes to return into Aſia himſelf, leſt the report of his defeat ſhould occaſion an inſurrection in his abſence: but to leave behind him an army of 300,000 men under his command; with which, if he ſhould conquer Greece, the chief glory of the conqueſt would redound to Xerxes; but if the deſign miſcarried, the diſgrace would fall upon his generals.

Theſe are the principal heads which furniſh the orator with proper arguments in giving advice. Cicero, in his oration for the Manilian law, where he endeavours to perſuade the Roman people to chooſe Pompey for their general in the Mithridatic war, reaſons from three of theſe topics; into which he divides his whole diſcourſe; namely, the neceſſity of the war, the greatneſs of it, and the choice of a proper general. Under the firſt of theſe he ſhows, that the war was neceſſary, from four conſiderations; the honour of the Roman ſtate, the ſafety of their allies, their own revenues, and the fortunes of many of their fellow-citizens, which were all highly concerned in it, and called upon them to put a ſtop to the growing power of king Mithridates, by which they were all greatly endangered. So that this argument is taken from the head of *neceſſity*. The ſecond, in which he treats of the greatneſs of the war, is founded upon the topic of *poſſibility*. For though he ſhows the power of Mithridates to be very great, yet not ſo formidable, but that he might be ſubdued; as was evident from the many advantages Lucullus had gained over him and his aſſociates. In the third head, he endeavours to prevail with them to intruſt the management of the war in the hands of Pompey, whom he deſcribes as a conſummate general, for his ſkill in military affairs, courage, authority, and ſucceſs; in all which qualities he repreſents him as ſuperior to any other of their generals whom they could at that time make choice of. The deſign of all which was, to perſuade them, that they had very good reaſon to hope for ſucceſs, and a happy event of the war, under his conduct. So that the whole force of his reaſoning under this head is drawn from *probability*. Theſe are the three general topics which make up that fine diſcourſe. Each of which is indeed ſupported by divers other arguments and conſiderations, which will be obvious in peruſing the oration itſelf, and therefore need not be here enumerated. On the contrary, in another oration he endeavours to diſſuade the ſenate from conſenting to a peace with Mark Antony, becauſe it was baſe, dangerous, and impracticable.

But no ſmall ſkill and addreſs are required in giving advice. For ſince the tempers and ſentiments of mankind, as well as their circumſtances, are very different and various; it is often neceſſary to accommodate the diſcourſe to their inclinations and opinions of things. And therefore the weightieſt arguments are not always the moſt proper and fitteſt to be uſed on all occaſions. Cicero, who was an admirable maſter of this art, and knew perfectly well how to ſuit what he ſaid to the taſte and reliſh of his hearers, in treating upon this ſubject, diſtinguiſhes mankind into two ſorts; the ignorant and unpoliſhed, who always prefer profit to honour; and ſuch as are more civilized and polite, who prefer honour and reputation to all other things. Wherefore they are to be moved by theſe different views: Praiſe, glory, and virtue, influence the one; while the other is only to be engaged by a proſpect of gain and pleaſure. Beſides, it is plain, that the generality are much more inclined to avoid evils than to purſue what is good; and to keep clear of ſcandal and diſgrace, than to practiſe what is truly generous and noble. Perſons likewiſe of a different age act from different principles; young men for the moſt part view things in another light from thoſe who are older and have had more experience, and conſequently are not to be influenced by the ſame motives.

Chap. IV. *Of Arguments ſuited to Judicial Diſcourſes.*

In *judicial* controverſies there are two parties; the plaintiff or proſecutor, and the defendant or perſon charged. The ſubject of them is always ſomething paſt. And the end propoſed by them Cicero calls *equity*, or *right* and *equity*; the former of which ariſes from the laws of the country, and the latter from reaſon and the nature of things. For at Rome the prætors had a court of equity, and were empowered, in many caſes relating to property, to relax the rigour of the written laws. But as this ſubject is very copious, and cauſes may ariſe from a great variety of things, writers have reduced them to three heads, which they call *ſtates*, to ſome one of which all judicial proceedings may be referred; namely, *whether a thing is*, *what it is*, or *how it is*. By the *ſtate* of a cauſe therefore is meant the

principal queſtion in diſpute, upon which the whole affair depends. Which, if it ſtops in the firſt inquiry, and the defendant denies the fact, the ſtate is called *conjectural*; but if the fact be acknowledged, and yet denied to be what the adverſary calls it, it is termed *definitive*; but if there is no diſpute either about the fact or its name, but only the juſtice of it, it is *the ſtate of quality*: as was ſhown more largely before, pp. 218, 219. But we there conſidered theſe ſtates only in a general view, and deferred the particular heads of argument proper for each of them to this *judicial* kind of diſcourſes; where they moſt frequently occur, and from which examples may eaſily be accommodated to other ſubjects.

All judicial cauſes are either *private* or *public*. Thoſe are called *private*, which relate to the right of particular perſons; and they are likewiſe called *civil* cauſes, as they are converſant about matters of property. *Public* cauſes are thoſe which relate to public juſtice and the government of the ſtate; which are alſo called *criminal*, becauſe by them crimes are proſecuted, whether capital, or thoſe of a leſs heinous nature. We ſhall take the heads of the arguments only from this latter kind, becauſe they are more copious, and eaſy to be illuſtrated by examples; from which ſuch as agree to the former, namely *civil* cauſes, will ſufficiently appear.

1. The *conjectural* ſtate. When the accuſed perſon denies the fact, there are three things which the proſecutor has to conſider; whether he *would* have done it, whether he *could*, and whether he *did* it. And hence ariſe three topics; from the *will*, the *power*, and the *ſigns* or circumſtances which attended the action. The affections of the mind diſcover the will; as, paſſion, an old grudge, a deſire of revenge, a reſentment of an injury, and the like. Therefore Cicero argues from Clodius's hatred of Milo, that he deſigned his death; and from thence infers, that he was the aggreſſor in the combat between them, wherein Clodius was killed. This is what he principally endeavours to prove, and comes properly under this ſtate: for Milo owned that he killed him, but alleged that he did it in his own defence. So that in regard to this point, Which of them aſſaulted the other? the charge was mutual. The proſpect of advantage may alſo be alleged to the ſame purpoſe. Hence it is ſaid of L. Caſſius, that whenever he ſat as judge in a caſe of murder, he uſed to adviſe and move the court to examine to whom the advantage aroſe from the death of the deceaſed. And Cicero puts this to Antony concerning the death of Cæſar. "If any one (ſays he) ſhould bring you upon trial, and uſe that ſaying of Caſſius, *Cui bono?* 'Who got by it?' look to it, I beſeech you, that you are not confounded." To theſe arguments may be added, hope of impunity, taken either from the circumſtances of the accuſed perſon, or of him who ſuffered the injury. For perſons, who have the advantage of intereſt, friends, power, or money, are apt to think they may eaſily eſcape; as likewiſe ſuch who have formerly committed other crimes with impunity. Thus Cicero repreſents Clodius as hardened in vice, and above all the reſtraint of laws, from having ſo often eſcaped puniſhment upon committing the higheſt crimes. On the contrary, ſuch a confidence is ſometimes raiſed from the condition of the injured party, if he is indigent, obſcure, timorous, or deſtitute of friends: much more if he has an ill reputation, or is loaded with popular hatred and reſentment. It was this preſumption of the obſcurity of Roſcius, who lived in the country, and his want of intereſt at Rome, which encouraged his accuſers to charge him with killing his father, as Cicero ſhows in his defence of him. Laſtly, the temper of a perſon, his views, and manner of life, are conſiderations of great moment in this matter. For perſons of bad morals, and ſuch as are addicted to vice, are eaſily thought capable of committing any wickedneſs. Hence Salluſt argues from the evil diſpoſition and vicious life of Catiline, that he affected to raiſe himſelf upon the ruins of his country.—The ſecond head is the *power* of doing a thing: and there are three things which relate to this, the *place*, the *time*, and *opportunity*. As if a crime is ſaid to have been committed in a private place, where no other perſon was preſent; or in the night; or when the injured perſon was unable to provide for his defence. Under this head may likewiſe be brought in the circumſtances of the perſons; as if the accuſed perſon was ſtronger, and ſo able to overpower the other; or more active, and ſo could eaſily make his eſcape. Cicero makes great uſe of this topic in the caſe of Milo, and ſhows, that Clodius had all the advantages of *place*, *time*, and *opportunity*, to execute his deſign of killing him. The third head comprehends the *ſigns* and circumſtances which either preceded, accompanied, or followed, the commiſſion of the fact. So threats, or the accuſed perſon being ſeen at or near the place before the fact was committed, are circumſtances that may probably precede murder; fighting, crying out, bloodſhed, are ſuch as accompany it; paleneſs, trembling, inconſiſtent anſwers, heſitation, or faltering of the ſpeech, ſomething found upon the perſon accuſed which belonged to the deceaſed, are ſuch as follow it. Thus Cicero proves that Clodius had threatened the death of Milo, and given out that he ſhould not live above three days at the fartheſt.—Theſe arguments, taken from conjectures, are called *preſumptions*, which, though they do not directly prove that the accuſed perſon committed the fact with which he is charged; yet when, laid together, they appeared very ſtrong, ſentence by the Roman law might ſometimes be given upon them, to convict him.

Theſe are the topics from which the proſecutor takes his arguments. Now the buſineſs of the defendant is to invalidate theſe. Therefore ſuch as are brought from the *will*, he either endeavours to ſhow are not true, or ſo weak as to merit very little regard. And he refutes thoſe taken from the *power*, by proving that he wanted either opportunity or ability: as, if he can ſhow, that neither the place nor time inſiſted on was at all proper; or that he was then in another place. In like manner he will endeavour to confute the *circumſtances*, if they cannot be directly denied, by ſhowing that they are not ſuch as do neceſſarily accompany the fact, but might have proceeded from other cauſes, though nothing of what is alleged had been committed; and it will be of great ſervice to aſſign ſome other probable cauſe. But ſometimes the defendant does not only deny that he did the fact, but charges it upon another. Thus Cicero, in his oration for Roſcius, not only defends him from each of theſe three heads, but likewiſe charges the fact upon his accuſers.

2. The *definitive* ſtate, which is principally concerned in defining and fixing the name proper to the fact: though orators ſeldom make uſe of exact definitions, but commonly chooſe larger deſcriptions, taken from various properties of the ſubject or thing deſcribed.

The heads of argument in this ſtate are much the ſame to both parties. For each of them defines the fact his own way, and endeavours to refute the other's definition. We may illuſtrate this by an example from Quintilian: "A perſon is accuſed of ſacrilege, for ſtealing money out of a temple, which belonged to a private perſon." The fact is owned; but the queſtion is, *Whether it be properly ſacrilege?* The proſecutor calls it ſo, becauſe it was taken out of a temple. But ſince the money belonged to a private perſon, the defendant denies it to be ſacrilege, and ſays it is only ſimple theft. Now the reaſon why the defendant uſes this plea, and inſiſts upon the diſtinction, is, becauſe by the Roman law the penalty of theft was only four times the value of what was ſtolen; whereas ſacrilege was puniſhed with death. The proſecutor then forms his definition agreeably to his charge, and ſays, "To ſteal any thing out of a ſacred place is ſacrilege." But the defendant excepts

againſt this definition, as defective; and urges, that it does not amount to ſacrilege, unleſs the thing ſtolen was likewiſe ſacred. And this caſe might once, perhaps, have been a matter of controverſy, ſince we find it expreſsly determined in the Pandects, that "An action of ſacrilege ſhould not lie, but only of theft, againſt any one who ſhould ſteal the goods of private perſons depoſited in a temple."

The ſecond thing is the proof brought by each party to ſupport his definition; as in the example given us by Cicero, of one "who carried his cauſe by bribery, and was afterwards proſecuted again upon an action of prevarication." Now, if the defendant was caſt upon this action, he was, by the Roman law, ſubjected to the penalty of the former proſecution. Here the proſecutor defines prevarication to be, *Any bribery or corruption in the defendant, with a deſign to pervert juſtice.* The defendant, therefore, on the other hand, reſtrains it to *bribing only the proſecutor.*

And if this latter ſenſe agrees better with the common acceptation of the word, the proſecutor in the third place pleads the intention of the law, which was to comprehend all bribery in judicial matters under the term of *prevarication.* In anſwer to which the defendant endeavours to ſhow, either from the head of contraries, that a real proſecutor and a prevaricator are uſed as oppoſite terms in the law; or from the etymology of the word, that a prevaricator denotes one who pretends to appear in the proſecution of a cauſe, while in reality he favours the contrary ſide; and conſequently, that money given for this end only can, in the ſenſe of the law, be called *prevarication.*

Laſtly the proſecutor pleads, that it is unreaſonable that he who does not deny the fact ſhould eſcape by a cavil about a word. But the defendant inſiſts upon his explication as agreeable to the law; and ſays, the fact is miſrepreſented and blackened, by affixing to it a wrong name.

3. The third ſtate is that of *quality*, in which the diſpute turns upon the juſtice of an action. And here the defendant does not deny he did the thing he is charged with; but aſſerts it to be right and equitable, from the circumſtances of the caſe, and the motives which induced him to it.

And, firſt, he ſometimes alleges, the reaſon of doing it was in order to prevent ſome other thing of worſe conſequence, which would otherwiſe have happened. We have an inſtance of this in the life of Epaminondas, who, with two other generals joined in the command with him, marched the Theban army, into Peloponneſus againſt the Lacedemonians; but by the influence of a contrary faction at home, their commiſſions were ſuperſeded, and other generals ſent to command the army. But Epaminondas, being ſenſible that, if he obeyed this order at that time, it would be attended with the loſs of the whole army, and conſequently the ruin of the ſtate, refuſed to do it; and having perſuaded the other generals to do the like, they happily finiſhed the war in which they were engaged; and upon their return home, Epaminondas taking the whole matter upon himſelf, on his trial was acquitted. The arguments proper in this caſe are taken from the juſtice, uſefulneſs, or neceſſity, of the action. The accuſer therefore will plead, that the fact was not juſt, profitable, nor neceſſary, conſidered either in itſelf or comparatively with that for the ſake of which it is ſaid to have been done: and he will endeavour to ſhow, that what the defendant aſſigns for the reaſon of what he did might not have happened as he pretends. Beſides, he will repreſent of what ill conſequence it muſt be, if ſuch crimes go unpuniſhed. The defendant, on the other hand, will argue from the ſame heads, and endeavour to prove the fact was juſt, uſeful, or neceſſary. And he will further urge, that no juſt eſtimate can be made of any action, but from the circumſtances which attend it; as the deſign, occaſion, and motives for doing it: which he will repreſent in the moſt favourable light to his own cauſe, and endeavour to ſet them in ſuch a view, as to induce others to think they could not but have done the ſame in the like circumſtances. Again, the cauſe of an action is ſometimes charged by the defendant upon the party who received the damage, or ſome other perſon, who either made it neceſſary or injoined him to do it. The firſt of theſe was Milo's plea for kil'ing Clodius, becauſe he aſſaulted him with a deſign to take away his life. Here the fact is not denied, as in the caſe of Roſcius abovementioned, under the *conjectural* ſtate; but juſtified from the reaſon of doing it. For that an aſſaſſin might be juſtly killed, Cicero ſhows both from law and reaſon. The accuſer, therefore, in ſuch a caſe, will, if there be room for it, deny the truth of this allegation. So the friends of Clodius affirmed that Milo was the aggreſſor, and not Clodius; which Cicero, in his defence of Milo, principally labours to refute. In the ſecond caſe, the proſecutor will ſay, No one ought to offend becauſe another has offended firſt; which defeats the courſe of public juſtice, renders the laws uſeleſs, and deſtroys the authority of the magiſtrate. The defendant, on the other hand, will endeavour to repreſent the danger and neceſſity of the caſe, which required an immediate remedy, and in that manner; and urges, that it was vain and impracticable to wait for redreſs in the ordinary way, and therefore no ill conſequence can ariſe to the public. Thus Cicero, in defending Sextius, who was proſecuted for a riot in bringing armed men into the forum, ſhows that his deſign was only to repel force with force; which was then neceſſary, there being no other means left for the people to aſſemble, who were excluded by a mob of the contrary party. Of the third caſe we have alſo an example in Cicero, who tells us, that, "in making a league between the Romans and Samnites, a certain young nobleman was ordered by the Roman general to hold the ſwine (deſigned for a ſacrifice); but the ſenate afterwards diſapproving the terms, and delivering up their general to the Samnites, it was moved, Whether this young man ought not likewiſe to be given up." Thoſe who were for it might ſay, that, to allege the command of another, is not a ſufficient plea for doing an ill action; and this is what the Roman law now expreſsly declares. But in anſwer to that, it might be replied, that it was his duty to obey the command of his general, who was anſwerable for his own orders, and not thoſe who were obliged to execute them; and therefore, to give up this young nobleman would be to puniſh one perſon for the fault of another.

Laſtly, a fact is ſometimes rather excuſed than defended, by pleading that it was not done deſignedly, or with any ill intent. This is called *conceſſion*; and conſiſts of two parts, *apology* and *intreaty.* The former repreſents the matter as the effect of inadvertency, chance, or neceſſity. Ariſtotle gives us an example of inadvertency or imprudence in a woman at Athens, who gave a young man a love-potion, which killed him; for which ſhe was tried, but acquitted: though afterwards this was made criminal by the Roman law. The caſe of Adraſtus, as related by Herodotus, is an inſtance of chance; who being intruſted by Crœſus with the care of his ſon, as they were hunting, killed him accidentally with a javelin which he threw at a boar. It is neceſſity, when a perſon excuſes his making a default, from ſtreſs of weather, ſickneſs, or the like. Thus Cicero pleaded his illneſs, contracted by the fatigue of a long journey, as an excuſe for not appearing in the ſenate upon the ſummons of Mark Antony, who threatened to oblige him to it by pulling his houſe down. But what the defendant here attributes to inadvertency, chance, or neceſſity, the oppoſite party will attribute to deſign, negligence, or ſome other culpable reaſon; and repreſent it as a matter injurious to the public to introduce ſuch precedents; and alſo produce inſtances, if that can be done, where the like excuſes have not been admitted. On the other hand, the defendant will inſiſt on his innocence, and

ſhow the hardſhip and ſeverity of judging men's actions rather by the event, than from the intention: that ſuch a procedure makes no difference between the innocent and the guilty; but muſt neceſſarily involve many honeſt men in ruin and deſtruction, diſcourage all virtuous and generous deſigns, and turn greatly to the prejudice of human ſociety. He will alſo conſider the inſtances alleged by the accuſer, and ſhow the difference between them and his own caſe. And, laſtly, he will have recourſe to intreaty, or a ſubmiſſive addreſs to the equity and clemency of the court, or party offended, for pardon; as Cicero has done in his oration to Cæſar, in favour of Ligarius.

Chap. V. *Of the Character and Addreſs of an Orator.*

Having conſidered and explained the firſt part of invention, which furniſhes the orator with ſuch arguments as are neceſſary for the proof of his ſubject, we are next to ſhow what are the proper means to conciliate the minds of his hearers; to gain their affection; and to recommend both himſelf, and what he ſays, to their good opinion and eſteem. For the parts of invention are commonly thus diſtinguiſhed; that the firſt reſpects the *ſubject* of the diſcourſe, the ſecond the *ſpeaker*, and the third the *hearers*. Now the ſecond of theſe, what we have at preſent to explain, is by Quintilian called a *propriety of manners*. And in order to expreſs this, it is neceſſary, as he tells us, "that every thing appear eaſy and natural, and the diſpoſition of the ſpeaker be diſcovered by his words." We may form an eaſy conception of this from the conduct of ſuch perſons as are moſt nearly concerned in each other's welfare. As when relations or friends converſe together upon any affairs of importance, the temper and diſpoſition of the ſpeaker plainly ſhows itſelf by his words and manner of addreſs. And what nature here directs to without colouring or diſguiſe, the orator is to endeavour to perform by his art. Though, indeed, if what a perſon ſays be inconſiſtent with his uſual conduct and behaviour at other times, he cannot expect it ſhould gain much credit, or make any deep impreſſion upon his hearers: which may be one reaſon why the ancient rhetoricians make it ſo neceſſary a qualification in an orator, that he be a good man ſince he ſhould always be conſiſtent with himſelf, and, as we ſay, talk in character. And therefore it is highly requiſite, that he ſhould not only gain the ſkill of aſſuming thoſe qualities which the nature and circumſtances of his diſcourſe require him to expreſs; but likewiſe, that he ſhould uſe his utmoſt endeavours to get the real habits implanted in his mind. For as by this means they will be always expreſſed with greater eaſe and facility; ſo, by appearing conſtantly in the courſe of his life, they will have more weight and influence upon particular occaſions.

Now there are four qualities, more eſpecially ſuited to the character of an orator, which ſhould always appear in his diſcourſes, in order to render what he ſays acceptable to his hearers; and theſe are, *wiſdom*, *integrity*, *benevolence* and *modeſty*.

1. *Wiſdom* is neceſſary; becauſe we eaſily give into thoſe whom we eſteem wiſer and more knowing than ourſelves. Knowledge is very agreeable and pleaſant to all, but few make very great improvements in it; either by reaſon they are employed in other neceſſary affairs, and the mind of man cannot attend to many things at once; or becauſe the way to knowledge at firſt is hard and difficult, ſo that perſons either do not care to enter upon the purſuit of it, or, if they do, they are many times ſoon diſcouraged, and drop it, for want of ſufficient reſolution to ſurmount its difficulties. Such, therefore, as either cannot, or do not care to give themſelves the trouble of examining into things themſelves, muſt take up with the repreſentation of others; and it is an eaſe to them to hear the opinion of perſons whom they eſteem wiſer than themſelves. No one loves to be deceived; and thoſe who are fearful of being miſled, are pleaſed to meet with a perſon, in whoſe wiſdom, as they think, they can ſafely truſt. The character of wiſdom therefore is of great ſervice to an orator, ſince the greater part of mankind are ſwayed by authority rather than arguments.

2. But this of itſelf is not ſufficient, unleſs the opinion of *integrity* be joined with it. Nay, ſo far from it, that the greater knowledge and underſtanding a man is ſuppoſed to have, unleſs he likewiſe have the character of an honeſt man, he is often the more ſuſpected. For knowledge without honeſty, is generally thought to diſpoſe a perſon, as well as qualify him, to deceive.

3. And to both theſe qualities the appearance of kindneſs and *benevolence* ſhould likewiſe be added. For though a perſon have the reputation of wiſdom and honeſty, yet if we apprehend he is either not well affected to us, or at leaſt regardleſs of our intereſt, we are in many caſes apt to be jealous of him. Mankind are naturally ſwayed by their affections, and much influenced through love or friendſhip; and therefore nothing has a greater tendency to induce perſons to credit what is ſaid, than intimations of affection and kindneſs. The beſt orators have been always ſenſible what great influence the expreſſions of kindneſs and benevolence have upon the minds of others, to induce them to believe the truth of what they ſay; and therefore they frequently endeavour to impreſs them with the opinion of it. Thus Demoſthenes begins his celebrated oration for Cteſiphon. "It is my hearty prayer (ſays he) to all the deities, that this my defence may be received by you with the ſame affection which I have always expreſſed for you and your city." And it is a very fine image of it which we have in Cicero, where, in order to influence the judges in favour of Milo, he introduces him ſpeaking thus, as became a brave man, and a patriot, even upon the ſuppoſition he ſhould be condemned by them: "I bid my fellow-citizens adieu: may they continue flouriſhing and proſperous; may this famous city be preſerved, my moſt dear country, however it has treated me; may my fellow-citizens enjoy peace and tranquillity without me, ſince I am not to enjoy it with them, though I have procured it for them: I will withdraw, I will be gone."

4. *Modeſty*. It is certain, that what is modeſtly ſpoken is generally better received than what carries in it an air of boldneſs and confidence. Moſt perſons, though ignorant of a thing, do not care to be thought ſo; and would have ſome deference paid to their underſtanding. But he who delivers himſelf in an arrogant and aſſuming way ſeems to upbraid his hearers with ignorance, while he does not leave them to judge for themſelves, but dictates to them, and as it were demands their aſſent to what he ſays; which is certainly a very improper method to win upon them. For not a few, when convinced of an error in ſuch a way, will not own it; but will rather adhere to their former opinion, than ſeem forced to think right, when it gives another the opportunity of a triumph. A prudent orator therefore will behave himſelf with modeſty, that he may not ſeem to inſult his hearers; and will ſet things before them in ſuch an engaging manner, as may remove all prejudice either from his perſon or what he aſſerts. This is particularly neceſſary in the exordium of a diſcourſe. If the orator ſet out with an air of arrogance and oſtentation, the ſelf-love and pride of the hearers will be preſently awakened, and will follow him with a very ſuſpicious eye throughout all his progreſs. His modeſty ſhould diſcover itſelf not only in his expreſſions at the beginning, but in his whole manner; in his looks, in his geſtures, in the tone of his voice. Every auditory take in good part thoſe marks of reſpect and awe, which are paid to them by one who addreſſes them. Indeed the modeſty of an introduction ſhould never betray any thing mean or abject. It is always of great uſe to an orator, that together with modeſty and deference to

his hearers he ſhould ſhow a certain ſenſe of dignity, ariſing from a perſuaſion of the juſtice or importance of the ſubject on which he is to ſpeak. For to ſpeak timorouſly and with heſitation, deſtroys the credit of what is offered; and ſo far as the ſpeaker ſeems to diſtruſt what he ſays himſelf, he often induces others to do the like.

But, as has been ſaid already, great care is to be taken that theſe characters do not appear feigned and counterfeit. For what is fictitious can ſeldom be long concealed. And if this be once diſcovered, it makes all that is ſaid ſuſpected, how ſpecious ſoever it may otherwiſe appear.

It is further neceſſary, that the orator ſhould know the world, and be well acquainted with the different tempers and diſpoſitions of mankind. Nor indeed can any one reaſonably hope to ſucceed in this province, without well conſidering the circumſtances of time and place, with the ſentiments and diſpoſitions of thoſe to whom he ſpeaks; which, according to Ariſtotle, may be diſtinguiſhed four ways, as they diſcover themſelves by the ſeveral *affections*, *habits*, *ages*, and *fortunes* of mankind. And each of theſe require a different conduct and manner of addreſs.

The *affections* denote certain emotions of the mind, which, during their continuance, give a great turn to the diſpoſition. For love prompts to one thing, and hatred to another. The like may be ſaid of anger, lenity, and the reſt of them.

Perſons differ likewiſe according to the various *habits* of their mind. So a juſt man is inclined one way, and an unjuſt man another; a temperate man to this, and an intemperate man to the contrary.

And as to the ſeveral *ages* of men, Ariſtotle has deſcribed them very accurately; and how perſons are differently affected in each of them. He divides the lives of men, conſidered as hearers, into three ſtages: youth, middle age, and old age—Young men, he ſays, have generally ſtrong paſſions, and are very eager to obtain what they deſire; but are likewiſe very mutable, ſo that the ſame thing does not pleaſe them long. They are ambitious of praiſe, and quick in their reſentments: laviſh of their money, as not having experienced the want of it: frank and open, becauſe they have not often been deceived; and credulous for the ſame reaſon. They readily hope the beſt, becauſe they have not ſuffered much, and are therefore not ſo ſenſible of the uncertainty of human affairs; for which reaſon they are likewiſe more eaſily deceived. They are modeſt, from their little acquaintance with the world. They love company and cheerfulneſs, from the brifkneſs of their ſpirits. In a word, they generally exceed in what they do; love violently, hate violently, and act in the ſame manner through the reſt of their conduct.—The diſpoſition of old men is generally contrary to the former. They are cautious, and enter upon nothing haſtily; having in the courſe of many years been often impoſed upon; having often erred, and experienced the prevailing corruption of human affairs; for which reaſon they are likewiſe ſuſpicious, and moderate in their affections either of love or hatred. They purſue nothing great and noble, and regard only the neceſſaries of life. They love money; having learnt by experience the difficulty of getting it, and how eaſily it is loſt. They are fearful, which makes them provident. Commonly full of complaints, from bodily infirmities, and a deficiency of ſpirits. They pleaſe themſelves rather with the memory of what is paſt, than with any future proſpect; having ſo ſhort a view of life before them, in compariſon of what is already gone: for which reaſon alſo, they love to talk of things paſt; and prefer them to what is preſent, of which they have but little reliſh, and know they muſt ſhortly leave them. They are ſoon angry, but not to exceſs. Laſtly, they are compaſſionate, from a ſenſe of their own infirmities, which makes them think themſelves of all perſons moſt expoſed.—Perſons of a middle age betwixt theſe two extremes, as they are freed from the raſhneſs and temerity of youth, ſo they have not yet ſuffered the decays of old age. Hence in every thing they generally obſerve a better conduct. They are neither ſo haſty in their aſſent as the one, nor ſo minutely ſcrupulous as the other, but weigh the reaſons of things. They regard a decency in their actions; are careful and induſtrious; and as they undertake what appears juſt and laudable upon better and more deliberate conſideration than young perſons, ſo they purſue them with more vigour and reſolution than thoſe who are older.

As to the different *fortunes* of mankind, they may be conſidered as noble, rich or powerful; and the contrary to theſe.—Thoſe of high birth, and noble extraction, are generally very tender of their honour, and ambitious to increaſe it; it being natural for all perſons to deſire an addition to thoſe advantages of which they find themſelves already poſſeſſed. And they are apt to conſider all others as much their inferiors, and therefore expect great regard and deference ſhould be ſhown them.—Riches, when accompanied with a generous temper, command reſpect from the opportunities they give of being uſeful to others; but they uſually elate the mind, and occaſion pride. For as money is commonly ſaid to command all things, thoſe who are poſſeſſed of a large ſhare of it, expect others ſhould be at their beck; ſince they enjoy that which all deſire, and which moſt perſons make the main purſuit of their lives to obtain.—But nothing is more apt to ſwell the mind than power. This is what all men naturally covet, even when perhaps they would not uſe it. But the views of ſuch perſons are generally more noble and generous than of thoſe who only purſue riches and the heaping up of money. A ſtate contrary to theſe gives a contrary turn of mind; and in lower life, perſons' diſpoſitions uſually differ according to their ſtation and circumſtances. A citizen and a courtier, a merchant and a ſoldier, a ſcholar and a peaſant, as their purſuits are different, ſo is generally their turn and diſpoſition of mind.

It is the orator's buſineſs, therefore, to conſider theſe ſeveral characters and circumſtances of life, with the different bias and way of thinking they give to the mind; that he may ſo conduct himſelf in his behaviour and manner of ſpeaking, as will render him moſt acceptable, and gain him the good eſteem of thoſe whom he addreſſes.

Chap. VI. *Of the Paſſions.*

As it is often highly neceſſary for the orator, ſo it requires his greateſt ſkill, to engage the paſſions in his intereſt. Quintilian calls this *the ſoul and ſpirit of his art*. And, doubtleſs, nothing more diſcovers its empire over the minds of men, than this power to excite, appeaſe, and ſway their paſſions, agreeably to the deſign of the ſpeaker. Hence we meet with the characters of *admirable*, *divine*, and other ſplendid titles, aſcribed to eloquence by ancient writers. It has indeed been objected by ſome, that whatever high encomiums may be given of this art by the admirers of it, it is however diſingenuous to deceive and impoſe upon mankind, as thoſe ſeem to do, who, by engaging their paſſions, give a bias to their minds, and take them off from the conſideration of the truth; whereas every thing ſhould be judged of from the reaſons brought to ſupport it, by the evidence of which it ought to ſtand or fall. But in anſwer to this, it may be conſidered that all fallacy is not culpable. We often deceive children for their good; and phyſicians ſometimes impoſe on their patients, to come at a cure. And why, therefore, when perſons will not be prevailed with by reaſon and argument, may not an orator endeavour, by engaging their paſſions, to perſuade them to that which is for their advantage? Beſides, Quintilian makes it a neceſſary qualification of an orator, that he be an honeſt man, and one who will not abuſe his art. But ſince thoſe of a con-

trary character will leave no methods untried in order to carry their point, it is requiſite for thoſe who deſign well to be acquainted with all their arts, without which they will not be a match for them; as in military affairs it is highly advantageous for the general of an army to get himſelf informed of all the deſigns and ſtratagems of the enemy, in order to counteract them. Indeed this part of oratory is not neceſſary at all times, nor in all places. The better prepared perſons are to conſider truth, and act upon the evidence of it, the leſs occaſion there appears for it. But the greater part of mankind, either do not duly weigh the force of arguments, or refuſe to act agreeably to their evidence. And where this is the caſe, that perſons will neither be convinced by reaſon, nor moved by the authority of the ſpeaker, the only way left to put them upon action, is to engage their paſſions. For the paſſions are to the mind what the wind is to a ſhip: they move, and carry it forward; and he who is without them, is in a manner without action, dull and lifeleſs. There is nothing great or noble to be performed in life, wherein the paſſions are not concerned. The Stoics, therefore, who were for eradicating the paſſions, both maintained a thing in itſelf impoſſible, and which, if it were poſſible, would be of the greateſt prejudice to mankind. For while they appeared ſuch zealous aſſertors of the government of reaſon, they ſcarce left it any thing to govern; for the authority of reaſon is principally exerciſed in ruling and moderating the paſſions, which, when kept in a due regulation, are the ſprings and motives to virtue. Thus hope produces patience, and fear induſtry; and the like might be ſhown of the reſt. The paſſions therefore are not to be extirpated, as the Stoics aſſerted, but put under the direction and conduct of reaſon. Indeed where they are ungovernable, and reſiſt the controul of reaſon, they are, as ſome have fitly called them, *diſeaſes of the mind*; and frequently hurry men into vice and the greateſt misfortunes of life: juſt as the wind, when it blows moderately, carries on the ſhip; but if it be too boiſterous and violent, may overſet her. The charge therefore brought againſt this art, for giving rules to influence the paſſions, appears groundleſs and unjuſt; ſince the proper uſe of the paſſions is, not to hinder the exerciſe of reaſon, but to engage men to act agreeably to reaſon. And if an ill uſe be ſometimes made of this, it is not the fault of the art, but of the artiſt.

We ſhall here conſider the paſſions, as they may be ſeparately referred, either to *demonſtrative*, *deliberative*, or *judicial* diſcourſes; though they are not wholly confined to any of them.

1. To the *demonſtrative* kind, we may refer *joy* and *ſorrow*, *love* and *hatred*, *emulation* and *contempt*.

Joy is an elation of the mind, ariſing from a ſenſe of ſome preſent good. Such a reflection naturally creates a pleaſant and agreeable ſenſation, which ends in a delightful calm and ſerenity. This is heightened by a deſcription of former evils, and a compariſon between them and the preſent felicity. Thus Cicero endeavours to excite in the minds of his fellow-citizens the higheſt ſenſe of joy and delight at Catiline's departure from Rome, by repreſenting to them the imminent danger which threatened both them and the city while he continued among them.

Sorrow, on the contrary, is an uneaſineſs of mind ariſing from a ſenſe of ſome preſent evil. This paſſion has generally a place in funeral diſcourſes. And it may be heightened, like the former, by compariſon, when any paſt happineſs is ſet in oppoſition to a preſent calamity. Hence Cicero aggravates the ſorrow at Rome occaſioned by the death of Metellus, from his character, and great ſervices to the public, while living.

Love excites us to eſteem any perſon for ſome excellency, and to do him all the good in our power. It is diſtinguiſhed from *friendſhip*, which is mutual; and therefore love may continue where friendſhip is loſt; that is, the affection may remain on one ſide. And when we aſſiſt a perſon from no other motive but to do him a kindneſs, Ariſtotle calls this *good-will*. Love takes its riſe from a variety of cauſes. Generoſity, benevolence, integrity, gratitude, courteſy, and other ſocial virtues, are great incitements to love any one endowed with ſuch qualities. And perſons generally love thoſe who are of a like diſpoſition with themſelves and purſue the ſame views. It is therefore the chief art of a flatterer to ſuit himſelf in every thing to the inclination of the perſon whoſe good graces he courts. When the orator would excite this affection towards any perſon, it is proper to ſhow, that he is poſſeſſed of at leaſt ſome, if not all, of theſe agreeable qualities. When the conſpirators with Catiline were to be brought to juſtice, Cicero was very ſenſible of the envy he ſhould contract on that account, and how neceſſary it was for him to ſecure the love of the Roman ſenate for his ſupport and protection in that critical juncture. And this he endeavours to do in his fourth oration againſt Catiline, by repreſenting to them in the moſt pathetic manner, that all the labours he underwent, the difficulties he conflicted with, and the dangers to which he was expoſed on that account, were not for his own ſake, but for their ſafety, quiet, and happineſs.

Hatred is oppoſed to love, and produced by the contrary diſpoſitions. And therefore perſons hate thoſe who never did them any injury, from the ill opinion they have of their baſe and vicious inclinations. So that the way to excite this paſſion is, by ſhowing that any one has committed ſome heinous fact with an ill intent. And the more nearly affected perſons are by ſuch actions, in what they account of the greateſt concern, the higher in proportion their hatred riſes. Since life therefore is eſteemed the moſt valuable good, Cicero endeavours to render Mark Antony odious to the citizens of Rome, by deſcribing his cruelty.

Emulation is a diſquiet, occaſioned by the felicity of another, not becauſe he enjoys it, but becauſe we deſire the like for ourſelves. So that this paſſion is in itſelf good and laudable, as it engages men to purſue thoſe things which are ſo. For the proper objects of emulation are any advantages of mind, body, or fortune, acquired by ſtudy or labour.

Emulation therefore is excited by a lively repreſentation of any deſirable advantages which appear to be attainable from the example of others who are or have been poſſeſſed of them. But where the felicity of another occaſions an uneaſineſs, not from the want of it, but becauſe he enjoys it, this paſſion is called *envy*, which the ancients deſcribe as an hideous monſter, feeding upon itſelf, and being its own tormentor. Ariſtotle juſtly obſerves, that it moſt uſually affects ſuch perſons as were once upon a level with thoſe they envy. For moſt men naturally think ſo well of themſelves, that they are uneaſy to ſee thoſe who were formerly their equals advanced above them. But, as this is a baſe and vicious paſſion, the orator is not to be informed how to excite it, but how to leſſen or remove it. And the method preſcribed by Cicero for this purpoſe is, to ſhow that the things which occaſioned it have not happened to the envied perſon undeſervedly, but are the juſt reward of his induſtry or virtue; that he does not ſo much convert them to his own profit or pleaſure, as to the benefit of others; and that the ſame pains and difficulties are neceſſary to preſerve them with which they were at firſt acquired.

Contempt is oppoſed to *emulation*, and ariſes from miſconduct in things not of themſelves vicious: as where a perſon either acts below his ſtation and character, or affects to do that for which he is not qualified. Thus Cicero endeavours to expoſe Cæcilius, and bring him into contempt of the court, for pretending to rival him in the accuſation of Verres, for which he was altogether unfit.

2. To *deliberative* diſcourſes may be referred *fear*, *hope*, and *ſhame*.

Fear ariſes from the apprehenſion of ſome great and impending evil. For the greateſt evils, while they appear at a diſtance, do not much affect us. Such perſons occaſion fear, who are poſſeſſed of power, eſpecially if they have been injured, or apprehend ſo: likewiſe thoſe who are addicted to do injuries, or who bear us an ill will. And the examples of others, who have ſuffered in a like caſe, or from the ſame perſons, help to excite fear. From the circumſtances therefore either of the thing or perſon, it will not be difficult for the orator to offer ſuch arguments as may be proper to awaken this paſſion. So Demoſthenes, when he would perſuade the Athenians to put themſelves in a condition of defence againſt king Philip, enumerates the ſeveral acts of hoſtility already committed by him againſt the neighbouring ſtates. And becauſe mens private concerns generally more affect them than what relates to the public, it is proper ſometimes to ſhow the neceſſary connection theſe have with each other, and how the ruin of one draws the other after it.

The contrary paſſion to *fear* is hope; which ariſes either from a proſpect of ſome future good, or the apprehenſion of ſafety from thoſe things which occaſion our fear. Young perſons are eaſily induced to hope the beſt, from the vigour of their ſpirits. And thoſe who have eſcaped former dangers are encouraged to hope for the like ſucceſs for the future. The examples of others alſo, eſpecially of wiſe and conſiderate men, have often the ſame good effect. To find them calm and ſedate when expoſed to the like dangers, naturally creates confidence and the hopes of ſafety. But nothing gives perſons ſuch firmneſs and ſteadineſs of mind, under the apprehenſion of any difficulties, as a conſciouſneſs of their own integrity and innocence. Let dangers come from what quarter they will, they are beſt prepared to receive them. They can calmly view an impending tempeſt, obſerve the way of its approach, and prepare themſelves in the beſt manner to avoid it. In Cicero's oration for the Manilian law, he encourages the Roman citizens to hope for ſucceſs againſt Mithridates, if they choſe Pompey for their general, from the many inſtances of his former ſucceſſes, which he there enumerates.

Shame ariſes from the apprehenſion of thoſe things that hurt a perſon's character. *Modeſty* has been wiſely implanted in mankind by the great Author of nature, as a guardian of virtue which ought for this reaſon to be cheriſhed with the greateſt care; becauſe, as Seneca has well obſerved, "if it be once loſt, it is ſcarce ever to be recovered." Therefore the true cauſe or foundation of ſhame is any thing baſe or vicious; for this wounds the character, and will not bear reflection. And he muſt arrive at no ſmall degree of inſenſibility, who can ſtand againſt ſuch a charge. If he be conſcious to himſelf that it is juſt. Therefore, to deter perſons from vicious actions, or to expoſe them for the commiſſion of them, the orator endeavours to ſet them in ſuch a light as may moſt awaken this paſſion, and give them the greateſt uneaſineſs by the reflection. And becauſe the bare repreſentation of the thing itſelf is not always ſufficient for this purpoſe, he ſometimes enforces it by enlarging the view, and introducing thoſe perſons as witneſſes of the fact for whom they are ſuppoſed to have the greateſt regard. Thus, when ſome of the Athenians, in an arbitration about certain lands which had been referred to them by the contending parties, propoſed it as the ſhorteſt way of deciding the controverſy, to take the poſſeſſion of them into their own hands; Cydias, a member of the aſſembly, to diſſuade them from ſuch an unjuſt action, deſired them to imagine themſelves at that time in the general aſſembly of the ſtates of Greece (who would all hear of it ſhortly), and then conſider how it was proper to act. But where perſons labour under an exceſs of modeſty, which prevents them from exerting themſelves in things fit and laudable, it may ſometimes be neceſſary to ſhow that it is faulty and ill grounded. On the other hand, *immodeſty*, or impudence, which conſiſts in a contempt of ſuch things as affect the reputation, can never be too much diſcouraged and expoſed. And the way of doing this is to make uſe of ſuch arguments as are moſt proper to excite ſhame. We have a very remarkable inſtance of it in Cicero's ſecond Philippic, wherein he affixes this character upon Mark Antony through every ſcene of his life.

3. To *judicial* diſcourſes, may be referred *anger* and *lenity*, *pity*, and *indignation*.

Anger is a reſentment, occaſioned by ſome affront, or injury, done without any juſt reaſon. Now men are more inclined to reſent ſuch a conduct, as they think they leſs deſerve it. Therefore perſons of diſtinction and figure, who expect a regard ſhould be paid to their character, can the leſs bear any indications of contempt. And thoſe who are eminent in any profeſſion or faculty, are apt to be offended if reflections are caſt either upon their reputation or art. Magiſtrates alſo, and perſons in public ſtations, ſometimes think it incumbent on them to reſent indignities, for the ſupport of their office. But nothing ſooner inflames this paſſion, than if good ſervices are rewarded with ſlights and neglect. The inſtance of Narſes, the Roman general, is remarkable in this kind; who, after he had been ſucceſsful in his wars with the Goths, falling under the diſpleaſure of the emperor Juſtin, was removed from the government of Italy, and received by the empreſs with this taunt, *That he muſt be ſent to weave among the girls*; which ſo provoked him, that he ſaid he would weave ſuch a web as they ſhould never be able to unravel. And accordingly, he ſoon after brought down the Longobards, a people of Germany, into Italy; where they ſettled themſelves in that part of the country, which from them is now called *Lombardy*. (See NARSES). The time and place in which an injury was done, and other circumſtances that attended it, may likewiſe contribute very much to heighten the fact. Hence Demoſthenes, in his oration againſt Midias, endeavours to aggravate the injury of being ſtruck by him, both as he was then a magiſtrate, and becauſe it was done at a public feſtival. From hence it appears, that the perſons who moſt uſually occaſion this paſſion are ſuch as neglect the rules of decency, contemn and inſult others, or oppoſe their inclinations; as likewiſe the ungrateful, and thoſe who violate the ties of friendſhip, or requite favours with injuries. But when the orator endeavours to excite anger, he ſhould be careful not to exceed due bounds in aggravating the charge, leſt what he ſays appear rather to proceed from prejudice, than a ſtrict regard to the demerit of the action.

Lenity is the remiſſion of anger. The deſigns of mens actions are principally to be regarded; and therefore what is done ignorantly, or through inadvertency, is ſooner forgiven. Alſo to acknowledge a fault, ſubmit, and aſk pardon, are the ready means to take off reſentment. For a generous mind is ſoon cooled by ſubmiſſion. Beſides, he who repents of his fault, does really give the injured party ſome ſatisfaction, by puniſhing himſelf; as all repentance is attended with grief and uneaſineſs of mind, and this is apt very much to abate the deſire of revenge. As, on the contrary, nothing is more provoking, than when the offender either audaciouſly juſtifies the fact, or confidently denies it. Men are likewiſe wont to lay aſide their reſentment, when their adverſaries happen by ſome other means to ſuffer what they think a ſufficient ſatisfaction. Laſtly, eaſy circumſtances, a lucky incident, or any thing which gives the mind a turn to mirth and pleaſure, has a natural tendency to remove anger. For anger is accompanied with pain and uneaſineſs, which very ill ſuit joy and cheerfulneſs. The orator, therefore, in order to aſſuage and pacify the minds of his auditors, will endeavour to leſſen their opinion of the fault,

and by that means to take off the edge of their reſentment. And to this purpoſe, it will be proper either to repreſent that the thing was not deſigned, or that the party is ſorry for it; or to mention his former ſervices; as alſo to ſhow the credit and reputation which will be gained by a generous forgiveneſs, And this laſt topic is very artfully wrought up by Cicero, in his addreſs to Cæſar, in favour of Ligarius.

Pity ariſes from the calamities of others, by reflecting, that we ourſelves are liable to the like misfortunes. So that evils, conſidered as the common lot of human nature, are principally the cauſe of pity. And this makes the difference between *pity* and *good-will*, which ariſes merely from a regard to the circumſtances of thoſe who want our aſſiſtance. But conſidering the uncertainty of every thing about us, he muſt ſeem in a manner diveſted of humanity, who has no compaſſion for the calamities of others; ſince there is no affliction which happens to any man, but either that, or ſome other as great, may fall upon himſelf. But thoſe perſons are generally ſooneſt touched with this paſſion, who have met with misfortunes themſelves. And by how much greater the diſtreſs is, or by how much the perſon appears leſs deſerving it, the higher pity does it excite: for which reaſon, perſons are generally moſt moved at the misfortunes of their relations and friends, or thoſe of the beſt figure and character. The orator, therefore, in order to excite the greater pity, will endeavour to heighten the idea of the calamity, from the ſeveral circumſtances both of the thing itſelf and the perſon who labours under it. A fine example of this may be ſeen in Cicero's defence of Muræna, *cap.* 40. &c.

Indignation, as oppoſed to *pity*, is an uneaſineſs at the felicity of another who does not ſeem to deſerve it. But this reſpects only external advantages, ſuch as riches, honours, and the like; for virtues cannot be the object of this paſſion. Ariſtotle therefore ſays, "that pity and indignation are generally to be found in the ſame perſons, and are both evidences of a good diſpoſition." Now the orator excites this paſſion, by ſhowing the perſon to be unworthy of that felicity which he enjoys. And as, in order to move compaſſion, it is ſometimes of uſe to compare the former happy ſtate of the perſon with his preſent calamity; ſo here, the greater indignation is raiſed, by comparing his former mean circumſtances with his preſent advancement: as Cicero does in the caſe of Vatinius.

Theſe are the paſſions with which an orator is principally concerned. In addreſſing to which, not only the greateſt warmth and force of expreſſion is often neceſſary; but he muſt likewiſe firſt endeavour to impreſs his own mind with the ſame paſſion he would excite in others.

A man may convince, and even perſuade others to act, by mere reaſon and argument. But that degree of eloquence which gains the admiration of mankind, and properly denominates one an orator, is never found without warmth or paſſion. Paſſion, when in ſuch a degree as to rouſe and kindle the mind, without throwing it out of the poſſeſſion of itſelf, is univerſally, found to exalt all the human powers. It renders the mind infinitely more enlightened, more penetrating, more vigorous and maſterly, than it is in its calm moments. A man, actuated by a ſtrong paſſion, becomes much greater than he is at other times. He is conſcious of more ſtrength and force; he utters greater ſentiments, conceives higher deſigns, and executes them with a boldneſs and a felicity of which on other occaſions he could not think himſelf capable. But chiefly, with reſpect to perſuaſion, is the power of paſſion felt. Almoſt every man in paſſion is eloquent. Then he is at no loſs for words and arguments. He tranſmits to others, by a ſort of contagious ſympathy, the warm ſentiments which he feels; his looks and geſtures are all perſuaſive; and nature here ſhows herſelf infinitely more powerful than art. This is the foundation of that juſt and noted rule, *Si vis me flere, dolendum eſt primum ipſi tibi.*

The warmth, however, which we expreſs, muſt be ſuited to the occaſion and the ſubject; for nothing can be more prepoſterous than an attempt to introduce great vehemence into a ſubject, which is either of ſlight importance, or which, by its nature, requires to be treated of calmly. A temperate tone of ſpeech is that for which there is moſt frequent occaſion; and he who is on every ſubject paſſionate and vehement, will be conſidered as a blusterer, and meet with little regard.

Part II. Of DISPOSITON.

AS *Invention* ſupplies the orator with neceſſary materials, ſo *Diſpoſition* directs him how to place them in the moſt proper and ſuitable order. Diſpoſition therefore conſidered as a part of oratory, naturally follows invention. And what is here chiefly intended by it is, the placing the ſeveral parts of a diſcourſe in a juſt method and dependence upon one another.

Writers are not all agreed in determining the parts of an oration; though the difference is rather in the manner of conſidering them, than in the things themſelves.—But Cicero, whom we ſhall here follow, mentions ſix, namely, *Introduction*, *Narration*, *Propoſition*, *Confirmation*, *Confutation*, and *Concluſion*.

Chap. I. *Of the Introduction.*

The deſign of this is to prepare the minds of the hearers for a ſuitable reception of the remaining parts that are to follow. And for this end, three things are requiſite; that the orator gain the *good opinion* of his hearers, that he ſecure their *attention*, and give them ſome *general notion* of his ſubject.

1. *Good opinion.* When the orator introduces his diſcourſe with his own perſon, he will be careful to do it with modeſty, and ſeem rather to extenuate his virtues and abilities, than to magnify them. And where the nature of the ſubject may ſeem to require it, he will endeavour to ſhow, that ſome juſt and good reaſon induced him to engage in it. We have a very fine example of this in Cicero's oration for the poet Aulus Licinius Archias, which begins thus: "If I have any natural genius, which I am ſenſible is very ſmall, or any ability in ſpeaking, wherein I own I have been very converſant; or any ſkill acquired from the ſtudy and precepts of the beſt arts, to which my whole life has been devoted; this Aulus Licinius has, in a particular manner, a right to demand of me the fruit of all theſe things. For as far back as I can remember, and call to mind what paſſed in my youth to the preſent time, he has been my chief adviſer and encourager both to undertake and purſue this courſe of ſtudies." When the orator ſets out with the perſons of thoſe to whom the diſcourſe is made, it is not unuſual to commend them for their virtues, and thoſe eſpecially which have a more immediate relation to the preſent ſubject. Thus Cicero begins his oration of thanks for the pardon of Marcellus, with an encomium upon the mildneſs, clemency, and wiſdom of Cæſar, to whom it was addreſſed. But ſometimes the orator expreſſes his gratitude for paſt favours; as Cicero has done in his orations, both to the people and ſenate of Rome, after his return from baniſhment.—And at other times he declares his concern for them and their intereſt; in which manner Cicero begins his fourth oration againſt Catiline, which was made in the ſenate. "I perceive (ſays he) that all your countenances and eyes are turned on me; I perceive that you

are ſolicitous, not only for your own danger, and that of the ſtate, but for mine likewiſe, if that ſhould be removed. Your affection for me is pleaſant in misfortunes, and grateful in ſorrow; but I adjure you to lay it aſide, and, forgetting my ſafety, conſider yourſelves and your children." But in judicial caſes, both the character of the perſon whoſe cauſe he eſpouſes, and that of the adverſe party likewiſe, furniſh the orator with arguments for exciting the good-will of his hearers: the former, by commemorating his virtues, dignity, or merits, and ſometimes his misfortunes and calamities. So Cicero, in his defence of Flaccus, begins his oration in commending him on the account of his ſervices done to the public, the dignity of his family, and his love to his country. And Demoſthenes, in his oration againſt Midias, ſets out with a recital of his vices, in order to recommend his own cauſe to the favourable opinion of the court.

2. *Attention.* On this head, Cicero ſays, "We ſhall be heard attentively on one of theſe three things; if we propoſe what is great, neceſſary, or for the intereſt of thoſe to whom the diſcourſe is addreſſed." So that, according to him, the topics of attention are much the ſame with thoſe of good opinion, when taken from the ſubject. And indeed, people are naturally led to attend either to thoſe things or perſons of which they have entertained a favourable opinion. But in order to gain this point, the orator ſometimes thinks it proper to requeſt the attention of his audience. Thus Cicero, in his defence of Cluentius, after having ſhown the heinouſneſs of the charge againſt him, concludes his introduction in the following manner, ſpeaking to the judges: "Wherefore I intreat, that while I briefly and clearly reply to a charge of many years ſtanding, you will, according to your uſual cuſtom, give me a kind and attentive hearing." And again, in his ſecond Philippic, addreſſing himſelf to the ſenate; "But as I muſt ſay ſomething for myſelf, and many things againſt Mark Antony; one of theſe I beg of you, that you will hear me kindly, while I ſpeak for myſelf; and the other I will undertake for, that when I ſpeak againſt him, you ſhall hear me with attention." But though the introduction be the moſt uſual and proper place for gaining attention, yet the orator finds it convenient ſometimes to quicken and excite his hearers in other parts of his diſcourſe, when he obſerves they flag, or has ſomething of moment to offer.

3. Some *general account* of the ſubject of the diſcourſe. This is always neceſſary, which the two others are not. And therefore it muſt be left to the prudence of the orator when to uſe or omit them as he ſhall judge proper, from the nature of his diſcourſe, the circumſtance of his hearers, and how he ſtands with them. But ſome account of the ſubject is what cannot be neglected. For every one expects to be ſoon informed of the deſign of the ſpeaker, and what he propoſes to treat of. Nor when they are all made uſe of, is it neceſſary they ſhould always ſtand in the order we have here placed them. Cicero ſometimes enters immediately upon his ſubject, and introduces the other heads afterwards. As in his third oration againſt Catiline, made to the body of the Roman people, which begins thus: "You ſee that the ſtate, all your lives, eſtates, fortunes, wives and children, and this ſeat of the greateſt empire, the moſt flouriſhing and beautiful city, having by the favour of heaven towards you, and my labours, counſels, and dangers, been this day reſcued from fire and ſword and the very jaws of deſtruction, are preſerved and reſtored to you." And then he proceeds to recommend himſelf to their eſteem and benevolence, from the conſideration of theſe benefits.

Theſe are the heads which commonly furniſh matter for this part of a diſcourſe. But orators often take occaſion from the time, place, largeneſs of the aſſembly, or ſome other proper circumſtance, to compliment their hearers, recommend themſelves, or introduce the ſubject upon which they are about to treat. Inſtances of each of theſe may be met with in ſeveral of Cicero's orations. And ſometimes they ſet out with ſome compariſon, ſimilitude, or other ornament, which they accomodate to the occaſion of their diſcourſe. Thus Iſocrates enters upon his celebrated panegyric in praiſe of his countrymen the Athenians with the following compariſon: "I have often wondered what could be their deſign who brought together theſe aſſemblies, and inſtituted the gymnaſtic ſports, to propoſe ſo great rewards for bodily ſtrength; and to vouchſafe no honour to thoſe who applied their private labours to ſerve the public, and ſo cultivated their minds as to be ſerviceable to others, to whom they ought to have ſhown greater regard. For although the ſtrength of a champion was doubled, no benefit would from thence accrue to others; but all enjoy the prudence of one man, who will hearken to his advice." In ſome caſes, orators have recourſe to a more covert and artful way of opening their ſubject, endeavour to remove jealouſies, apologize for what they are about to ſay, and ſeem to refer it to the candour of the hearers to judge of it as they pleaſe. Cicero appears to have been a perfect maſter of this art, and uſed it with great ſucceſs. Thus in his ſeventh Philippic, where he ſeems to expreſs the greateſt concern, leſt what he was about to ſay ſhould give any offence to the ſenate to whom he was ſpeaking: "I (ſays he) who always declared for peace, and to whom peace among ourſelves, as it is wiſhed for by all good men, was in a particular manner deſirable; who have employed all my induſtry in the forum, in the ſenate, and in the defence of my friends, whence I have arrived to the higheſt honours, a moderate fortune, and what reputation I enjoy; I therefore, who owe what I am to peace, and without it could not have been the perſon I am, be that what it will, for I would arrogate nothing to myſelf; I ſpeak with concern and fear, how you will receive what I am going to ſay; but I beg and intreat you, from the great regard I have always expreſſed for the ſupport and advancement of your honour, that if any thing ſaid by me ſhould at firſt appear harſh or unfit to be received, you will notwithſtanding pleaſe to hear it without offence, and not reject it till I have explained myſelf: I then, for I muſt repeat it again, who have always approved of peace, and promoted it, am againſt a peace with Mark Antony." This is called *inſinuation*; and may be neceſſary, where a cauſe is in itſelf doubtful, or may be thought ſo from the received notions of the hearers, or the impreſſions already made upon them by the contrary ſide. An honeſt man would not knowingly engage in a bad cauſe; and yet, through prevailing prejudice, that may be ſo eſteemed which is not ſo in itſelf. In theſe caſes, therefore, great caution and prudence are neceſſary to give ſuch a turn to things, and place them in that view, as may be leaſt liable to offence. And becauſe it ſometimes happens that the hearers are not ſo much diſpleaſed at the ſubject as the perſon, Quintilian's rule ſeems very proper, when he ſays, "if the ſubject diſpleaſes, the character of the perſon ſhould ſupport it; and when the perſon gives offence, he ſhould be helped by the cauſe."

Chap. II. *Of Narration.*

The orator having prepared his hearers to receive his diſcourſes with candour and attention, and acquainted them with his general deſign in the introduction, before he proceeds directly to his ſubject, often finds it neceſſary to give ſome account of what preceded, accompanied, or followed upon it. And this he does in order to enlarge the view of the particular point in diſpute, and place it in a clearer light. This is called *narration*; which is a recital of ſomething done, in the order and manner in which it was done. Hence it is eaſy to perceive what thoſe things are which properly enter into a narration. And ſuch are the cauſe, manner, time, place, and conſequences of an action; with the temper, fortune, views, ability, aſſociates, and other circumſtances of thoſe concerned in it. Not that each of theſe parti-

culars is neceſſary in every narration; but ſo many of them at leaſt as are requiſite to ſet the matter in a juſt light, and make it appear credible. Beſides. in relating a fact, the orator does not content himſelf with ſuch an account of it as is barely ſufficient to render what he ſays intelligible to his hearers; but deſcribes it in ſo ſtrong and lively a manner, as may give the greateſt evidence to his relation, and make the deepeſt impreſſion upon their minds. And if any part of it appears at preſent leſs probable, he promiſes to clear up and remove any remaining doubts in the progreſs of his diſcourſe. For the foundation of his reaſoning afterwards is laid in the narration, from whence he takes his arguments for the confirmation. And therefore it is a matter of no ſmall importance that this part be well managed, ſince the ſucceſs of the whole diſcourſe ſo much depends upon it. See NARRATION.

There are four properties required in a good narration; that it be ſhort, clear, probable, and pleaſant.

1. The *brevity* of a narration is not to be judged of barely from its length: for that may be too long, which contains but a little; and that too ſhort, which comprehends a great deal. Wherefore this depends upon the nature of the ſubject, ſince ſome things require more words to give a juſt repreſentation of them, and others fewer. That may properly therefore be called a *ſhort narration*, which contains nothing that could well have been omitted, nor omits any thing which was neceſſary to be ſaid. Now, in order to avoid both theſe extremes, care ſhould be taken not to go farther back in the account of things, nor to trace them down lower, than the ſubject requires; to ſay that only in the general, which does not need a more particular explication; not to aſſign the cauſes of things, when it is enough to ſhow they were done; and to omit ſuch things as are ſufficiently underſtood, from what either preceded, or was conſequent upon them. But the orator ſhould be careful, leſt, while he endeavours to avoid prolixity, he run into obſcurity. Horace was very ſenſible of this danger, when he ſaid: "*By ſtriving to be ſhort, I grow obſcure.*"

2. *Perſpicuity.* This may juſtly be eſteemed the chief excellency of language. For as the deſign of ſpeech is to communicate our thoughts to others, that muſt be its greateſt excellence which contributes moſt to this end; and that, doubtleſs, is perſpicuity. As perſpicuity therefore is requiſite in all diſcourſe, ſo it is particularly ſerviceable in a narration, which contains the ſubſtance of all that is to be ſaid afterwards. Wherefore, if this be not ſufficiently underſtood, much leſs can thoſe things which receive their light from it. Now the following things render a narration clear and plain: Proper and ſignificant words, whoſe meaning is well known and determined; ſhort ſentences, though full and explicit, whoſe parts are not perplexed, but placed in their juſt order; proper particles to join the ſentences, and ſhow their connection and dependence on each other; a due regard to the order of time, and other circumſtances neceſſary to be expreſſed; and laſtly, ſuitable tranſitions.

3. *Probability.* Things appear probable, when the cauſes aſſigned for them appear natural; the manner in which they are deſcribed is eaſy to be conceived; the conſequences are ſuch as might be expected; the characters of the perſons are juſtly repreſented; and the whole account is well atteſted, conſiſtent with itſelf, and agreeable to the general opinion. Simplicity likewiſe in the manner of relating a fact, as well as in the ſtyle, without any reſerve or appearance of art, contributes very much to its credibility. For truth loves to appear naked and open, ſtript of all colouring or diſguiſe. The conſpiracy of Catiline was ſo daring and extravagant, that no one but ſuch a deſperado could ever have undertaken it with any hopes of ſucceſs. However, Cicero's account of it to the ſenate was ſo full and exact, and ſo well ſuited to the character of the perſon, that it preſently gained credit. And, therefore, when, upon the concluſion of Cicero's ſpeech, Catiline, who was preſent, immediately ſtood up, and deſired they would not entertain ſuch hard thoughts of him, but conſider how much his family had always been attached to the public intereſt, and the great ſervices they had done the ſtate; their reſentments roſe ſo high, that he could not be heard: upon which he immediately left the city, and went to his aſſociates.

4. The laſt thing required in a narration is, that it be *pleaſant* and *entertaining*. And this is more difficult, becauſe it does not admit of that accurate compoſition and pompous dreſs which delight the ear, and recommend ſome other parts of a diſcourſe. For it certainly requires no ſmall ſkill in the ſpeaker, while he endeavours to expreſs every thing in the moſt natural, plain, and eaſy manner, not to grow flat and tireſome. For Quintilian's remark is very juſt, that "the moſt experienced orators find nothing in eloquence more difficult, than what all who hear it fancy they could have ſaid themſelves." And the reaſon of this ſeems very obvious. For as all art is an imitation of nature, the nearer it reſembles that, the more perfect it is in its kind. Hence unexperienced perſons often imagine that to be eaſieſt which ſuits beſt with thoſe natural ideas to which they have been accuſtomed; till, upon trial, they are convinced of their miſtake. Wherefore, to render this part of a diſcourſe pleaſant and agreeable, recourſe muſt be had to variety both in the choice of words and turns of the expreſſion. And therefore queſtions, admirations, interlocutions, imagery, and other familiar figures, help very much to diverſify and enliven a narration, and prevent it from becoming dull and tedious, eſpecially when it is carried on to any conſiderable length.

Having given a brief account of the nature and properties of a narration, we ſhall now proceed to conſider the uſes of it.

Laudatory orations are uſually as it were a ſort of continued narration, ſet off and adorned with florid language and fine images proper to grace the ſubject, which is naturally ſo well fitted to afford pleaſure and entertainment. Wherefore a ſeparate narration is more ſuited to *delibera ive* and *judicial* diſcourſes. In Cicero's oration for the Manilian law (which is of the former kind) the deſign of the narration is to ſhow the Roman people the neceſſity of giving Pompey the command of the army againſt king Mithridates, by repreſenting the nature of that war, which is done in the following manner: "A great and dangerous war (ſays he) threatens your revenues and allies from two very powerful kings, Mithridates and Tigranes; one of whom not being purſued after his defeat, and the other provoked, they think they have an opportunity to ſeize Aſia. Letters are daily brought from theſe parts to worthy gentlemen of the equeſtrian order, who have large concerns there in farming your revenues: they acquaint me, as friends, with the ſtate of the public affairs, and danger of their own; that many villages in Bithynia, which is now your province, are burnt down; that the kingdom of Ariobarzanes, which borders upon your revenues, is entirely in the enemy's power; that Lucullus, after ſeveral great victories, is withdrawn from the war; that he who ſucceeds him is not able to manage it; that all the allies and Roman citizens wiſh and deſire the command of that war may be given to one particular perſon; and that he alone, and no other, is dreaded by the enemies. You ſee the ſtate of the caſe, now conſider what ought to be done." Here is an unhappy ſcene of affairs, which ſeemed to call for immediate redreſs. The cauſes and reaſons of it are aſſigned in a very probable manner, and the account well atteſted by perſons of character and figure. And what the conſequences would be if not timely prevented, no one could well be ignorant. The only probable remedy ſuggeſted in general is, the committing that affair to one certain perſon, which he afterwards ſhows at large could be no other than Pompey. But in Cicero's defence of Milo (which is of the *judicial* kind), the deſign of the narration, which is greatly commended

by Quintilian, is to prove that, in the combat between Clodius and Milo, the former was the aggreſſor. And in order to make this appear, he gives a ſummary account of the conduct of Clodius the preceding year; and from the courſe of his actions and behaviour, ſhows the inveterate hatred he bore to Milo, who obſtructed him in his wicked deſigns. For which cauſe he had often threatened to kill him, and given out that he ſhould not live beyond ſuch a time: and accordingly he went from Rome without any other apparent reaſon, but that he might have an opportunity to attack him in a convenient place near his own houſe, by which he knew Milo was then obliged to paſs. Milo was in the ſenate that day, where he ſtaid till they broke up, then went home, and afterwards ſet forward on his journey. When he came to the place in which he was to be aſſaulted, Clodius appeared every way prepared for ſuch a deſign, being on horſeback, attended by a company of deſperate ruffians ready to execute his commands; whereas Milo was with his wife in a chariot, wrapped up in his cloak, and attended by ſervants of both ſexes. Theſe were all circumſtances which preceded the fact. And as to the action itſelf, with the event of it, the attack, as Cicero ſays, was begun by the attendants of Clodius from an higher ground, who killed Milo's coachman: upon which Milo, throwing off his cloak, leaped out, and made a brave defence againſt Clodius's men, who were got about the chariot. But Clodius, in the heat of the ſkirmiſh, giving out that Milo was killed, was himſelf ſlain by the ſervants of Milo, to avenge, as they thought, the death of their maſter. Here ſeem to be all the requiſites proper to make this account credible. Clodius's open and avowed hatred of Milo, which proceeded ſo far as to threaten his life; the time of his leaving Rome; the convenience of the place; his habit and company ſo different from thoſe of Milo; joined with his known character of a moſt profligate and audacious wretch, could not but render it very probable that he had formed that deſign to kill Milo. And which of them began the attack might very reaſonably be credited from the advanced gronnd on which Clodius and his men were placed; the death of Milo's coachman at the beginning of the combat; the ſkirmiſh afterwards at the chariot; and the reaſon of Clodius's own death at laſt, which does not appear to have been intended, till he had given out that Milo was killed.

But a diſtinct and ſeparate narration is not always neceſſary in any kind of diſcourſe. For if the matter be well known before, a ſet and formal narrative will be tedious to the hearers. Or if one party has done it already, it is needleſs for the other to repeat it. But there are three occaſions eſpecially, in which it may ſeem very requiſite: when it will bring light to the ſubject; when different accounts have already been given out concerning it, or when it has been miſrepreſented by the adverſe party. If the point in controverſy be of a dubious nature, or not ſufficiently known to the hearers, a diſtinct account of the matter, with the particular circumſtances attending it, muſt be very ſerviceable, in order to let them into a true ſtate of the caſe, and enable them to judge of it with greater certainty.

Moreover, where the oppoſite party has ſet the matter in a falſe light by ſome artful and invidious turn, or loaded it with any odious circumſtances, it ſeems no leſs neceſſary that endeavours ſhould be uſed to remove any ill impreſſions, which otherwiſe might remain upon the minds of the hearers, by a different and more favourable repreſentation. And if any thing can be fixed upon to make the contrary account appear abſurd or incredible, it ought particularly to be remarked. Thus Cicero, in his defence of Sextus Roſcius, ſhows that he was many miles diſtant from Rome at the time he was charged with having killed his father there. "Now (ſays he), while Sextus Roſcius was at Ameria, and this Titus Roſcius [*his accuſer*] at Rome, Sextus Roſcius [*the father*] was killed at the baths on Mount Palatine, returning from ſupper. From whence I hope there can be no doubt who ought to be ſuſpected of the murder. And, were not the thing plain of itſelf, there is this farther ſuſpicion to fix it upon the proſecutor; that, after the fact was committed, one Manlius Glaucia, an obſcure fellow the freedman, client, and familiar, of this Titus Roſcius, firſt carried the account of it to Ameria, not to the ſon of the deceaſed, but to the houſe of Titus Capito his enemy;" with more to the ſame purpoſe. But what we bring it for is, to ſhow the uſe which Cicero makes of this narration for retorting the crime upon the proſecutors.

But the orator ſhould be very careful, in conducting this part, to avoid every thing which may prejudice the cauſe he eſpouſes. Falſehood, and a miſrepreſentation of facts, are not to be juſtified; but no one is obliged to ſay thoſe things which may hurt himſelf. We ſhall juſt mention one inſtance of this from Cicero, where he has ſhown great ſkill in this reſpect, in pleading before Cæſar for the pardon of Ligarius, who had joined with Pompey in the civil war. For Ligarius, having been repreſented by the adverſe party as an enemy to Cæſar, and ſo eſteemed by Cæſar himſelf; Cicero very artfully endeavours in his narration to take off the force of this charge, by ſhowing, that, when the war firſt broke out, he refuſed to engage in it; which he would not have done, had he borne any perſonal hatred to Cæſar. "Quintus Ligarius (ſays he), before there was any ſuſpicion of a war, went into Africa as a legate to the proconſul Caius Confidius; in which he ſo approved himſelf, both to the Roman citizens and allies, that, when Confidius left the province, the inhabitants would not be ſatisfied he ſhould leave the government in the hands of any other perſon. Therefore Quintus Ligarius having excuſed himſelf in vain for ſome time, accepted of the government againſt his will; which he ſo managed during the peace, that both the citizens and allies were greatly pleaſed with his integrity and juſtice. The war broke out on a ſudden, which thoſe in Africa did not hear of till it was begun: but upon the news of it, partly through inconſiderate haſte, and partly from blind fear, they looked out for a leader, firſt for their own ſafety, and then as they were affected; when Ligarius, thinking of home, and deſirous to return to his friends, would not be prevailed on to engage in any affairs. In the mean time, Publius Accius Varus, the prætor, who was formerly governor of Africa, coming to Utica, recourſe was immediately had to him, who very eagerly took upon himſelf the government; if that can be called a *government*, which was conferred on a private man by the clamour of the ignorant multitude, without any public authority. Ligarius, therefore, who endeavoured to avoid every thing of that kind, ceaſed to act ſoon after the arrival of Varus." Here Cicero ends his narrative. For though Ligarius afterwards joined with Pompey's party, yet to have mentioned that, which was nothing more than what many others had done, whom Cæſar had already pardoned, could have ſerved only to increaſe his diſpleaſure againſt him. And therefore he doubtleſs ſhowed great ſkill in ſo managing his account, as to take off the main force of the accuſation, and by that means make way for his pardon, which he accordingly obtained.

Chap. III. *Of the Propoſition.*

In every juſt and regular diſcourſe, the ſpeaker's intention is to prove or illuſtrate ſomething. And when he lays down the ſubject upon which he deſigns to treat, in a diſtinct and expreſs manner, this is called the *propoſition*.

Orators uſe ſeveral ways in laying down the ſubject of their diſcourſes. Sometimes they do it in one general propoſition. We have an inſtance of this in Cicero's ſpeech to the ſenate, the day after Cæſar was killed (as it is given us by Dion Caſius), in which his deſign was to perſuade them to peace and unanimity. "This (ſays he) being the ſtate of our affairs, I think it neceſſary that we lay aſide all the diſcord and enmity which have been among us, and return again to our former peace and agreement." And then he proceeds to offer his reaſons for this advice.

At other times, to give a clearer and more diſtinct view of their diſcourſe, they ſubjoin to the propoſition the general heads of argument by which they endeavour to ſupport it. This method Cicero uſes in his ſeventh Philippic, where he ſays, "I who have always commended and adviſed to peace, am againſt a peace with Mark Antony. But why am I averſe to peace? Becauſe it is baſe, becauſe it is dangerous, and becauſe it is impracticable. And I beſeech you to hear me with your uſual candour, while I make out theſe three things."

But when the ſubject relates to ſeveral different things, which require each of them to be ſeparately laid down in diſtinct propoſitions, it is called a *partition*; though ſome have made two kinds of *partition*, one of which they call *ſeparation*, and the other *enumeration*. By the former of theſe, the orator ſhows in what he agrees with his adverſary, and wherein he differs from him. So, in the caſe formerly mentioned, of a perſon accuſed of ſacrilege for ſtealing private money out of a temple, he who pleads for the defendant ſays, "He owns the fact; but it being private money, the point in queſtion is, Whether this be ſacrilege?" And in the cauſe of Milo, Cicero, ſpeaking of Clodius, ſays, "The point which now comes before the court, is not, Whether he was killed or not; that we confeſs: but, Whether juſtly or unjuſtly." Now in reality here is no partition, ſince the former branch of the propoſition is what is agreed upon, and given up; and conſequently it is only the latter that remains to be diſputed. It is called *enumeration*, when the orator acquaints his hearers with the ſeveral parts of his diſcourſe upon which he deſigns to treat. And this alone properly ſpeaking, is a *partition*. Thus Cicero ſtates his plea in his defence of Muræna: "I perceive the accuſation conſiſts of three parts: the firſt reſpects the conduct of his life; the ſecond his dignity; and the third contains a charge of bribery."

There are three things requiſite in a good partition; that it be *ſhort*, *complete*, and conſiſt but of a *few members*.

A partition is ſaid to be *ſhort*, when each propoſition contains in it nothing more than what is neceſſary. So that the brevity here required is different from that of a narration; for that conſiſts chiefly in things, this in words. And, as Quintilian juſtly obſerves, brevity ſeems very proper here, where the orator does not ſhow what he is then ſpeaking of, but what he deſigns to diſcourſe upon.

Again, it ought to be *complete* and perfect. And for this end, care muſt be taken to omit no neceſſary part in the enumeration.

But, however, there ſhould be as *few heads* as is conſiſtent with the nature of the ſubject. The ancient rhetoricians preſcribe three or four at the moſt. And we do not remember that Cicero ever exceeds that number. But it is certain, the fewer they are, the better, provided nothing neceſſary be omitted. For too large a number is both difficult of retention, and apt to introduce that confuſion which partition is deſigned to prevent.

Hitherto we have been ſpeaking only of thoſe heads into which the ſubject or general argument of the diſcourſe is at firſt divided. For it is ſometimes convenient to divide theſe again, or at leaſt ſome of them, into ſeveral parts or members. And when this happens, it is beſt done, as the ſpeaker comes to each of them in the order at firſt laid down; by which means the memory of the hearers will be leſs burdened than by a multitude of particulars at one and the ſame time. Thus Cicero, in his oration for the Manilian law, compriſes what he deſigns to ſay under three general heads. "Firſt (ſays he) I ſhall ſpeak of the nature of the war, then of its greatneſs, and laſtly about the choice of a general." And when he comes to the firſt of theſe, he divides it again into four branches; and ſhows, "how much the glory of the Romans, the ſafety of their allies, their greateſt revenues, and the fortunes of many of their citizens, were all concerned in that war." The ſecond head, in which he conſiders the greatneſs of the war, has no diviſion. But when he comes to the third head, concerning the choice of a general, he divides that likewiſe into four parts; and ſhows, that ſo many virtues are neceſſary in a conſummate general, ſuch an one as was proper to have the management of that war, namely, *ſkill in military affairs*, *courage*, *authority*, and *ſucceſs*: all which he attributes to Pompey. And this is the ſcheme of that celebrated oration.

This ſubdividing, however, ſhould never have place but when it is abſolutely neceſſary. To ſplit a ſubject into a great many minute parts, by diviſions and ſubdiviſions without end, has always a bad effect in ſpeaking. It may be proper in a logical treatiſe; but it makes an oration appear hard and dry, and unneceſſarily fatigues the memory. In a ſermon, there may be from three to five, or ſix heads, including ſubdiviſions; ſeldom ſhould there be more.

Further, ſome divide their ſubject into two parts; and propoſe to treat upon it *negatively* and *poſitively*; by ſhowing firſt what it is not, and then what it is. But while they are employed to prove what it is not, they are not properly treating upon that, but ſomething elſe; which ſeems as irregular as it is unneceſſary. For he who proves what a thing is, does at the ſame time ſhow what it is not. However, in fact, there is a ſort of diviſion by affirmation and negation, which may ſometimes be conveniently uſed. As if a perſon, charged with killing another, ſhould thus ſtate his defence: *I had done right if I had killed him, but I did not kill him.* Here indeed, if the latter can be plainly made to appear, it may ſeem needleſs to inſiſt upon the former. But if that cannot be ſo fully proved, but there may be room left for ſuſpicion, it may be proper to make uſe of both: for all perſons do not ſee things in the ſame light, and he who believes the fact, may likewiſe think it juſt; while he who thinks it unjuſt, may not believe it, but rather ſuppoſe, had it really been committed by the party, he would not have denied it, ſince he looked upon it as defenſible. And this method of proceeding Quintilian compares to a cuſtom often uſed in traffic, when perſons make a large demand at firſt, in order to gain a reaſonable price. Cicero uſes this way of reaſoning in his defence of Milo; but in the contrary order: that is, he firſt anſwers the charge; and then juſtifies the fact, upon the ſuppoſition that the charge was true. For he proves, firſt, that Clodius was the aggreſſor; and not Milo, as the contrary party had aſſerted: and then to give the greater advantage to his cauſe, he proceeds to ſhow, that if Milo had been the aggreſſor, it would however have been a glorious action to take off ſuch an abandoned wretch, who was not only a common enemy to mankind, but had likewiſe often threatened his life.

A good and juſt partition is attended with conſiderable advantages. For it gives both light and ornament to a diſcourſe. And it is alſo a great relief to the hearers, who, by means of theſe ſtops and reſts, are much better enabled to keep pace with the ſpeaker without confuſion, and by caſting their thoughts either way, from what has been ſaid, both know and are prepared for what is to follow. And as perſons, in travelling a road with which they are acquainted, go on with greater pleaſure and leſs fatigue, becauſe they know how far it is to their journey's end; ſo to be appriſed of the ſpeaker's deſign, and the ſeveral parts of his diſcourſe which he propoſes to treat on, contributes very much to relieve the hearer, and keep up his attention. This muſt appear very evident to all who conſider how difficult it is to attend long and cloſely to one thing, eſpecially when we do not know how long it may be before we are like to be releaſed. Whereas, when we are before-hand acquainted with the ſcheme, and the ſpeaker proceeds regularly from one thing to another, opportunity is

given to eaſe the mind, by relaxing the attention, and recalling it again when neceſſary. In a ſermon, or in a pleading at the bar, few things are of greater conſequence than a proper or happy diviſion. It ſhould be ſtudied with much accuracy and care; for if one take a wrong method at firſt ſetting out, it will lead them aſtray in all that follows. It will render the whole diſcourſe either perplexed or languid; and though the hearers may not be able to tell where the fault or diſorder lies, they will be ſenſible there is a diſorder ſomewhere, and find themſelves little affected by what is ſpoken. The French writers of ſermons ſtudy neatneſs and elegance in the diviſion of their ſubjects much more than the Engliſh do; whoſe diſtributions, though ſenſible and juſt, yet are often inartificial and verboſe.

Chap. IV. *Of Confirmation.*

The orator having acquainted his hearers, in the propoſition, with the ſubject on which he deſigns to diſcourſe, uſually proceeds either to prove or illuſtrate what he has there laid down. For ſome diſcourſes require nothing more than an enlargement or illuſtration, to ſet them in a proper light, and recommend them to the hearers; for which reaſon, likewiſe, they have often no diſtinct propoſition. But where arguments are brought in defence of the ſubject, this is properly *confirmation*. For, as Cicero defines it, "confirmation is that which gives proof, authority, and ſupport to a cauſe, by reaſoning." And for this end, if any thing in the propoſition ſeems obſcure, or liable to be miſunderſtood, the orator firſt takes care to explain it, and then goes on to offer ſuch arguments for the proof of it, and repreſent them in ſuch a light, as may be moſt proper to gain the aſſent of his hearers.

But here it is proper to obſerve, that there are different ways of reaſoning ſuited to different arts. The mathematician treats his ſubject after another manner than the logician, and the orator in a method different from them both. Two methods of reaſoning are employed by orators, the *ſynthetic* and *analytic*.

I. Every piece of *ſynthetic* reaſoning may be reſolved into a ſyllogiſm or ſeries of ſyllogiſms (ſee Logic). Thus we may reduce Cicero's argument, by which he endeavours to prove that Clodius, aſſaulted Milo, and not Milo Clodius, to a ſyllogiſm in this manner.

He was the aggreſſor, whoſe advantage it was to kill the other.
But it was the advantage of Clodius to kill Milo, and not Milo to kill him.
Therefore Clodius was the aggreſſor, or he aſſaulted Milo.

The thing to be proved was, that Clodius aſſaulted Milo, which therefore comes in the concluſion: and the argument, by which it is proved, is taken from the head of profit or advantage. Thus the logician would treat this argument; and if either of the premiſes were queſtioned, he would ſupport it with another ſyllogiſm. But this ſhort and dry way of reaſoning does not at all ſuit the orator: who not only for variety changes the order of the parts, beginning ſometimes with the minor, and at other times with the concluſion, and ending with the major, but likewiſe clothes each part with ſuch ornaments of expreſſion as are proper to enliven the ſubject, and render it more agreeable and entertaining. And he frequently ſubjoins, either to the major propoſition, or minor, and ſometimes to both, one or more arguments to ſupport them; and perhaps others to confirm or illuſtrate them as he thinks it requiſite. Therefore, as a logical ſyllogiſm conſiſts of three parts or propoſitions, a rhetorical ſyllogiſm frequently contains four, and many times five parts. And Cicero reckons this laſt the moſt complete. But all that is ſaid in confirmation of either of the premiſes is accounted but as one part. This will appear more evident by examples. By a ſhort ſyllogiſm Cicero thus proves, that the Carthaginians were not to be truſted: "Thoſe who have often deceived us, by violating their engagements, ought not to be truſted. For if we receive any damage by their treachery, we can blame no body but ourſelves. But the Carthaginians have often ſo deceived us. Therefore it is madneſs to truſt them." Here the major propoſition is ſupported by a reaſon. The minor needed none; becauſe the treachery of the Carthaginians was well known. So that this ſyllogiſm conſiſts of four parts. But by a ſyllogiſm of five parts he proves ſomewhat more largely and elegantly, that the world is under the direction of a wiſe governor. The major is this: "Thoſe things are better governed which are under the direction of wiſdom, than thoſe which are not." This he proves by ſeveral inſtances: "A houſe managed with prudence has every thing in better order, and more convenient, than that which is under no regulation. An army commanded by a wiſe and ſkilful general is in all reſpects better governed than one which has a fool or a madman at the head of it. And the like is to be ſaid of a ſhip, which performs her courſe beſt under the direction of a ſkilful pilot." Then he proceeds to the minor thus: "But nothing is better governed than the univerſe." Which he proves in this manner: "The riſing and ſetting of the heavenly bodies keep a certain determined order; and the ſeveral ſeaſons of the year do not only neceſſarily return in the ſame manner, but are ſuited to the advantage of the whole; nor did the viciſſitudes of night and day ever yet become prejudicial, by altering their courſe." From all which he concludes, "That the world muſt be under the direction of a wiſe governor." In both theſe examples, the regular order of the parts is obſerved. We ſhall therefore produce another, in which the order is directly contrary; for, beginning with the concluſion, he proceeds next to the minor propoſition, and ſo ends with the major. In his defence of Cœlius, his deſign is to prove that Cœlius had not led a looſe and vicious life, with which his enemies had charged him. And this he does, by ſhowing he had cloſely followed his ſtudies, and was a good orator. This may probably at firſt ſight appear but a weak argument; though to him who conſiders what Cicero everywhere declares neceſſary to gain that character, it may perhaps be thought otherwiſe. The ſenſe of what he ſays here may be reduced to this ſyllogiſm.

Thoſe who have purſued the ſtudy of oratory, ſo as to excel in it, cannot have led a looſe and vicious life.
But Cœlius has done this.
Therefore his enemies charge him wrongfully.

But let us hear Cicero himſelf. He begins with the concluſion, thus: "Cœlius is not chargeable with profuſeneſs, extravagancy, contracting of debts, or intemperance, a vice which age is ſo far from abating, that it rather increaſes it. Nay, he never engaged in amours, and thoſe pleaſures of youth, as they are called, which are ſoon thrown off, as reaſon prevails." Then he proceeds to the minor, and ſhows from the effects, that Cœlius had cloſely applied himſelf to the beſt arts, by which he means thoſe neceſſary for an orator: "You have now heard him make his own defence, and you formerly heard him engaged in a proſecution (I ſpeak this to vindicate, not to applaud him), you could not but perceive his manner of ſpeaking, his ability, his good ſenſe, and command of language. Nor did he only diſcover a good genius, which will oftentimes do much of itſelf when it is not improved by induſtry; but what he ſaid (if my affection for him did not bias my judgment) appeared to be the effect of learning, application, and ſtudy." And then he comes to the major: "But be aſſured, that thoſe vices charged upon Cœlius, and the ſtudies upon which I am now diſcourſing, cannot meet in the ſame perſon. For it is

not poſſible that a mind, diſturbed by ſuch irregular paſſions, ſhould be able to go through what we orators do, I do not mean only in ſpeaking, but even in thinking." And this he proves by an argument taken from the ſcarcity of good orators. "Can any other reaſon be imagined, why ſo few, both now, and at all times, have engaged in this province, when the rewards of eloquence are ſo magnificent, and it is attended with ſo great delight, applauſe, glory, and honour? All pleaſures muſt be neglected; diverſions, recreations, and entertainments omitted; and even the converſation of all our friends muſt in a manner be laid aſide. This it is which deters perſons from the labour and ſtudy of oratory; not their want of genius or education."

2. By *Enthymem*. But orators do not often uſe complete ſyllogiſms, but moſt commonly enthymems. An *enthymem*, as is ſhown elſewhere, is an imperfect ſyllogiſm, conſiſting of two parts; the concluſion, and one of the premiſes. And in this kind of ſyllogiſm, that propoſition is omitted, whether it be the major or minor, which is ſufficiently manifeſt of itſelf, and may eaſily be ſupplied by the hearers. But the propoſition that is expreſſed is uſually called the *antecedent*, and the concluſion the *conſequent*. So if the major of that ſyllogiſm be omitted, by which Cicero endeavours to prove that Clodius aſſaulted Milo, it will make this enthymem:

The death of Milo would have been an advantage to Clodius.
Therefore Clodius was the aggreſſor; or, therefore he aſſaulted Milo.

In like manner that other ſyllogiſm above-mentioned, by which he ſhows that the Carthaginians ought not to be truſted, by omitting the minor, may be reduced to the following enthymem:

Thoſe who have often broke their faith ought not to be truſted.
For which reaſon the Carthaginians ought not to be truſted.

Every one would readily ſupply the minor, ſince the perfidiouſneſs of the Carthaginians was known to a proverb. But it is reckoned a beauty in enthymems, when they conſiſt of contrary parts: becauſe the turn of them is moſt acute and pungent. Such is that of Micipſa in Salluſt: "What ſtranger will be faithful to you who are an enemy to your friends?" And ſo likewiſe that of Cicero for Milo, ſpeaking of Clodius: "You ſit as avengers of his death; whoſe life you would not reſtore, did you think it in your power." Orators manage enthymems in the ſame manner they do ſyllogiſms; that is, they invert the order of the parts, and confirm the propoſition by one or more reaſons: and therefore a rhetorical enthymem frequently conſiſts of three parts, as a ſyllogiſm does of five. Though, ſtrictly ſpeaking, a ſyllogiſm can conſiſt of no more than three parts, and an enthymem but of two: and the arguments brought to ſupport either of the propoſitions conſtitute ſo many new enthymems, of which the part they are deſigned to prove is the concluſion. To illuſtrate this by an example:

An honeſt man thinks himſelf under the higheſt obligation to his country.
Therefore he ſhould ſhun no danger to ſerve it.

In this *enthymem* the major is wanting, which would run thus: "He who is under the higheſt obligations to another, ſhould ſhun no danger in order to ſerve him." This laſt propoſition is founded upon the common principle of gratitude; which requires that, to the utmoſt of our power, a return ſhould be made in proportion to the kindneſs received. And this being a maxim generally allowed, it is omitted by the orator. But now this enthymem, conſiſting of the minor and concluſion, might be managed in ſome ſuch manner as this, beginning with the concluſion: "An honeſt man ought to ſhun no danger, but readily expoſe his life for the ſafety and preſervation of his country." Then the reaſon of this conduct might be added, which is the antecedent of the enthymem, or minor of the ſyllogiſm: "For he is ſenſible, that his obligations to his country are ſo many, and ſo great, that he can never fully requite them." And this again might be confirmed by an enumeration of particulars: "He looks upon himſelf as indebted to his country for every thing he enjoys; for his friends, relations, all the pleaſures of life, and even for life itſelf." Now the orator calls this *one enthymem*, though in reality there are two: For the ſecond reaſon, or argument, added to the firſt, becomes the antecedent of a new enthymem, of which the firſt reaſon is the conſequent. And if theſe two enthymems were expreſſed ſeparately in the natural order of the parts, the former would ſtand thus: "An honeſt man thinks himſelf under the higheſt obligations to his country; therefore he ought to ſhun no danger for its preſervation." The latter thus: "An honeſt man eſteems himſelf indebted to his country for every thing he enjoys; therefore he thinks he is under the higheſt obligations to it." The ſame thing might be proved in the like way of reaſoning, by arguments of a different kind. From compariſon, thus: "As it would be thought baſe and ungrateful in a ſon not to hazard himſelf for the preſervation of his father; an honeſt man muſt certainly eſteem it ſo when his country is in danger." Or from an example in this manner: "An honeſt man in like circumſtances would propoſe to himſelf the example of Decius, who freely gave up his life for the ſervice of his country. He gave up his life indeed, but did not loſe it; for he cannot be ſaid to have loſt his life, who lives in immortal honour." Orators frequently intermix ſuch arguments to adorn and illuſtrate their ſubject with others taken from the nature and circumſtances of things. And now, if we conſider a little this method of reaſoning, we ſhall find it the moſt plain and eaſy imaginable. For when any propoſition is laid down, and one or more reaſons ſubjoined to prove it, each reaſon joined with the propoſition makes a diſtinct enthymem, of which the propoſition is the concluſion. Thus Cicero, in his ſeventh Philippic, lays down this as the foundation of his diſcourſe, "That he is againſt a peace with Mark Antony;" for which he gives three reaſons: "Becauſe it is baſe, becauſe it is dangerous, and becauſe it is impracticable." Theſe ſeverally joined with the propoſition, form three enthymems; and upon each of theſe he diſcourſes ſeparately, which make up that oration. And this method is what perſons for the moſt part naturally fall into, who know nothing of the terms *ſyllogiſm* or *enthymem*. They advance ſomething, and think of a reaſon to prove it, and another perhaps to ſupport that; and, ſo far as their invention will aſſiſt them, or they are maſters of language, they endeavour to ſet what they ſay in the plaineſt light, give it the beſt dreſs, embelliſh it with proper figures and different turns of expreſſion; and, as they think convenient, illuſtrate it with ſimilitudes, compariſons, and the like ornaments, to render it moſt agreeable, till they think what they have advanced ſufficiently proved. As this method of arguing therefore is the moſt plain, eaſy, and natural; ſo it is what is moſt commonly uſed in oratory. Whereas a ſtrict ſyllogiſtical way of diſcourſing is dry and jejune, cramps the mind, and does not admit of thoſe embelliſhments of language which are a great advantage to the orator: for which reaſon he ſeldom uſes complete ſyllogiſms; and when he does, it is with great latitude. In every diſcourſe care ſhould be taken not to blend arguments confuſedly together that are of a ſeparate nature. "All arguments (ſays the elegant Dr. Blair) are directed to prove one or other of theſe three things; that ſomething is true; that it is morally right or fit; or that it is profitable and good. Theſe make the three great ſubjects of diſcuſſion among mankind; truth, duty, and

intereſt. But the arguments directed towards any one of them are generically diſtinct; and he who blends them all under one topic, which he calls his argument, as, in ſermons eſpecially, is too often done, will render his reaſoning indiſtinct and inelegant. Suppoſe, for inſtance, that I am recommending to an audience benevolence, or the love of our neighbour; and that I take my firſt argument from the inward ſatisfaction which a benevolent temper affords; my ſecond, from the obligation which the example of Chriſt lays upon us to this duty; and my third, from its tendency to procure us the good-will of all around us; my arguments are good, but I have arranged them wrong: for my firſt and third arguments are taken from conſiderations of intereſt, internal peace, and external advantages; and between theſe, I have introduced one, which reſts wholly upon duty. I ſhould have kept thoſe claſſes of arguments, which are addreſſed to different principles in human nature, ſeparate and diſtinct."

II. The other method of reaſoning is the analytic, in which the orator conceals his intention concerning the point he is to prove, till he has gradually brought his hearers to the deſigned concluſion. They are led on, ſtep by ſtep, from one known truth to another, till the concluſion be ſtolen upon them, as the natural conſequence of a chain of propoſitions. As, for inſtance, when one intending to prove the being of a God, ſets out with obſerving that every thing which we ſee in the world has had a beginning; that whatever has had a beginning, muſt have had a prior cauſe; that in human productions, art ſhown in the effect, neceſſarily infers deſign in the cauſe; and proceeds leading you on from one cauſe to another, till you arrive at one ſupreme firſt cauſe, from whom is derived all the order and deſign viſible in his works. This is much the ſame with the Socratic method, by which that philoſopher ſilenced the ſophiſts of his age.

He proceeded by ſeveral queſtions, which being ſeparately granted, the thing deſigned to be inferred was afterwards put, which, by reaſon of its ſimilitude with ſeveral caſes allowed before, could not be denied. But this is a captious way of reaſoning; for while the reſpondent is not aware of what is deſigned to be inferred, he is eaſily induced to make thoſe conceſſions, which otherwiſe he would not. Beſides, it is not ſo well ſuited to continued diſcourſes, as to thoſe which are interlocutory; and therefore we meet with it oftenеſt in the Socratic dialogues both of Plato and Xenophon. However, it may be made uſe of in oratory by a figure called *ſubjection*, when the ſame perſon firſt puts the queſtion, and then makes the anſwer. So in the famous cauſe of Epaminondas, general of the Thebans, who was accuſed for refuſing to ſurrender his command to his ſucceſſor appointed by the ſtate, till after he had engaged the enemy, and given them a total defeat, Cicero thus repreſents his accuſer pleading for the words of the law againſt Epaminondas, who alleged the intention of it in his defence: "Should Epaminondas add that exception to the law, which, he ſays, was the intention of the writer, namely, *Except any one refuſe to give up his command when it is for the intereſt of the public he ſhould not*; would you admit of it? I believe not. Should you yourſelves, which is a thing moſt remote from your juſtice and wiſdom, in order to ſcreen him, order this exception to be added to the law, without the command of the people; would the Thebans ſuffer it to be done? No certainly. Can it be right then to come into that, as if it was written, which it would be a crime to write? I know it cannot be agreeable to your wiſdom to think ſo."

Under the analytic method may be comprehended reaſoning by *example*. Rhetoricians uſe this word in a different ſenſe from the common acceptation. For that is uſually called an *example*, which is brought either to prove or illuſtrate ſome general aſſertion; As if any one ſhould ſay, that *human bodies may be brought to ſuſtain the greateſt labours by uſe and exerciſe*; and in order to prove this ſhould relate what is ſaid of Milo of Croton, that "by the conſtant practice of carrying a calf ſeveral furlongs every day, he could carry it as far after it had grown to its full ſize." But in oratory the word *example* is uſed for any kind of ſimilitude; or, as Voſſius defines it, "When one thing is inferred from another, by reaſon of the likeneſs which appears between them." Hence it is called an *imperfect induction*, which infers ſomething from ſeveral others of a like nature, and has always the greateſt force when the examples are taken from facts. Now facts may be compared with reſpect to ſome agreement or ſimilitude between them, which in themſelves are either equal or unequal. Of the former kind this is an inſtance: "Cato acted as became a patriot and a lover of his country's liberty, in oppoſing the arms of Cæſar: and therefore ſo did Cicero." The reaſon of the inference is founded in the parity of the caſe, which equally concerned all good ſubjects of the Roman government at that time. For all were alike obliged to oppoſe a common enemy, who endeavoured to ſubvert the conſtitution, and ſubject them to his own arbitrary power. But though an example conſiſts in the compariſon of two ſingle facts, yet ſeveral perſons may be concerned in each fact. Of this kind is that which follows: "As Pompey, Cæſar, and Craſſus, acted illegally in the firſt triumvirate, by engroſſing the ſole power into their own hands, and by that means violating the public liberty; ſo likewiſe did Auguſtus, Mark Antony, and Lepidus, in the ſecond triumvirate, by purſuing the ſame meaſures." But when Cicero defends Milo for killing Clodius, from the like inſtances of Ahala Servilius, Scipio Naſica, Lucius Opimius, and others; that is not an example, but an induction: becauſe one thing is there inferred from its ſimilitude to ſeveral others. But when a compariſon is made between two facts that are unequal, the inference may be either from the greater to the leſs, or from the leſs to the greater. From the greater to the leſs in this manner: "Cæſar had no juſt pretenſions to the Roman government, and therefore much leſs had Antony." The reaſon lies in the difference between the two perſons. Cæſar had very much enlarged the bounds of the Roman empire by his conqueſts, and greatly obliged the populace by his generoſity; but as he had always acted by an authority from the ſenate and people of Rome, theſe things gave him no claim to a power over them. Much leſs then had Antony any ſuch pretence, who always acted under Cæſar, and had never performed any ſignal ſervices himſelf. Cicero has deſcribed the difference between them in a very beautiful manner in his ſecond Philippic, thus ſpeaking to Antony: "Are you in any thing to be compared to him? He had a genius, ſagacity, memory, learning, care, thought, diligence; he had performed great things in war, though detrimental to the ſtate; he had for many years deſigned to get the government into his hands, and obtained his end by much labour and many dangers; he gained over the ignorant multitude by public ſhows, buildings, congiaries, and feaſts; obliged his friends by rewards, and his enemies by a ſhow of clemency. In a word, he ſubjected a free ſtate to ſlavery, partly through fear, and partly compliance. I can liken you to him for ambition of power; but in other things you are in no reſpect to be compared with him." By a compariſon from the leſs to the greater, Cicero thus argues againſt Catiline: "Did the brave Scipio, when a private man, kill Tiberius Gracchus, for attempting to weaken the ſtate; and ſhall we conſuls bear with Catiline endeavouring to deſtroy the world by fire and ſword?" The circumſtances of theſe two caſes were very different; and the compariſon runs between a private man, and a conſul intruſted with the higheſt authority; between a deſign only to raiſe a tumult, and a plot to deſtroy the government: whence the orator juſtly infers, that what was eſteemed

lawful in one caſe, was much more ſo in the other. The like way of reaſoning is ſometimes uſed from other ſimilitudes, which may be taken from things of all kinds, whether animate or inanimate. Of the former ſort is that of Cicero ſpeaking of Muræna, when candidate for the conſulſhip, after he had himſelf gone through that office: "If it is uſual (ſays he) for ſuch perſons as are ſafely arrived in port, to give thoſe who are going out the beſt account they can with relation to the weather, pirates, and coaſts; becauſe thus nature directs us to aſſiſt thoſe who are entering upon the ſame dangers which we ourſelves have eſcaped: how ought I, who now after a great ſtorm am brought within a near proſpect of land, to be affected towards him, who, I perceive, muſt be expoſed to the greateſt tempeſts of the ſtate?" He alludes to the late diſturbances and tumults occaſioned by the conſpiracy of Catiline, which had been ſo happily ſuppreſſed by him in the time of his conſulate. Of the latter kind is that of Quintilian: "As the ground is made better and more fruitful by culture, ſo is the mind by inſtruction." There is both a beauty and juſtneſs in this ſimile.

But compariſons are ſometimes made between facts and other things, in order to infer ſome difference or oppoſition between them. In comparing two facts, on account of ſome diſagreement and unlikeneſs, the inference is made from the difference between one and the other in that particular reſpect only. As thus: "Though it was not eſteemed cruelty in Brutus to put his two ſons to death, for endeavouring to betray their country; it might be ſo in Manlius, who put his ſon to death, only for engaging the enemy without orders, though he gained the victory." The difference between the two facts lies in the different nature of the crime. The ſons of Brutus entered into a conſpiracy to betray their country; and though they miſcarried in it, yet the intention and endeavours they uſed to accompliſh it were criminal in the higheſt degree. But young Manlius could only be charged with raſhneſs. His deſign was honourable, and intended for the intereſt of his country; only it was irregular, and might have proved of ill conſequence to military diſcipline. Now in all ſuch caſes, the force of the argument is the ſtronger the greater the difference appears. But the ſame facts which differ in one reſpect may agree in many others; as in the example here mentioned. Brutus and Manlius were both magiſtrates as well as fathers; they both killed their ſons, and that for a capital crime by the Roman law. In any of which reſpects they may be compared in a way of ſimilitude: as, "If Brutus might lawfully put his ſon to death for a capital crime, ſo might Manlius." But now contrary facts do not only differ in ſome certain reſpect, but are wholly oppoſite to each other; ſo that what is affirmed of the one muſt be denied of the other; and if one be a virtue, the other is a vice. Thus Cicero compares the conduct of Marcellus and Verres in a way of oppoſition. "Marcellus (ſays he), who had engaged, if he took Syracuſe, to erect two temples at Rome, would not beautify them with the ſpoils he had taken: Verres, who had made no vows to Honour and Virtue, but to Venus and Cupid, endeavoured to plunder the temple of Minerva. The former would not adorn the gods with the ſpoils of other deities: the latter carried the ornaments of Minerva, a virgin, into the houſe of a ſtrumpet." If therefore the conduct of Marcellus was laudable and virtuous, that of Verres muſt bear the contrary character. But this way of reaſoning has likewiſe place in other reſpects. Thus Cicero, in the quarrel between Cæſar and Pompey, adviſed to peace from the difference between a foreign and domeſtic war: "That the former might prove beneficial to the ſtate; but in the latter, whichever ſide conquered, the public muſt ſuffer." And thus the ill effects of intemperance may be ſhown in a way of oppoſition: "That as temperance preſerves the health of the body, keeps up the vigour of the mind, and prolongs life; ſo exceſs muſt neceſſarily have the contrary effects."

Thus we have given a brief account of the principal ways of reaſoning commonly made uſe of by orators. As to the diſpoſition of arguments, or the order of placing them, ſome adviſe to put the weaker, which cannot wholly be omitted, in the middle: and ſuch as are ſtronger, partly in the beginning, to gain the eſteem of the hearers and render them more attentive; and partly at the end, becauſe what is laſt heard is likely to be retained longeſt: But if there are but two arguments, to place the ſtronger firſt, and then the weaker; and after that to return again to the former, and inſiſt principally upon that. But this muſt be left to the prudence of the ſpeaker, and the nature of the ſubject. Though to begin with the ſtrongeſt, and ſo gradually deſcend to the weakeſt, can never be proper, for the reaſon laſt mentioned. Nor ought arguments to be crowded too cloſe upon one another; for that takes off from their force, as it breaks in upon the attention of the hearers, and does not leave them ſufficient time duly to conſider them. Nor indeed ſhould more be uſed than are neceſſary; becauſe the fewer they are, the more eaſily they are remembered. And the obſervation of a great maſter of eloquence upon this ſubject is certainly very juſt, that *arguments ought rather to be weighed than numbered.*

Chap. V. *Of Confutation.*

The forms of reaſoning here are the ſame as have been already explained under *Confirmation*. *Confutation*, however, is often the more difficult taſk; becauſe he who is to prove a thing comes uſually prepared; but he who is to confute it is frequently left to a ſudden anſwer. For which reaſon, in *judicial* caſes, Quintilian ſays, "It is as much eaſier to accuſe than defend, as it is to make a wound than to heal it." Therefore, not only a good judgment, but a readineſs of thought alſo, ſeems neceſſary for this province. But, in all diſputes, it is of the greateſt conſequence to obſerve where the ſtreſs of the controverſy lies. For without attending to this, perſons may cavil about different matters without underſtanding each other, or deciding any thing. And in confutation, what the adverſary has advanced ought carefully to be conſidered, and in what manner he has expreſſed himſelf. As to the things themſelves, whether they immediately relate to the matter in diſpute, or are foreign to it. Thoſe things that are foreign to the ſubject may either be paſſed over in ſilence, or in a very few words ſhown to be inſignificant. And there ought likewiſe to be a diſtinction made between ſuch things as relate to the ſubject, according to their importance. Thoſe that appear to have no great weight ſhould be ſlightly remarked. For to inſiſt largely upon ſuch matters is both tireſome to the hearers, and apt to bring the judgment of the ſpeaker into queſtion. And therefore things of that nature are generally better turned off with an air of neglect, a pungent queſtion, or an agreeable jeſt, than confuted by a ſerious and laboured anſwer. But thoſe things, which relate to the merits of the cauſe, may be confuted either by *contradicting* them, or by ſhowing ſome *miſtake* in the reaſoning, or their *invalidity* when granted.

Things may be *contradicted* ſeveral ways. What is apparently falſe may be expreſsly *denied*. Thus Cicero in his defence of Cluentius, "When the accuſer had ſaid, that the man fell down dead after he had drunk off his cup, denies that he died that day." And things which the adverſary cannot prove, may likewiſe be denied. Of which we have alſo an inſtance in Cicero, who firſt upbraids Mark Antony as guilty of a breach not only of good breeding, but likewiſe of friendſhip, for reading publicly a private letter he had ſent him. And then adds, "But what will you ſay now, if I ſhould deny that ever I ſent you that letter? How will you prove it? By the hand-writing? In which I confeſs you have a peculiar ſkill, and have found the benefit of it. But how can you make it out? For it is in my

ſecretary's hand. I cannot but envy your maſter who had ſo great a reward for teaching you to underſtand juſt nothing. For what can be more unbecoming not only an orator, but even a man, than for any one to offer ſuch things, which if the adverſary denies, he has nothing more to ſay?" It is an handſome way of contradicting a thing, by ſhowing that the adverſary himſelf maintained the contrary. So when Oppius was charged with defrauding the ſoldiers of their proviſion, Cicero refutes it, by proving, that the ſame perſons charged Oppius with a deſign to corrupt the army by his liberality. An adverſary is never more effectually ſilenced than when you can faſten contradictions upon him; for this is ſtabbing him with his own weapon. Sometimes a thing is not in expreſs terms denied, but repreſented to be utterly incredible. And this method expoſes the adverſary more than a bare denial. So when ſome perſons reproached Cicero with cowardice, and a ſhameful fear of death, he recites their reaſons in ſuch a manner, that any one would be inclined to think the charge entirely falſe. "Was it becoming me (ſays he) to expect death with that compoſedneſs of mind as ſome have imagined? Well, and did I then avoid it? Nay, was there any thing in the world that I could apprehend more deſirable? Or when I had done the greateſt things in ſuch a crowd of ill-minded perſons about me, do you think baniſhment and death were not always in my view, and continually ſounding in my ears as my certain fate, while I was ſo employed? Was life deſirable when all my friends were in ſuch ſorrow, and myſelf in ſo great diſtreſs, deprived of all the gifts both of nature and fortune? Was I ſo unexperienced, ſo ignorant, ſo void of reaſon and prudence? Had I never ſeen nor heard any thing in my whole life? Did all I had read and ſtudied avail nothing? What! did not I know that life is ſhort, but the glory of generous actions permanent? When death is appointed for all, does it not ſeem eligible, that life, which muſt be wreſted from us, ſhould rather be freely devoted to the ſervice of our country, than reſerved to be worn out by the decays of nature? Was not I ſenſible, there has been this controverſy among the wiſeſt men, that ſome ſay, the minds of men and their conſciences utterly periſh at death; and others, that the minds of wiſe and brave men are then in their greateſt ſtrength and vigour, when they are ſet free from the body? The firſt ſtate is not greatly to be dreaded, to be void of ſenſe: but the other, of enjoying larger capacities, is greatly to be deſired. Therefore, ſince I always aimed at dignity, and thought nothing was worth living for without it; how ſhould I, who am paſt the conſulſhip, and did ſo great things in it, be afraid to die?" Thus far Cicero. There is likewiſe an ironical way of contradicting a thing, by retorting that and other things of the like nature upon the adverſe party. Thus Cicero, in his oration againſt Vatinius, ſays: "You have objected to me, that I defended Cornelius, my old friend, and your acquaintance. But pray why ſhould I not have defended him? Has Cornelius carried any law contrary to the omens? Has he violated any law? Has he aſſaulted the conſul? Did he take poſſeſſion of a temple by force of arms? Did he drive away the tribune, who oppoſed the paſſing a law? Has he thrown contempt upon religion? Has he plundered the treaſury? Has he pillaged the ſtate? No, theſe, all theſe, are your doings." Such an unexpected return is ſometimes of great ſervice to abate the confidence of an adverſary.

A ſecond way of confutation is, by obſerving ſome *flaw* in the reaſoning of the adverſe party. We ſhall endeavour to illuſtrate this from the ſeveral kinds of reaſoning treated of before under *Confirmation*. And firſt, as to ſyllogiſms; they may be refuted, either by ſhowing ſome miſtake in the premiſes, or that the concluſion is not juſtly deduced from them. So when the Clodian party contended, that Milo ought to ſuffer death for this reaſon, Becauſe he had confeſſed that he had killed Clodius; that argument, reduced to a ſyllogiſm, would ſtand thus:

He who confeſſes he has killed another, ought not to be allowed to ſee the light.
But Milo confeſſes this.
Therefore he ought not to live.

Now the force of this argument lies in the major or firſt propoſition; which Cicero refutes, by proving, that the Roman people had already determined contrary to what is there aſſerted: "In what city (ſays he) do theſe men diſpute after this weak manner? In that wherein the firſt capital trial was in the caſe of the brave Horatius, who, before the city enjoyed perfect freedom, was ſaved by the ſuffrages of the Roman people, though he confeſſed that he killed his ſiſter with his own hand." But when Cicero accuſed Verres for mal-adminiſtration in his government of Sicily, Hortenſius, who defended him, being ſenſible the allegations brought againſt him could not be denied, had no other way left to bring him off, but by pleading his military virtues in abatement, which at that time were much wanted, and very ſerviceable to the ſtate. The form of the argument was this:

That the Romans then wanted good generals.
That Verres was ſuch,
And conſequently, that it was for the intereſt of the public that he ſhould not be condemned.

But Cicero, who knew his deſign, ſtates the argument for him in his charge; and then anſwers it by denying the conſequence, ſince the crimes of Verres were of ſo heinous a nature, that he ought by no means to be pardoned on the account of any other qualifications: though indeed he afterwards refutes the minor or ſecond propoſition, and ſhows that he had not merited the character of a good general. Enthymems may be refuted, either by ſhowing that the antecedent is falſe, or the conſequent not juſtly inferred from it. As thus, with reſpect to the former caſe:

A ſtrict adherence to virtue has often proved detrimental.
Therefore virtue ought not conſtantly to be embraced.

Here the antecedent may be denied. For virtue is always beneficial to thoſe who ſtrictly adhere to it, both in the preſent ſatisfaction it affords them, and the future rewards they may certainly expect from it. And as to the latter caſe, in this manner:

She is a mother.
Therefore ſhe loves her children.

Now as the certainty of that inference depends upon this general aſſertion, That all mothers love their children, which is not true, the miſtake of the reaſoning may be ſhown from the inſtance of Medea and others, who deſtroyed their own children. As to *induction* and example, by which the truth or equity of a thing is proved from its likeneſs to one or more other things; the reaſoning in either is invalid, if the things ſo compared can be ſhown not to have that ſimilitude or agreement on which the inference is founded. One inſtance therefore may ſerve for both. As when Cicero, after the death of Cæſar, pleaded for the continuance of his laws, but not of thoſe which were made afterwards by Mark Antony: Becauſe, though both were in themſelves invalid, and impoſitions upon the public liberty; yet ſome of Cæſar's were uſeful, and others could not be ſet aſide without diſturbance to the ſtate, and injuring particular perſons; but thoſe of Antony were all detrimental to the public.

The laſt method of *confutation* before-mentioned was, when the orator does in ſome ſenſe *grant* the adverſary his argument, and at the ſame time ſhows its *invalidity*. And this is done by a variety of ways, according to the different nature of the ſub-

ject. Sometimes he allows what was ſaid may be true; but pleads, that what he contends for is neceſſary. This was the method by which Hortenſius propoſed to bring off Verres, as we have already ſhown from Cicero, whoſe words are theſe, addreſſing himſelf to the judges: "What ſhall I do? which way ſhall I bring in my accuſation? where ſhall I turn myſelf? for the character of a brave general is placed like a wall againſt all the attacks I can make. I know the place, I perceive where Hortenſius intends to diſplay himſelf. He will recount the hazards of war, the neceſſities of the ſtate, the ſcarcity of commanders; and then he will intreat you, and do his utmoſt to perſuade you, not to ſuffer the Roman people to be deprived of ſuch a commander upon the teſtimony of the Sicilians, nor the glory of his arms to be ſullied by a charge of avarice." At other times the orator pleads, that although the contrary opinion may ſeem to be attended with advantage, yet that his own is more juſt or honourable. Such was the caſe of Regulus, when his friends endeavoured to prevail with him to continue at Rome, and not return to Carthage, where he knew he muſt undergo a cruel death. But as this could not be done without violating his oath, he refuſed to hearken to their perſuaſions. Another way of confutation is, by retorting upon the adverſary his own argument. Thus Cicero, in his defence of Ligarius, ſays: "You have, Tubero, that which is moſt deſirable to an accuſer, the confeſſion of the accuſed party; but yet ſuch a confeſſion, that he was on the ſame ſide that you, Tubero, choſe yourſelf, and your father too, a man worthy of the higheſt praiſe. Wherefore, if there was any crime in this, you ought firſt to confeſs your own before you attempt to faſten any upon Ligarius." The orator takes this advantage where an argument proves too much, that is, more than the perſon deſigned it for, who made uſe of it. Not much unlike this is what they call *inverſion*, by which the orator ſhows, that the reaſons offered by the oppoſite party make for him. So when Cæcilius urged, that the province of accuſing Verres ought to be granted to him, and not to Cicero, becauſe he had been his treaſurer in Sicily at the time thoſe crimes were committed with which he was charged, and conſequently knew moſt of that affair; Cicero turns the argument upon him, and ſhows, for that very reaſon he was the moſt unfit of any man to be intruſted with his proſecution; ſince having been concerned with him in his crimes, he would certainly do all in his power to conceal or leſſen them. Again, ſometimes the charge is acknowledged, but the crime ſhifted off to another. Thus, when Sextius was accuſed of ſedition, becauſe he had got together a body of gladiators, and brought them into the forum, where a warm engagement happened between them and Clodius's faction; Cicero owns the fact, but charges the crime of ſedition upon Clodius's party in being the aggreſſors. Another method made uſe of for the ſame purpoſe is, to alleviate the charge, and take off the force of it, by ſhowing, that the thing was not done with that intention which the adverſary inſinuates. Thus Cicero, in his defence of king Dejotarus, owns he had raiſed ſome forces, though not to invade the Roman territories, as had been alleged, but only to defend his own borders, and ſend aid to the Roman generals.

We have hitherto been ſpeaking of the methods of confutation uſed by orators, in anſwering thoſe arguments which are brought by the contrary party. But ſometimes they raiſe ſuch objections themſelves to what they have ſaid, as they imagine may be made by others; which they afterwards anſwer, the better to induce their hearers to think, that nothing conſiderable can be offered againſt what they have advanced, but what will admit of an eaſy reply. Thus, when Cicero, at the requeſt of the Sicilians, had undertaken the accuſation of Verres, it came under debate, whether he, or Cæcilius, who had been Verres's quæſtor in Sicily, ſhould be admitted to that province. Cicero, therefore, in order to ſet him aſide, among other arguments, ſhows his incapacity for ſuch an undertaking, and for that end recounts at large the qualifications neceſſary for an orator. Which he repreſents to be ſo many and great, that he thought it neceſſary to ſtart the following objection to what he had himſelf ſaid upon that ſubject. "But you will ſay perhaps, Have you all theſe qualifications?" To which he thus replies: "I wiſh I had; but it has been my conſtant ſtudy from my youth to gain them. And if, from their greatneſs and difficulty, I have not been able to attain them, who have done nothing elſe through my whole life; how far, do you imagine, you muſt be from it, who never thought of them before; and even now, when you are entering upon them, have no apprehenſion, what, and how great, they are?" This is an effectual way of defeating an adverſary, when the objection is well founded, and clearly anſwered. But we ſhall have occaſion to conſider this matter more largely hereafter, under the figure *prolepſis*, to which it properly relates.

Chap. VI. *Of the Concluſion.*

Rhetoricians make the *concluſion* of a diſcourſe to conſiſt of two parts: *recapitulation*, and *an addreſs to the paſſions*.

1. *Recapitulation* is a ſummary account of what the ſpeaker has before offered in maintenance of his ſubject; and is deſigned both to refreſh the memory of the hearers, and to bring the principal arguments together into a narrow compaſs, that they may appear in a ſtronger light. Now there are ſeveral things neceſſary to a good repetition.

And firſt, it muſt be ſhort and conciſe; ſince it is deſigned to refreſh the memory, and not to burden it. For this end, therefore, the chief things only are to be touched upon; thoſe on which the cauſe principally depends, and which the orator is moſt deſirous ſhould be regarded by his hearers. Now theſe are, The general heads of the diſcourſe, with the main arguments brought to ſupport them. But either to inſiſt particularly upon every minute circumſtance, or to enlarge upon thoſe heads which it may be thought proper to mention, carries in it not ſo much the appearance of a repetition, as of a new diſcourſe.

Again, it is convenient in a repetition to recite things in the ſame order in which they were at firſt laid down. By this means the hearers will be enabled much better to keep pace with the ſpeaker as he goes along; and if they happen to have forgot any thing, they will the more readily recall it. And beſides, this method appears moſt ſimple and open, when the ſpeaker reviews what he has ſaid in the ſame manner it was before delivered, and ſets it in the cleareſt light for others to judge of it. But though a repetition contains only the ſame things which had been more largely treated of before; yet it is not neceſſary they ſhould be expreſſed in the ſame words. Nay, this would many times be tireſome and unpleaſant to the hearers: whereas a variety of expreſſion is grateful, provided the ſenſe be the ſame. Beſides, every thing ought now to be repreſented in the ſtrongeſt terms, and in ſo lively a manner, as may at the ſame time both entertain the audience, and make the deepeſt impreſſion upon their minds. We have a very exact and accurate example of repetition in Cicero's oration for Quintius. Cicero was then a young man, and ſeems to have kept more cloſely to the rules of art, than afterwards, when by uſe and practice he had gained a greater freedom of ſpeaking. We formerly cited the partition of this ſpeech, upon another occaſion, which runs thus: "We deny, Sextus Nevius, that you were put into the poſſeſſion of the eſtate of P. Quintius, by the prætor's edict. This is the diſpute between us. I will therefore ſhow, firſt, that you had no juſt cauſe to apply to the prætor for the poſſeſſion of the eſtate of P. Quintius; then, that you could not poſſeſs it by the edict; and laſtly, that you

did not poſſeſs it. When I have proved theſe three things, I will conclude." Now Cicero begins his concluſion with a repetition of thoſe three heads, and a ſummary account of the ſeveral arguments he made uſe of under each of them. But they are too long to be here exhibited. In his oration for the Manilian law, his repetition is very ſhort. He propoſed in the partition to ſpeak to three things: the nature of the war againſt king Mithridates, the greatneſs of it, and what ſort of general was proper to be intruſted with it. And when he has gone through each of theſe heads, and treated upon them very largely, he reduces the ſubſtance of what he has ſaid to this general and ſhort account: "Since therefore the war is ſo neceſſary, that it cannot be neglected; and ſo great, that it requires a very careful management; and you can intruſt it with a general of admirable ſkill in military affairs, of ſingular courage, the greateſt authority, and eminent ſucceſs: do you doubt to make uſe of this ſo great a bleſſing, conferred and beſtowed upon you by heaven, for the preſervation and enlargement of the Roman ſtate?" Indeed this repetition is made by Cicero, before he proceeds to the confutation; and not at the end of his diſcourſe, where it is uſually longer and more particular: however, this may ſerve to ſhow the nature of ſuch a recital.

But ſometimes a repetition is made, by running a compariſon between the ſpeaker's own arguments and thoſe of the adverſe party; and placing them in oppoſition to each other. And this method Cicero takes in the concluſion of his third oration upon the Agrarian law. And here ſometimes the orator takes occaſion to find fault with his adverſary's management, in theſe and ſuch like expreſſions: "This part he has entirely dropt. To that he has given an invidious turn, or a falſe colouring. He leaves arguments, and flies to intreaties; and not without good reaſon, if we conſider the weakneſs of his cauſe."

But when the diſcourſe is very long, and the arguments inſiſted on have been many, to prevent the hearers growing out of patience by a more particular recital, the orator ſometimes only juſt mentions ſuch things, which he thinks of leaſt conſequence, by ſaying, that he omits or paſſes over them, till he comes to what is of greater moment, which he repreſents more fully. This method Cicero has taken in his defence of Cluentius; where, having run over ſeveral leſſer heads in the manner now deſcribed, he then alters his expreſſion, and introduces what was of more importance, by ſaying, "What I firſt complain of, is that wickedneſs, which is now diſcovered." And ſo he proceeds more particularly to recite thoſe things which immediately related to Cluentius. And this is what the writers upon this art call *preterition*. But this much may ſerve for repetition or recapitulation.

2. We now proceed to the other part of the concluſion, which conſiſts in an *addreſs to the paſſions*. Indeed the orator ſometimes endeavours occaſionally to work upon the paſſions of his hearers in other parts of his diſcourſe, but more eſpecially in the concluſion, where he is warmeſt himſelf, and labours to make them ſo. For the main deſign of the introduction is to conciliate the hearers, and gain their attention; of the narration, propoſition, and confirmation, to inform them; and of the concluſion, to move them. And therefore, to uſe Quintilian's words. "Here all the ſprings of eloquence are to be opened. It is here we ſecure the minds of the hearers, if what went before was well managed. Now we are paſt the rocks and ſhallows, all the ſails may be hoiſted. And as the greateſt part of the concluſion conſiſts in illuſtration, the moſt pompous language and ſtrongeſt figures have place here." Now the paſſions to which the orator more particularly addreſſes, differ according to the nature of the diſcourſe. In demonſtrative orations, when laudatory,—love, admiration, and emulation, are uſually excited; but in invectives,—hatred, envy, and contempt. In deliberative ſubjects, either the hope of gratifying ſome deſire is ſet in view, or the fear of ſome impending evil. And in judicial diſcourſes, almoſt all the paſſions have place, but more eſpecially reſentment and pity; inſomuch that moſt of the ancient rhetoricians mention only theſe two. But having treated upon the nature of the paſſions, and the methods ſuited both to excite and allay them, in a former chapter, we ſhall at preſent only add a few general obſervations, which may not be improper in this place, where the ſkill of the orator in addreſſing to them is more eſpecially required.

The orator will obſerve what circumſtances either of things, or perſons, or both, will furniſh him with motives proper to apply to thoſe paſſions he deſires to excite in the minds of his hearers. Thus Cicero, in his orations for Plancus and Sylla, moves his hearers from the circumſtances of the men; but in his accuſation of Verres, very frequently from the barbarity and horrid nature of his crimes; and from both, in his defence of Quintius.

But the ſame paſſion may be excited by very different methods. This is plain from the writings of thoſe Roman ſatyriſts which are yet extant; for they have all the ſame deſign, and that is to engage men to a love of virtue, and hatred of vice: but their manner is very different, ſuited to the genius of each writer. Horace endeavours to recommend virtue, by laughing vice out of countenance; Perſius moves us to an abhorrence and deteſtation of vice, with the gravity and ſeverity of a philoſopher; and Juvenal, by open and vehement invectives. So orators make uſe of all theſe methods in exciting the paſſions; as may be ſeen by their diſcourſes, and particularly thoſe of Cicero. But it is not convenient to dwell long upon the ſame paſſion. For the image thus wrought up in the minds of the hearers does not laſt a great while, but they ſoon return to reflection. When the emotion, therefore, is once carried as high as it well can be, they ſhould be left under its influence, and the ſpeaker proceed to ſome new matter, before it declines again.

Moreover, orators ſometimes endeavour to raiſe contrary paſſions to each other, as they are concerned for oppoſite parties. So the accuſer excites anger and reſentment, but the defendant pity and compaſſion. At other times, one thinks it ſufficient to allay and take off that paſſion which the other has raiſed, and bring the hearers to a calm and ſedate conſideration of the matter before them.

But this eſpecially is to be regarded, that the orator expreſs the ſame paſſion himſelf with which he endeavours to affect others; and that not only in his action and voice, but likewiſe in his language: and therefore his words, and manner of expreſſion, ſhould be ſuited to that perturbation and diſorder of mind which he deſigns to repreſent. However, a decency and propriety of character is always carefully to be obſerved; for, as Cicero very well remarks, "A neglect of this is not only very culpable in life, but likewiſe in diſcourſe. Nor do the ſame things equally become every ſpeaker, or every audience; nor every time, and every place." And therefore he greatly commends that painter, who, deſigning to repreſent in a picture the ſacrifice of Iphigenia, Agamemnon's daughter, drew Calchas the prieſt with a ſad countenance; Ulyſſes, her father's great friend, more dejected; and her uncle Menelaus, moſt diſconſolate; but threw a veil over the face of Agamemnon himſelf, as being unable to expreſs that exceſs of ſorrow which he thought was proper to appear in his countenance. And this juſtneſs of character is admirably well obſerved by Cicero himſelf, in his defence of Milo; for as Milo was always known to be a man of the greateſt reſolution and moſt undaunted courage, it was very improper to introduce him (as the uſual method then was in capital caſes) moving pity, and begging for

mercy. Cicero therefore takes this part upon himſelf; and what he could not do with any propriety in the perſon of Milo, he performs in his own, and thus addreſſes the judges: "What remains, but that I intreat and beſeech you, that you would ſhow that compaſſion to this brave man, for which he himſelf does not ſolicit, but I, againſt his inclination, earneſtly implore and requeſt. Do not be leſs inclined to acquit him, if in this our common ſorrow, you ſee no tear fall from Milo's eyes; but perceive in him the ſame countenance, voice, and language, as at other times, ſteady and unmoved. Nay, I know not whether for this reaſon you ought not much ſooner to favour him: For if, in the conteſt of gladiators (perſons of the loweſt condition and fortune in life), we are wont to be diſpleaſed with the timorous and ſuppliant, and thoſe who beg for their life; but interpoſe in favour of the brave and courageous, and ſuch as expoſe themſelves to death; and we ſhow more compaſſion to thoſe who do not ſue for it, than to thoſe who do: with how much greater reaſon ought we to act in the ſame manner towards the braveſt of our fellow-citizens?" And as theſe words were agreeable to his own character, while ſoliciting in behalf of another; ſo, immediately after, he introduces Milo ſpeaking like himſelf, with a generous and undaunted air: "Theſe words of Milo (ſays he) quite ſink and diſpirit me, which I daily hear from him. Farewell, farewell, my fellow-citizens, farewell! may you be happy, flouriſh and proſper; may this renowned city be preſerved, my moſt dear country, however it has treated me; may it continue in peace, though I cannot continue in it, to whom it owes its peace! I will retire; I will be gone."

But as perſons are commonly more affected with what they ſee than with what they hear, orators ſometimes call in the aſſiſtance of that ſenſe in moving the paſſions. For this reaſon it was uſual among the Romans, in judicial caſes, for accuſed perſons to appear with a dejected air and a ſordid garb, attended by their parents, children, or other relations and friends, with the like dreſs and aſpect; as likewiſe to ſhow their ſcars, wounds, bloody garments, and other things of the like nature, in open court. So when, upon the death of Cæſar, Mark Antony harangued the populace, he at the ſame time expoſed to their view the garment in which he was ſtabbed, fixed upon a pole; at which ſight they were ſo enraged, that immediately they ran with lighted torches to ſet fire to the houſes of the conſpirators. But this cuſtom at laſt became ſo common, and was ſometimes ſo ill conducted, that the force of it was greatly abated, as we learn from Quintilian. However, if the Romans proceeded to an exceſs on the one hand, the ſtrictneſs of the Areopagites at Athens may perhaps be thought too rigid on the other; for in that court, if the orator began to ſay any thing which was moving, an officer immediately ſtood up, and bade him be ſilent. There is certainly a medium between theſe two extremes, which is ſometimes not only uſeful, but even neceſſary: for, as Quintilian very juſtly ſays, "It is neceſſary to apply to the paſſions, when thoſe things which are true, juſt, and of common benefit, cannot be come at any other way."

Chap. VII. *Of Digreſſion, Tranſition, and Amplification.*

The number, order, and nature of the parts which conſtitute a complete and regular oration, we have endeavoured to explain in ſeveral preceding chapters. But there are two or three things yet remaining, very neceſſary to be known by an orator, which ſeem moſt properly to come under the ſecond branch of his art.—And theſe are, *Digreſſion*, *Tranſition*, and *Amplification*.

I. *Digreſſion*, as defined by Quintilian, is, "A going off from the ſubject we are upon, to ſome different thing, which may however be of ſervice to it." We have a very beautiful inſtance of this in Cicero's defence of Cœlius, who was accuſed of having firſt borrowed money of Clodia, and then engaging her ſervants to poiſon her. Now, as the proof of the fact depended upon ſeveral circumſtances, the orator examines them ſeparately; and ſhows them to be all highly improbable. "How (ſays he) was the deſign of this poiſon laid? Whence came it? how did they get it? by whoſe aſſiſtance, to whom, or where, was it delivered?" Now to the firſt of theſe queries he makes the accuſer give this anſwer: "They ſay Cœlius had it at home, and tried the force of it upon a ſlave provided on purpoſe, whoſe ſudden death proved the ſtrength of the poiſon." Now as Cicero repreſents the whole charge againſt Cœlius as a fiction of Clodia, invented out of revenge for ſome ſlights he had put upon her; to make this the more probable, he inſinuates that ſhe had poiſoned her huſband, and takes this opportunity to hint it, that he might ſhow how eaſy it was for her to charge another with poiſoning a ſervant, who had done the ſame to her own huſband. But not contented with this, he ſteps out of his way, and introduces ſome of the laſt words of her huſband Metellus, to render the fact more barbarous and ſhocking, from the admirable character of the man. "O immortal gods! why do you ſometimes wink at the greateſt crimes of mankind, or delay the puniſhment of them to futurity? For I ſaw, I myſelf ſaw (and it was the moſt doleful ſcene of my whole life) when Q. Metellus was taken from the boſom of his country; and when he, who thought himſelf born to be ſerviceable to this ſtate, within three days after he had appeared with ſuch advantage in the ſenate, in the forum, and every where in public, was ſnatched from us in the flower of his age, and prime of his ſtrength and vigour. At which time, when he was about to expire, and his mind had loſt the ſenſe of other things, ſtill retaining a concern for the public, he looked upon me, as I was all in tears, and intimated in broken and dying words, how great a ſtorm hung over the city and threatened the whole ſtate; often ſtriking the wall which ſeparated his houſe from that of Quintus Catulus, and frequently calling both upon him and me, and ſeeming to grieve not ſo much at the approach of his own death, as that both his country and I ſhould be deprived of his aſſiſtance. Had he not been wickedly taken off on a ſudden, how would he after his conſulſhip have withſtood the fury of his kinſman Publius Clodius, who, while in that office, threatened, in the hearing of the ſenate, to kill him with his own hand, when he firſt began to break out? And will this woman dare to come out of thoſe doors, and talk of the force of poiſon? will not ſhe fear, leſt the houſe itſelf ſhould ſpeak the villany? will not ſhe dread the conſcious walls, nor that ſad and mournful night? But I return to the accuſation." And then he proceeds to conſider and refute the ſeveral circumſtances of the accuſation. All this was no part of his argument; but having mentioned the charge of poiſon, he immediately takes occaſion to introduce it, in order to excite the indignation of the hearers againſt Clodia, and invalidate the proſecution as coming from a perſon of her character. Digreſſion cannot properly be ſaid to be a neceſſary part of a diſcourſe; but it may ſometimes be very convenient, and that upon ſeveral accounts.

As firſt, where a ſubject is of itſelf flat and dry, or requires cloſe attention, it is of uſe to relieve and unbend the mind by ſomething agreeable and entertaining. For which reaſon Quintilian obſerves, that the orators of his time generally made an excurſion in their harangues upon ſome pleaſing topic, between the narration and the proof. But he condemns the practice, as too general; for while they ſeemed to think it neceſſary, it obliged them ſometimes to bring in things trifling and foreign to the purpoſe. Beſides, a digreſſion is confined to no one part of a diſcourſe, but may come in any where, as occaſion offers; provided it fall in naturally with the ſubject, and be made ſome

way ſubſervient to it. We never meet with it in Cicero, without ſome evident and good reaſon. So in his proſecution of Verres for his barbarous and inhuman outrages againſt the Sicilians, he takes an occaſion to launch out into a beautiful deſcription of the iſland, and to recount the advantages which accrued from it to the Romans. His ſubject did not neceſſarily lead him to this, but his view in it was to heighten and aggravate the charge againſt Verres.

Again, as a *digreſſion* ought not to be made without ſufficient reaſon, ſo neither ſhould it be too frequent. And he who never does it but where it is proper and uſeful, will not often ſee occaſion for it. Frequently to leave the ſubject, and go off to other things, breaks the thread of the diſcourſe, and is apt to introduce confuſion. Indeed ſome kinds of writing admit of a more frequent uſe of digreſſions than others. In hiſtory they are often very ſerviceable. For as that conſiſts of a ſeries of facts, and a long continued narrative without variety is apt to grow dull and tedious; it is neceſſary at proper diſtances to throw in ſomething entertaining, in order to enliven it, and keep up the attention. And accordingly we find the beſt hiſtorians often embelliſh their writings with deſcriptions of cities, rivers, and countries, as likewiſe with the ſpeeches of eminent perſons upon important occaſions, and other ornaments, to render them the more pleaſing and delightful. Poets take a ſtill greater liberty in this reſpect: for as their principal view is moſt commonly to pleaſe, they do not attend ſo cloſely to connection; but as an image offers itſelf, which may be agreeably wrought up, they bring it in, and go off more frequently to different things, than other writers.

Another property of a *digreſſion* is, that it ought not to be too long, leſt the hearers forget what preceded, before the ſpeaker returns again to his ſubject.

For a digreſſion being no principal part of a diſcourſe, nor of any further uſe than as it ſerves ſome way or other to enforce or illuſtrate the main ſubject; it cannot anſwer this end, if it be carried to ſuch a length, as to cauſe that either to be forgotten or neglected. And every one's memory will not ſerve him to connect together two parts of a diſcourſe, which lie at a wide diſtance from each other. The better therefore to guard againſt this, it is not unuſual with orators, before they enter upon a digreſſion of any conſiderable length, to prepare their hearers, by giving them notice of it, and ſometimes deſiring leave to divert a little from the ſubject. And ſo likewiſe at the concluſion they introduce the ſubject again by a ſhort tranſition. Thus Cicero, in the example cited above, when he has finiſhed his digreſſion concerning the death of Metellus, proceeds to his ſubject again with theſe words: "But I return to the accuſation."

Indeed we find orators ſometimes, when ſore preſſed, and the cauſe will not bear a cloſe ſcrutiny, artfully run into digreſſions with a deſign to divert the attention of the hearers from the ſubject, and turn them to a different view. And in ſuch caſes, as they endeavour to be unobſerved, ſo they do it tacitly without any tranſition or intimation of their deſign; their buſineſs being only to get clear of a difficulty, till they have an opportunity of entering upon ſome freſh topic.

II. *Tranſitions* are often uſed not only after a digreſſion, but likewiſe upon other occaſions. A tranſition is, "A form of ſpeech, by which the ſpeaker in a few words tells his hearers both what he has ſaid already, and what he next deſigns to ſay." Where a diſcourſe conſiſts of ſeveral parts, this is often very proper in paſſing from one to another, eſpecially when the parts are of a conſiderable length; for it aſſiſts the hearers to carry on the ſeries of the diſcourſe in their mind, which is a great advantage to the memory. It is likewiſe a great relief to the attention, to be told when an argument is finiſhed, and what is to be expected next. And therefore we meet with it very frequently in Hiſtory. But we conſider it at preſent only as made uſe of by orators. Cicero, in his ſecond oration againſt Catiline, who had then left Rome, having at large deſcribed his conduct and deſigns, adds: "But why do I talk ſo long concerning one enemy, and ſuch an one; who owns himſelf an enemy, and whom I do not fear, ſince, what I always deſired, there is now a wall between us; and ſay nothing of thoſe, who conceal themſelves, who remain at Rome, and among us?" And then he proceeds to give an account of the other conſpirators.

But ſometimes, in paſſing from one thing to another, a general hint of it is thought ſufficient to prepare the hearers, without particularly ſpecifying what has been ſaid, or is next to follow. Thus Cicero in his ſecond Philippic ſays, "But thoſe things are old, this is yet freſh." And again: "But I have inſiſted too long upon trifles, let us come to things of greater moment." And at other times, for greater brevity, the tranſition is imperfect, and mention made only of the following head, without any intimation of what has been ſaid already. As in Cicero's defence of Muræna, where he ſays: "I muſt now proceed to the third part of my oration, concerning the charge of bribery." And ſoon after: "I come now to Cato, who is the ſupport and ſtrength of this charge."

III. The third and laſt head is *Amplification*. Now by amplification is meant, not barely a method of enlarging upon a thing; but ſo to repreſent it in the fulleſt and moſt comprehenſive view, as that it may in the livelieſt manner ſtrike the mind, and influence the paſſions. Cicero, ſpeaking of this, calls it *the greateſt commendation of eloquence*; and obſerves, "that it conſiſts not only in magnifying and heightening a thing, but likewiſe in extenuating and leſſening it." But though it conſiſts of theſe two parts, and may be applied either way; yet to amplify, is not to ſet things in a falſe light, but to paint them in their juſt proportion and proper colours, ſuitable to their nature and qualities. Rhetoricians have obſerved ſeveral ways of doing this.

One is to aſcend from a particular thing to a general. Thus Cicero, in his defence of Archias, having commended him as an excellent poet, and likewiſe obſerved, that all the liberal arts have a connection with each other, and a mutual relation between them, in order to raiſe a juſt eſteem of him in the minds of his hearers, takes occaſion to ſay many things in praiſe of polite literature in general, and the great advantages that may be received from it. "You will aſk me (ſays he), why we are ſo delighted with this man? Becauſe he ſupplies us with thoſe things, which both refreſh our minds after the noiſe of the forum, and delight our ears when wearied with contention. Do you think we could either be furniſhed with matter for ſuch a variety of ſubjects, if we did not cultivate our minds with learning; or bear ſuch a conſtant fatigue, without affording them that refreſhment? I own I have always purſued theſe ſtudies; let thoſe be aſhamed, who have ſo given up themſelves to learning, as neither to be able to convert it to any common benefit, nor diſcover it in public. But why ſhould it ſhame me, who have ſo lived for many years that no advantage or eaſe has ever diverted me, no pleaſure allured me, nor ſleep retarded me, from this purſuit? Who then can blame me, or who can juſtly be diſpleaſed with me, if I have employed that time in reviewing theſe ſtudies, which has been ſpent by others in managing their affairs, in the celebration of feſtivals, or other diverſions, in refreſhments of mind and body, in unſeaſonable banquets, in dice, or tennis? And this ought the rather to be allowed me, becauſe my ability as an orator has been improved by thoſe purſuits, which, ſuch as it is, was never wanting to aſſiſt my friends. And if it be eſteemed but ſmall, yet I am ſenſible from what ſpring I muſt draw thoſe things which are of the greateſt importance." With more to the ſame purpoſe:

from which he draws this inference: "Shall I not therefore love this man? ſhall I not admire him? ſhall I not by all means defend him?"

A contrary method to the former is, to deſcend from a general to a particular. As if any one, while ſpeaking in commendation of eloquence, ſhould illuſtrate what he ſays from the example of Cicero, and ſhow the great ſervices he did his country, and the honours he gained to himſelf, by his admirable ſkill in oratory. Our common way of judging of the nature of things is from what we obſerve in particular inſtances, by which we form general notions concerning them. When therefore we conſider the character of Cicero, and the figure he made in the world, it leads us to conclude, there muſt be ſomething very admirable in that art by which he became ſo celebrated. And this method he has taken himſelf in his oration for the Manilian law, where having firſt intimated the ſcarcity of good generals at that time among the Romans, he then deſcribes the virtues of a complete commander as a proof of it, and ſhows how many and great qualifications are neceſſary to form ſuch a character, as courage, prudence, experience, and ſucceſs: all which he afterwards applies to Pompey.

A third method is by an enumeration of parts. So, when Cicero, upon the defeat of Mark Antony before Mutina, propoſed that a funeral monument ſhould be erected in honour of the ſoldiers who were killed in that battle, as a comfort to their ſurviving relations; he does it in this way, to give it the greater weight: "Since (ſays he) the tribute of glory is paid to the beſt and moſt valiant citizens by the honour of a monument, let us thus comfort their relations, who will receive the greateſt conſolation in this manner: their parents who produced ſuch brave defenders of the ſtate; their children, who will enjoy theſe domeſtic examples of fortitude; their wives, for the loſs of ſuch huſbands, whom it will be more fitting to extol than lament; their brethren, who will hope to reſemble them no leſs in their virtues than in their aſpect. And I wiſh we may be able to remove the grief of all theſe by our reſolutions." Such repreſentations greatly enlarge the image of a thing, and afford the mind a much clearer view of it than if it were contracted into one ſingle propoſition.

Again, another method not much unlike the former is, when any thing is illuſtrated from a variety of cauſes. Thus Cicero juſtifies his behaviour in retiring, and not oppoſing his enemies, when they ſpirited up the mob in order to baniſh him, from the following reaſons, which at that time determined him to ſuch a conduct: "When (ſays he) unleſs I was given up, ſo many armed fleets ſeemed ready to attack this ſingle ſhip of the ſtate, toſſed with the tempeſts of ſeditions and diſcords, and the ſenate was now removed from the helm; when baniſhment, murder, and outrage, were threatened; when ſome, from an apprehenſion of their own danger, would not defend me; others were incited by an inveterate hatred to all good men, others thought I ſtood in the way, others took this opportunity to expreſs their reſentment, others envied the peace and tranquillity of the ſtate; and upon all theſe accounts I was particularly ſtruck at: ſhould I have choſen rather to oppoſe them (I will not ſay to my own certain deſtruction, but to the greateſt danger both of you and your children), than alone to ſubmit to and undergo what threatened us all in common?" Such a number of reaſons brought together, muſt ſet a thing in a very ſtrong and clear light.

The like may be ſaid of a number and variety of effects. Thus Cicero deſcribes the force and excellence of oratory from its great and ſurpriſing effects, when he ſays, "Nothing ſeems to be more excellent, than by diſcourſe to draw the attention of a whole aſſembly, delight them, and ſway their inclinations different ways at pleaſure. This, in every free ſtate, and eſpecially in times of peace and tranquillity, has been always in the higheſt eſteem and reputation. For what is either ſo admirable, as for one only, or a very few, out of a vaſt multitude, to be able to do that which all have a natural power of doing? or ſo delightful to hear, as a judicious and ſolid diſcourſe in florid and polite language? or ſo powerful and grand, as to influence the populace, the judges, the ſenate, by the charms of eloquence? Nay, what is ſo noble, ſo generous, ſo munificent, as to afford aid to ſupplicants, to ſupport the afflicted, give ſafety, deliver from dangers, and preſerve from exile? Or what is ſo neceſſary as to be always furniſhed with arms to guard yourſelf, aſſert your right, or repel injuries? And, not to confine our thoughts wholly to the courts of juſtice or the ſenate, what is there in the arts of peace more agreeable and entertaining than good language and a fine way of ſpeaking? For it is this eſpecially wherein we excel other animals, that we can diſcourſe together, and convey our thoughts to each other by words. Who therefore would not eſteem, and in a particular manner endeavour to ſurpaſs others in that wherein mankind principally excels brute beaſts? But to proceed to its chief advantages: What elſe would have drawn men into ſocieties, or taken them off from a wild and ſavage life, and ſoftened them into a polite and civilized behaviour; or, when ſettled in communities, have reſtrained them by laws?" Who but, after ſuch a deſcription, muſt conceive the ſtrongeſt paſſion for an art attended with ſo many great and good effects?

A thing may likewiſe be illuſtrated by its oppoſite. So the bleſſings and advantages of peace may be recommended from the miſeries and calamities of war; and thus Cicero endeavours to throw contempt upon Catiline and his party, by comparing them with the contrary ſide: "But if, omitting all theſe things with which we abound, and they want, the ſenate, the knights, the populace, the city, treaſury, revenues, all Italy, the provinces, and foreign nations; if, I ſay, omitting theſe things, we compare the cauſes themſelves in which each ſide is engaged, we may learn from thence how deſpicable they are. —For on this ſide modeſty is engaged, on that impudence; on this chaſtity, on that lewdneſs; on this integrity, on that fraud; on this piety, on that profaneneſs; on this conſtancy, on that fury; on this honour, on that baſeneſs; on this moderation, on that unbridled paſſion: In a word, equity, temperance, fortitude, prudence, and all virtues, contend with injuſtice, luxury, cowardice, raſhneſs, and all vices; plenty with want; reaſon with folly; ſobriety with madneſs; and, laſtly, good hope with deſpair. In ſuch a conteſt, did men deſert us, would not heaven ordain that ſo many and ſo great vices ſhould be defeated by theſe moſt excellent virtues?"

Gradation is another beautiful way of doing this. So when Cicero would aggravate the cruelty and barbarity of Verres for crucifying a Roman citizen, which was a ſort of puniſhment only inflicted upon ſlaves, he chooſes this way of doing it. "It is a crime (ſays he) to bind a Roman citizen, wickedneſs to whip him, and a ſort of parricide to kill him; what then muſt I call it to crucify him? No name can ſufficiently expreſs ſuch a villany." And the images of things may be thus heightened, either by aſcending, as in this inſtance; or deſcending, as in that which follows, relating to the ſame action of Verres: "Was I not to complain of or bewail theſe things to Roman citizens, nor the friends of our ſtate, nor thoſe who had heard of the Roman name; nay, if not to men, but beaſts; or, to go yet further, if, in the moſt deſert wilderneſs, to ſtones and rocks; even all mute and inanimate creatures would be moved by ſo great and heinous cruelty."

And, to name no more, facts may be amplified from their circumſtances; as time, place, manner, event, and the like. But inſtances of this would carry us too far; and therefore we ſhall only add, that, as the deſign of *amplification* is not barely to prove or evince the truth of things, but alſo to adorn and

illuſtrate them, it requires a florid and beautiful ſtyle, conſiſting of ſtrong and emphatical words, flowing periods, harmonious numbers, lively tropes, and bright figures. But the conſideration of theſe things comes under the third part of oratory, upon which we are now to enter.

Part III. Of ELOCUTION.

ELOCUTION directs us to ſuit both the words and expreſſions of a diſcourſe to the nature of the ſubject, or to ſpeak with propriety and decency. This faculty is in one word called *eloquence*; and thoſe perſons who are poſſeſſed of it are therefore ſtyled *eloquent*.

Elocution is two-fold, general and particular. The former treats of the ſeveral properties and ornaments of language in common; the latter conſiders them as they are made uſe of to form different ſorts of ſtyle.

I. GENERAL ELOCUTION.

This, according to rhetoricians, conſiſts of three parts; *Elegance*, *Compoſition*, and *Dignity*. A diſcourſe which has all theſe properties ſuitably adjuſted, muſt, with reſpect to the language, be perfect in its kind, and delightful to the hearers.

Chap. I. *Of Elegance.*

Elegance conſiſts in two things, *Purity* and *Perſpicuity*: and both theſe, as well with reſpect to ſingle words, as their conſtruction in ſentences. Theſe properties in language give it the name of *elegant*, for a like reaſon that we call other things ſo which are clean and neat in their kind. But in the common uſe of our tongue, we are apt to confound *elegance* with *eloquence*; and ſay, *a diſcourſe is elegant*, when we mean by the expreſſion, that it has all the properties of fine language.

§ 1. *Purity.*

By this we are to underſtand the choice of ſuch words and phraſes as are ſuited and agreeable to the uſe of the language in which we ſpeak: And ſo grammarians reduce the faults they oppoſe to it to two ſorts, which they call *barbariſm* and *ſolecciſm*; the former of which reſpects ſingle words, and the latter their conſtruction. But we ſhall conſider them jointly, and in a manner different from grammarians; for with them all words are eſteemed pure which are once adopted into a language, and authoriſed by uſe. And as to phraſes, or forms of expreſſion, they allow them all the ſame claim, which are agreeable to the analogy of the tongue. But in oratory, neither all words nor all expreſſions are ſo called which occur in language; but ſuch only as come recommended by the authority of thoſe who ſpeak or write with accuracy and politeneſs. Indeed it is a common ſaying, *that we ſhould think with the learned, and ſpeak with the vulgar*. But the meaning of that expreſſion is no more than that we ſhould ſpeak agreeably to the common uſage of the tongue, that every one may underſtand us; and not chooſe ſuch words or expreſſions as are either difficult to be underſtood, or may carry in them an appearance of affectation and ſingularity. But in order to ſet this matter in a clearer light, we ſhall here recount the principal things which vitiate the purity of language.

And firſt, it often happens, that ſuch words and forms of ſpeaking as were introduced by the learned are afterwards dropped by them as mean and ſordid, from a ſeeming baſeneſs contracted by vulgar uſe. For polite and elegant ſpeakers diſtinguiſh themſelves by their diſcourſe, as perſons of figure do by their garb; one being the dreſs of the mind, as the other is of the body. And hence it comes to paſs, that both have their different faſhions, which are often changed; and as the vulgar affect to imitate thoſe above them in both, this frequently occaſions an alteration when either becomes too trite and common. But beſide theſe ſordid words and expreſſions, which are rendered ſo by the uſe of the vulgar, there is another ſort firſt introduced by them, which is careſully to be avoided by all thoſe who are deſirous to ſpeak well. For the vulgar have their peculiar words and phraſes, ſuited to their circumſtances, and taken from ſuch things as uſually occur in their way of life. Thus in the old comedians, many things are ſpoken by ſervants, agreeable to their character, which would be very unbecoming from the mouth of a gentleman. And we cannot but daily obſerve the like inſtances among ourſelves.

Again, this is common to language with all other human productions, that it is in its own nature liable to a conſtant change and alteration. For, as Horace has juſtly obſerved,

> All human works ſhall waſte;
> Then how can feeble words pretend to laſt?

Nothing could ever pleaſe all perſons, or at leaſt for any length of time. And there is nothing from which this can leſs be expected than language. For as the thoughts of men are exceedingly various, and words are the ſigns of their thoughts, they will be conſtantly inventing new ſigns to expreſs them by, in order to convey their ideas with more clearneſs or greater beauty. If we look into the different ages of the Latin writers, what great alterations and changes do we find in their language? How few now underſtand the remaining fragments of the *twelve tables*? Nay, how many words do we meet with even in Plautus, the meaning of which has not yet been fixed with certainty by the ſkill of the beſt critics? And if we conſider our own language, it will appear to have been in a manner entirely changed from what it was a few ages ſince. To mention no others, our celebrated Chaucer is to moſt perſons now almoſt unintelligible, and wants an expoſitor. And even ſince our own memory, we cannot but have obſerved, that many words and expreſſions, which a few years ago were in common uſe, are now in a manner laid aſide and antiquated; and that others have conſtantly ſucceeded, and daily do ſucceed, in their room. So true is that obſervation of the ſame poet:

> Some words that have or elſe will feel decay
> Shall be reſtor'd, and come again in play;
> And words now fam'd ſhall not be fancied long;
> They ſhall not pleaſe the ear nor move the tongue:
> As uſe ſhall theſe approve, and thoſe condemn;
> Uſe, the ſole rule of ſpeech, and judge ſupreme.

We muſt therefore no leſs abſtain from antiquated or obſolete words and phraſes, than from ſordid ones. Though all old words are not to be thought antiquated. By the former we mean ſuch as, though of an ancient ſtanding, are not yet entirely diſuſed nor their ſignification loſt. And from the uſe of theſe we are not to be wholly debarred, eſpecially when they appear more ſignificant than any others we can fix upon. But as to phraſes or expreſſions, greater caution ſeems ſtill neceſſary: and ſuch as are old ſhould doubtleſs, if at all, be uſed more ſparingly. The Latin tongue was brought to its greateſt perfection in the reign of Auguſtus, or ſomewhat ſooner; and he himſelf ſtudied it very careſully. For, as Suetonius tells us, "He applied himſelf to eloquence, and the ſtudy of the liberal arts, from his

childhood, with great diligence and labour. He chose a manner of speaking which was smooth and elegant: he avoided the ill savour, as he used to call it, of antiquated words; and he was wont to blame Tiberius for his affectation of them." In our own language, such words are to be esteemed antiquated, which the most polite persons have dropped, both in their discourse and writings; whose example we should follow, unless we would be thought to converse rather with the dead than the living.

But further: As on the one hand we must avoid obsolete words and phrases; so, on the other, we should refrain from new ones, or such whose use has not yet been sufficiently established, at least among those of the best taste. Words may be considered as new in two respects; either when they are first brought into a language, or when they are used in a new sense. As the former of these may sometimes leave us in the dark by not being understood, so the latter are most apt to mislead us; for when we hear a word that has been familiar to us, we are presently led to fix that idea to it with which it has usually been attended. And therefore in both cases, some previous intimation may be necessary. Cicero, who perhaps enlarged the furniture of the Roman tongue more than any one person besides, appears always very cautious how he introduces any thing new, and generally gives notice of it when he attempts it, as appears in many instances scattered through his works. What bounds we are now to fix to the purity of the Latin tongue in the use of it, the learned are not well agreed. It is certain, our furniture is much less than when it was a living language, and therefore the greater liberty must of necessity be sometimes taken. So that their opinion seems not unadvisable, who direct us to make choice principally of what we are furnished with from the writers of the Augustan age; and, where we cannot be supplied from them, to make use of such authors as lived nearest to them, either before or since. And as to our own tongue, it is certainly prudent to be as careful how we admit any thing into it that is uncouth or disagreeable to its genius, as the ancient Romans were into theirs; for the perfection of a language does in a great measure consist in a certain analogy and harmony running through the whole, by which it may be capable of being brought to a standard.

But besides those things already mentioned, any mistake in the sense of words, or their construction, is opposed to purity. For to speak purely, is to speak correctly. And such is the nature of these faults in elocution, that they are often not so easy to be observed by hearing as by reading. Whence it is, that many persons are thought to speak better than they write; for while they are speaking, many slips and inaccuracies escape disregarded, which in reading would presently appear. And this is more especially the case of persons unacquainted with arts and literature; who, by the assistance of a lively fancy and flow of words, often speak with great ease and freedom, and by that means please the ear; when, at the same time, what they say, would not so well bear reading.

We shall only add, that a distinction ought likewise to be made between a poetic diction and that of prose writers. For poets in all languages have a sort of peculiar dialect, and take greater liberties, not only in their figures, but also in their choice and disposition of words; so that what is a beauty in them would often appear unnatural and affected in prose.

§ 2. *Of Perspicuity.*

Perspicuity, as well as *purity*, consists partly in *single words*, and partly in their *construction*.

I. As to *single words*, those are generally clearest and best understood which are used in their proper sense. But it requires no small attention and skill to be well acquainted with the force and propriety of words; which ought to be duly regarded, since the perspicuity of a discourse depends so much upon it. Cæsar seems plainly to have been of this mind, when he tells us, "The foundation of eloquence consists in the choice of words." It may not be amiss, therefore, to lay down some few observations, by which the distinct notions of words and their peculiar force may more easily be perceived. All words may be divided into *proper words* and *tropes*. Those are called *proper words*, which are expressed in their proper and usual sense. And *tropes* are such words as are applied to some other thing than what they properly denote, by reason of some similitude, relation, or contrariety between the two things. So, when a subtle artful man is called a *fox*, the reason of the name is founded in a similitude of qualities. If we say, *Cicero will always live*, meaning *his works*, the cause is transferred to the effect. And when we are told, *Cæsar conquered the Gauls*, we understand that he did it with the assistance of his army; where a part is put for the whole, from the relation between them. And when Cicero calls Antony *a fine guardian of the state*, every one perceives he means the contrary. But the nature and use of tropes will be explained more fully hereafter in their proper place. All words must at first have had one original and primary signification, which, strictly speaking, may be called their *proper sense*. But it sometimes happens through length of time, that words lose their original signification, and assume a new one, which then becomes their proper sense. So *hostis* in the Latin tongue at first signified a *stranger*; but afterwards that sense of the word was entirely laid aside, and it was used to denote a *public enemy*. And in our language, it is well known, that the word *knave* anciently signified a *servant*. The reason of the change seems to be much the same, as in that of the Latin word *latro*; which first signified a *soldier*, but afterwards a *robber*. Besides, in all languages it has frequently happened, that many words have gradually varied from their first sense to others somewhat different; which may, notwithstanding, all of them, when rightly applied, be looked upon as proper. Nay, in process of time, it is often difficult to say which is the original or most proper sense. Again, sometimes two or more words may appear to have the same signification with each other, and may therefore be used indifferently; unless the beauty of the period, or some other particular reason, determine to the choice of one rather than another. Of this kind are the words *ensis* and *gladius* in the Latin tongue; and in ours, *pity* and *compassion*. And there are other words of so near an affinity to each other, or at least appear so from vulgar use, that they are commonly thought to be synonymous. Such are the words *mercy* and *pity*; though mercy in its strict sense is exercised towards an offender, and pity respects one in distress. As this peculiar force and distinction of words is carefully to be attended to, so it may be known several ways. Thus the proper signification of substantives may be seen by their application to other substantives. As in the instance just now given, a person is said to show *mercy to a criminal*, and *pity to one in distress*. And in the like manner, verbs are distinguished, by being joined to some certain nouns, and not to others. So a person is said *to command an inferior*, *to entreat a superior*, and *to desire an equal*. Adjectives, also, which denote the properties of things, have their signification determined by those subjects to which they most properly relate. Thus we say, *an honest mind*, and *a healthful body*; *a wise man*, and *a fine house*. Another way of distinguishing the propriety of words, is by their use in gradations. As if one should say, *Hatreds, grudges, quarrels, tumults, seditions, wars, spring from unbridled passions*. The proper sense of words may likewise be known by observing to what other words they are either opposed, or used as equivalent. So in that passage of Cicero, where he says, "I cannot perceive why you should be angry with me: If it be because I defend him whom you accuse, why may not

I be diſpleaſed with you for accuſing him whom I defend? You ſay, I accuſe my enemy; and I ſay, I defend my friend." Here the words *accuſe* and *defend, friend* and *enemy*, are oppoſed; and *to be angry* and *diſpleaſed*, are uſed as terms equivalent. Laſtly, the derivation of words contributes very much to determine their true meaning. Thus becauſe the word *manners* comes from the word *man*, it may properly be applied either to that or any other put for it. And therefore we ſay, *the manners of men*, and *the manners of the age*, becauſe the word *age* is there uſed for *the men of the age*. But if we apply the word *manners* to any other animal, it is a trope. By theſe and ſuch like obſervations we may perceive the proper ſenſe and peculiar force of words, either by their connection with other words, diſtinction from them, oppoſition to them, equivalency with them, or derivation. And by thus fixing their true and genuine ſignification, we ſhall eaſily ſee when they become tropes. But though words, when taken in their proper ſignification, generally convey the plaineſt and cleareſt ſenſe; yet ſome are more forcible, ſonorous, or beautiful, than others. And by theſe conſiderations we muſt often be determined in our choice of them. So whether we ſay, *he got*, or *he obtained, the victory*, the ſenſe is the ſame; but the latter is more full and ſonorous. In Latin, *timeo* ſignifies *I fear*; *pertimeo* is more full and ſignificant; and *pertimeſco* more ſonorous than either of the former. The Latin and Greek languages have much the advantage of ours in this reſpect, by reaſon of their compoſitions; by the help of which they can often expreſs that in one word for which we are obliged to put two words, and ſometimes more. So *pertimeo* cannot be fully expreſſed in our language by one word; but we are forced to join one or two particles to the verb, to convey its juſt idea, and ſay, *I greatly*, or *very much fear*: and yet even then we ſcarce ſeem to reach its full force. As to tropes, though generally ſpeaking they are not to be choſen where plainneſs and perſpicuity of expreſſion is only deſigned, and proper words may be found; yet through the penury of all languages, the uſe of them is often made neceſſary. And ſome of them, eſpecially metaphors, which are taken from the ſimilitude of things, may, when cuſtom has rendered them familiar, be conſidered as proper words, and uſed in their ſtead. Thus, whether we ſay, *I ſee your meaning*, or, *I underſtand your meaning*, the ſenſe is equally clear, though the latter expreſſion is proper, and the former metaphorical, by which the action of ſeeing is transferred from the eyes to the mind.

II. But *perſpicuity* ariſes not only from a choice of *ſingle words*, but likewiſe from the *conſtruction* of them in ſentences. For the meaning of all the words in a ſentence, conſidered by themſelves, may be very plain and evident; and yet, by reaſon of a diſorderly placing them, or confuſion of the parts, the ſenſe of the whole may be very dark and obſcure. Now it is certain, that the moſt natural order is the plaineſt; that is, when both the words and parts of a ſentence are ſo diſpoſed, as beſt agrees with their mutual relation and dependence upon each other. And where this is changed, as is uſually done, eſpecially in the ancient languages, for the greater beauty and harmony of the periods; yet due regard is had by the beſt writers to the evidence and perſpicuity of the expreſſion.

But to ſet this ſubject in a clearer light, on which the perfection of language ſo much depends, we ſhall mention ſome few things which chiefly occaſion obſcurity; and this either with reſpect to ſingle words, or their conſtruction.

And firſt, all ambiguity of expreſſion is one cauſe of obſcurity. This ſometimes ariſes from the different ſenſes in which a word is capable of being taken. So we are told, that upon Cicero's addreſſing himſelf to Octavius Cæſar, when he thought himſelf in danger from his reſentment, and reminding him of the many ſervices he had done him, Octavius replied, *He came the laſt of his friends*. But there was a deſigned ambiguity in the word *laſt*, as it might either reſpect the time of his coming, or the opinion he had of his friendſhip. And this uſe of ambiguous words we ſometimes meet with, not only in poetry, where the turn and wit of an epigram often reſts upon it; but likewiſe in proſe, either for pleaſantry or ridicule. Thus Cicero calls Sextus Clodius *the light of the ſenate*; which is a compliment he pays to ſeveral great men, who had diſtinguiſhed themſelves by their public ſervices to their country. But Sextus, who had a contrary character, was a relation of P. Clodius, whoſe dead body, after he had been killed by Milo, he carries in a tumultuous manner into the ſenate-houſe, and there burnt it with the ſenators benches, in order to inflame the populace againſt Milo. And it is in alluſion to that riotous action, that Cicero uſing this ambiguous expreſſion, calls him *the light of the ſenate*; In ſuch inſtances, therefore, it is a beauty, and not the fault we are cautioning againſt: as the ſame thing may be either good or bad, as it is differently applied. Though even in ſuch deſigned ambiguities, where one ſenſe is aimed at, it ought to be ſufficiently plain, otherwiſe they loſe their intention. And in all ſerious diſcourſes they ought carefully to be avoided. But obſcurity more frequently ariſes from the ambiguous conſtruction of words, which renders it difficult to determine in what ſenſe they are to be taken. Quintilian gives us this example of it: "A certain man ordered in his will, that his heir ſhould erect for him a ſtatue holding a ſpear made of gold." A queſtion ariſes here, of great conſequence to the heir from the ambiguity of the expreſſion, whether the words *made of gold* are to be applied to the *ſtatue* or the *ſpear*; that is, whether it was the deſign of the teſtator by this appointment, that the whole ſtatue, or only the ſpear, ſhould be made of gold. A ſmall note of diſtinction, differently placed between the parts of this ſentence, would clear up the doubt, and determine the ſenſe either way. For if one comma be put after the word *ſtatue*, and another after *ſpear*, the words *made of gold* muſt be referred to the ſtatue, as if it had been ſaid, *a ſtatue, made of gold, holding a ſpear*. But if there be only the firſt comma placed after the *ſtatue*, it will limit the words *made of gold* to the *ſpear* only; in the ſame ſenſe as if it had been ſaid, *a ſtatue, holding a golden ſpear*. And either of theſe ways of expreſſion would in this caſe have been preferable for avoiding the ambiguity, according to the intention of the teſtator. The ancient heathen oracles were generally delivered in ſuch ambiguous terms. Which, without doubt, were ſo contrived on purpoſe, that thoſe who gave out the anſwers, might have room left for an evaſion. See ORACLE.

Again, obſcurity is occaſioned either by too ſhort and conciſe a manner of ſpeaking, or by ſentences too long and prolix; either of theſe extremes have ſometimes this bad conſequence. We find an inſtance of the former in Pliny the elder, where ſpeaking of helebore, he ſays, "They forbid it to be given to aged perſons and children, and leſs to women than men." The verb is wanting in the latter part of the ſentence, *and leſs to women than men*: which in ſuch caſes being uſually ſupplied from what went before, would here ſtand thus; *and they forbid it to be given leſs to women than men*. But this is directly contrary to the ſenſe of the writer, whoſe meaning is, either that it is ordered to be given in a leſs quantity to women than men, or not ſo frequently to women as men. And therefore the word *order* is here to be ſupplied, which being of a contrary ſignification to *forbid*, expreſſed in the former part of the ſentence, occaſions the obſcurity. That long periods are often attended with the ſame ill effect, muſt be ſo obvious to every one's experience, that it would be entirely needleſs to produce any examples in order to evince the truth of it. And therefore we ſhall only obſerve, that the beſt way of preventing this ſeems to be by dividing ſuch ſentences as exceed a proper length into two or more: which may generally be done without much trouble.

Another cauſe of obſcurity, not inferior to any yet mentioned, is *parenthеſis*, when it is either too long or too frequent. This

of Cicero, in his oration for Sylla, is longer than we uſually find in him: "O immortal gods! (for I muſt attribute to you what is your own; nor indeed can I claim ſo much to my own abilities, as to have been able of myſelf to go through ſo many, ſo great, ſuch different affairs, with that expedition, in that boiſterous tempeſt of the ſtate), you inflamed my mind with a deſire to ſave my country." But where any obſcurity ariſes from ſuch ſentences, they may frequently be remedied by much the ſame means as was juſt now hinted concerning long and prolix periods; that is, by ſeparating the parentheſis from the reſt of the ſentence and placing it either before or after. So in this ſentence of Cicero, the parentheſis may ſtand laſt, in the following manner:—"O immortal gods! you inflamed my mind with a deſire to ſave my country: for I muſt attribute to you what is your own; nor indeed can I claim ſo much to my own abilities, as to have been able of myſelf to go through ſo many, ſo great, ſuch different affairs, with that expedition, in that boiſterous tempeſt of the ſtate." This order of the ſentence is very plain, and leſs involved than the former.

Chap. II. *Of Compoſition.*

Compoſition, in the ſenſe it is here uſed, gives rules for the ſtructure of ſentences, with the ſeveral members, words, and ſyllables, of which they conſiſt, in ſuch a manner as may beſt contribute to the force, beauty, and evidence of the whole.

Compoſition conſiſts of four parts, which rhetoricians call *period*, *order*, *juncture*, and *number*. The firſt of theſe treats of the ſtructure of ſentences; the ſecond of the parts of ſentences, which are words and members; and the two laſt, of the parts of words, which are letters and ſyllables. For all articulate ſounds, and even the moſt minute parts of language, come under the cognizance of oratory.

§. 1. *Of Period.*

In every ſentence or propoſition, ſomething is ſaid of ſomething. That of which ſomething is ſaid, logicians call the *ſubject*, and that which is ſaid of it, the *predicate:* but in grammatical terms, the former is *a noun ſubſtantive of the nominative caſe*, and the latter, *a finite verb*, denoting affirmation, and ſome ſtate of being, acting, or ſuffering. Theſe two parts may of themſelves conſtitute a ſentence: As when we ſay, *The ſun ſhines*, or *The clock ſtrikes*, the word *ſun* and *clock* are the ſubject in theſe expreſſions, *ſhines* and *ſtrikes* imply each the copula and predicate. Moſt commonly, however, the noun and the verb are accompanied with other words, which in grammatical conſtruction are ſaid either to be connected with or to depend upon them; but in a logical conſideration they denote ſome property or circumſtance relating to them. As in the following ſentence: *A good man loves virtue for itſelf.* The ſubject of this ſentence is *a good man*; and the predicate, or thing affirmed of him, that he *loves virtue for itſelf*. But the two principal or neceſſary words, on which all the reſt depend, are *man* and *loves*. Now a ſimple ſentence conſiſts of one ſuch noun and verb, with whatever elſe is joined to either or both of them. And a compound ſentence contains two or more of them; and may be divided into ſo many diſtinct propoſitions, as there are ſuch nouns and verbs, either expreſſed or underſtood. So in the following ſentence, *Compliance gains friends, but truth procures hatred*, there are two members, each of which contains in it an entire propoſition. For, *Compliance gains friends* is one complete ſentence, and *Truth procures hatred* is another: which are connected into one compound ſentence by the particle *but*. Moreover, it frequently happens, that compound ſentences are made up of ſuch parts or members, ſome if not all of which are themſelves compounded, and contain in them two or more ſimple members. Such is that of Salluſt: "Ambition has betrayed many perſons into deceit; to ſay one thing, and to mean another; to found friendſhip and enmity, not upon reaſon, but intereſt; and to be more careful to appear honeſt, than really to be ſo." This ſentence conſiſts of four members; the laſt of which three conſiſting of oppoſite parts, are all compounded, as will appear by expreſſing them at length in the following manner: *Ambition has betrayed many perſons into deceit*; [that is, ambition] *has betrayed them to ſay one thing, and to mean another*; *it has betrayed them to found friendſhip and enmity, not upon reaſon, but intereſt*; *and it has betrayed them to be more careful to appear honeſt, than really to be ſo.* The three laſt of theſe members, beginning with the words *it betrays*, are all of them compounded, and conſiſt of two oppoſite members; which might each of them be expreſſed at length in the ſame manner, by ſupplying the ellipſis. As, *Ambition has betrayed many perſons to ſay one thing, and it has betrayed them to mean another*. And ſo of the reſt. From this inſtance we ſee how much is left to be ſupplied by the mind in all diſcourſe, which if expreſſed would both deſtroy its harmony, and render it exceedingly tedious. But ſtill regard muſt be had to that which is omitted, ſo as to render what is ſaid conſiſtent with it; otherwiſe there can be no propriety in what is ſpoken. Nor can the members of a ſentence be diſtinguiſhed and duly ranged in their proper order without this. But to proceed: Some ſentences conſiſt either wholly, or in part, of ſuch members as contain in them two or more compound ones, which may therefore, for diſtinction's ſake, be called *decompound members*.— Of this kind is that of Cicero, in his defence of Milo: "Great is the force of conſcience, great either way: that thoſe perſons are not afraid who have committed no offence; and thoſe who have offended, always think puniſhment preſent before their eyes." The latter member of this ſentence, which begins with the word *that*, contains in it two compound members, which repreſent the different ſtate of mind between innocent and guilty perſons. And it is in the proper diſtinction and ſeparation of the members in ſuch complex ſentences, that the art of pointing chiefly conſiſts. For the principal uſe of the comma, is to divide the ſimple members, a ſemicolon the compound ones, a colon ſuch as are decompounded, and a period the whole from the following ſentence. We mention this the rather, to ſhow the different acceptation of theſe terms by grammarians, from that of the ancient writers upon oratory For theſe latter apply them to the ſenſe, and not to any points of diſtinction. A very ſhort member, whether ſimple or compound, with them is a comma, and a longer a colon; for they have no ſuch a term is a ſemicolon. Beſides, they call a very ſhort ſentence, whether ſimple or compound, a *comma*, and one of a ſomewhat greater length, a *colon*. And therefore if a perſon expreſſed himſelf either of theſe ways, in any conſiderable number of ſentences together, he was ſaid to ſpeak by commas or colons. But a ſentence containing more words than will conſiſt with either of theſe terms, they call a ſimple period; the leaſt compound period with them requiring the length of two colons. However, this way of denominating ſentences, and the parts of them, rather from their length than the nature of them, appearing not ſo ſuitable, we have choſen rather to make uſe of the terms *ſimple* and *compound members*; and to call all thoſe *compound periods*, which contain two or more members, whether ſimple or compounded.

But to proceed: Sentences, with reſpect to their form or compoſition, are diſtinguiſhed into two ſorts, called by Cicero *tracta*, "ſtraight or direct;" and *contorta*, "bent or winding." By the former are meant thoſe whoſe members follow each other in a direct order, without any inflection; and by the latter, thoſe which ſtrictly ſpeaking are called periods. For περιοδος in Greek ſignifies a *circuit* or *circle*. And ſo the Latins call it *circuitus* and *ambitus*. By which both of them mean a ſentence conſiſting of correſpondent parts, ſo framed, that the voice in pronouncing them, may have a proper elevation and cadency, and diſtinguiſh them by its inflection; and as the latter part returns back, and unites with the former, the period, like a circle, ſurrounds and incloſes the whole ſenſe. This elevation of the voice in the former part of the period, is by the Greeks called προτασις,

and by the Latins *propoſitio*; and the depreſſion of it in the latter part, by the one *αποδοσις*, and by the other *redditio*.

Now as ſimple ſentences have not theſe correſpondent parts, which require any inflection of the voice; nor a circular form, by reaſon of their brevity; they are not properly periods, in the ſtrict ſenſe of the word: though in common ſpeech the words *ſentence* and *period* are often uſed as equivalent terms. Thus, if we ſay, *Generous minds are incited to the performance of noble exploits from motives of glory*; here is no diſtinction of parts, nor inflection of the voice in this ſentence. And indeed there is not any thing which relates to the ſtructure of theſe ſentences, but what will more properly be taken notice of in the ſecond part of *compoſition*, which is *order*.

And as to thoſe compound ſentences, whoſe members follow each other in a direct order, without any inflection, there is little art required in their compoſition. We ſhall produce one example of this kind from Cicero: "Natural reaſon inclines men to mutual converſe and ſociety; and implants in them a ſtrong affection for thoſe who ſpring from them; and excites them to form communities, and join in public aſſemblies; and, for theſe ends, to endeavour to procure both the neceſſaries and conveniences of life; and that not for themſelves only, but likewiſe for their wives, children, and others who are dear to them, and have a right to their aſſiſtance." Here are five ſhort members in this ſentence, placed in a ſeries, without any inflection of the parts, or orbit of the whole. And as ſuch ſentences have no other boundary but the concluſion of the ſenſe, ſuited to the breath of the ſpeaker, he may either contract or lengthen them at pleaſure, without offending the ear. So, ſhould the ſentence laſt mentioned conclude with the firſt member in this manner, *Natural reaſon inclines men to mutual converſe and ſociety, and implants in them a ſtrong affection for thoſe who ſpring from them.* And the like may be ſaid of the reſt. Since ſuch ſentences therefore may be thus limited at pleaſure, it ſeems more convenient both for the ſpeaker and hearers to confine them to a moderate length.

But becauſe the principal art relating to this part of compoſition lies in the frame and ſtructure of ſuch compound ſentences as are properly called *periods*, we ſhall treat upon theſe ſomewhat more largely. In the formation of theſe periods, two things are chiefly to be regarded; their *length* and *cadency*. As the length ought to be ſuited to the breath of the ſpeaker, the ancient rhetoricians ſcarce admit of more than four colons: by which we may here underſtand compound members of a moderate ſize, which will be generally found a ſuitable and proportionate length. For to extend them farther than the voice can well manage muſt be painful to the ſpeaker, and of conſequence unpleaſant to the hearers. As to the cadency, what Cicero has obſerved, is found true by experience, that the ears judge what is full and what is deficient; and direct us to fill up our periods, that nothing be wanting of what they expect. When the voice is raiſed at the beginning of a ſentence, they are in ſuſpence till it be finiſhed; and are pleaſed with a full and juſt cadency, but are ſenſible of any defect, and are diſpleaſed with redundancy. Therefore care muſt be taken that periods be neither deficient, and as it were maimed, that is, that they do not drop before their time, and defraud the ears of what ſeemed to be promiſed them; nor, on the other hand, offend them by too long and immoderate excurſions. This riſe and cadency of the voice in pronunciation, depend on the nature and ſituation of the members, as we ſhall endeavour to ſhow by particular inſtances; in the explication of which, by the word *members*, are to be underſtood ſuch as are uncompounded. In a period of two members, the turn of the voice begins with the latter member. Of this kind is the following ſentence of Cicero: "If impudence prevailed as much in the forum and courts of juſtice, as inſolence does in the country and places of leſs reſort; Aulus Cæcina would ſubmit as much to the impudence of Sextus Ebutius in this cauſe, as he did before to his inſolence when aſſaulted by him." Here the cadency begins at the words *Aulus Cæcina*. If a ſentence conſiſt of three members, the inflection is beſt made at the end of the ſecond member: for if it begin immediately after the firſt, the voice will be either apt to ſink too low, and not to be heard, before it reach the end: or elſe be precipitated, in order to prevent it. Cicero begins his oration for Milo with a ſentence of this form: "Although I fear, it may be a ſhame to be diſmayed at entrance of my diſcourſe in the defence of a moſt valiant man; and that it nowiſe becomes me, while Milo is more concerned for the ſafety of the ſtate than for himſelf, not to ſhow the ſame greatneſs of mind in his behalf: *yet* this new form of proſecution terrifies my eyes, which, whatever way they turn, want the ancient cuſtom of the forum, and former manner of trials." Here the cadency beginning at the third member with the word *yet*, makes a proper diviſion of the ſentence, and eaſy for the ſpeaker. But a period of four members is reckoned the moſt complete and perfect where the inflection begins at the middle, that is, with the third member. Nor is it the ſame caſe here, as if, in a ſentence of three members, the cadency be made at the ſecond. For in proportion to the time of raiſing the voice may the ſpace be allowed for its ſinking. The following ſentence of Cicero gives us an inſtance of this, where he ſpeaks to his ſon: "Although, ſon Mark having now been an hearer of Cratippus for a year, and this at Athens you ought to abound in the precepts and doctrines of philoſophy, by reaſon of the great character both of your inſtructor and the city; one of which can furniſh you with knowledge, and the other with examples: yet, as I always to my advantage joined the Latin tongue with the Greek, and have done it not only in oratory, but likewiſe in philoſophy; I think you ought to do the ſame, that you may be equally converſant in both languages." The turn in this period begins at the word *yet*; which ſtanding near the middle, the voice is raiſed to that pitch in pronouncing the former part, as to permit of a gradual cadency, without being loſt before the concluſion of the ſentence. But where the ſenſe does not ſuit with this diviſion at the entrance upon the third member, it is beſt made at the fourth. Such is the following ſentence of Cicero: "If I have any genius, which I am ſenſible is very ſmall; or any readineſs in ſpeaking, wherein I do not deny but I have been much converſant; or any ſkill in oratory, from an acquaintance with the beſt arts, to which I confeſs I have been always inclined: *no one* has a better right to demand of me the fruit of all theſe things, than this Aulus Licinius." The cadency of this ſentence does not begin till the words *no one*; yet it ends handſomely, and without diſappointing the ear. Though indeed the three firſt members having each of them an inflection, check the elevation of the voice, and by that variety in the pronunciation add to the harmony of the ſentence. An equality of the members ſhould likewiſe be attended to in the compoſition of a period the better to adjuſt their riſe and cadency. And for this reaſon, in ſentences of three members, where the cadency begins with the third; or in thoſe of four members, where it begins at the fourth; it promotes the harmony to make the laſt member longeſt. This is properly the nature of rhetorical periods, which when rightly formed have both an equal beauty and dignity in their compoſition.

But as all diſcourſe is made up of diſtinct ſentences, and whenever we expreſs our thoughts it is in ſome of the forms abovementioned; ſo the uſe of them is not promiſcuous, but ſuited to anſwer different deſigns in ſpeaking. And in this view they are conſidered and made uſe of by the orator, as will be ſhown hereafter.

§ 2. *Of Order.*

By *order*, rhetoricians mean the placing each word and member of a ſentence in ſuch a manner as will moſt contribute to the force, beauty, or evidence of the whole.

Order is of two kinds, *natural* and *artificial*. And each of theſe may be conſidered with reſpect to the parts either of ſimple or compound ſentences.

As to ſimple ſentences, we may call that order *natural*, when all the words in a ſentence are ſo placed, as they are connected with or follow each other in a grammatical conſtruction. And it may properly enough admit of this name, as it is founded in the nature of a propoſition, and the relation of the ſeveral words of which it conſiſts to each other. This we explained in the laſt chapter, and illuſtrated by proper examples; and ſhall therefore only give one inſtance of it here, to introduce the ſubject we are now upon. And it is this: *The fame of Iſocrates excited Ariſtotle to the profeſſion of oratory.* Here theſe words, *the fame of Iſocrates*, contain the ſubject of this ſentence, with what relates to it; and all thoſe which follow, *excited Ariſtotle to the profeſſion of oratory*, make up the predicate and its dependants. And in both parts each word grammatically conſidered ſtands in its proper order of conſtruction. And this ſeems agreeable to the natural way of conveying our thoughts, which leads us firſt to expreſs the ſubject or thing of which ſome other thing is ſaid, before the predicate or that which is ſaid concerning it; and with reſpect to both, as every idea ſucceeds another in the order of our conceptions, to range it in the ſame order when we communicate them to others. Our language in the general keeps pretty much to this method. But in one thing particularly it recedes from it; and that is, in placing adjectives, which denote the properties of things, before their ſubſtantives or ſubjects, whoſe properties they are: as when it is ſaid, *Evil communication corrupts good manners.* And this we always do, except ſomething follows which depends upon the adjective. So we ſay, *He was a man eminent for his virtue:* not *an eminent man.*

Artificial order, as it reſpects ſimple ſentences, has little or no regard to the natural conſtruction of words; but diſpoſes them in ſuch a manner as will be moſt agreeable to the ear, and beſt anſwer the deſign of the ſpeaker. The Latins take a much greater liberty in this reſpect than we do, or than the nature of our language will permit. Quintilian ſays, it is beſt for the verb to ſtand laſt, when there is no particular reaſon to the contrary. And he gives this reaſon for it, *becauſe the force of the ſentence lies in the verb.* So that, according to him, they ſeem to have had this view in putting the verb at the end; that as the whole ſentence is imperfect without the verb, the mind being thus held in ſuſpence might receive the deeper impreſſion from it at laſt. They likewiſe ſeparate ſuch words as have an immediate relation between them or dependence one upon another, and place any of them firſt or laſt as they pleaſe. In ſhort, their order ſeems in a manner arbitrary, if it does not break in upon perſpicuity, to which they uſually attend. But moſt of theſe things are unſuitable to the genius of our language. One might ſay indeed, *Convince him you cannot*; inſtead of ſaying, *You cannot convince him*: Or, *With my own eyes I ſaw it*; for, *I ſaw it with my own eyes.* And again: *In proportion to the increaſe of luxury the Roman ſtate declined*; for, *The Roman ſtate declined in proportion to the increaſe of luxury.* But this inverſion of words is proper in Engliſh compoſition only when it gives force to the expreſſion; as in the higher ſtyle it often does. It ſerves to impreſs known truths upon the mind, but is unfit for communicating the firſt principles of knowledge.

As to compound ſentences, that is, ſuch as conſiſt of two or more members, either ſimple or compounded; what relates to the words in each member ſeparately is the ſame as in ſimple ſentences. But with regard to the diſpoſition of the ſeveral members, that may be called the *natural order*, which ſo places them, as they mutually depend on each other. Thus the antecedent member naturally precedes the relative; as in this expreſſion, *Men are apt to forgive themſelves what they blame in others.* In hypothetical ſentences the conditional member naturally ſtands firſt. Thus: *If Socrates be a rational creature, he is a man.* That member which expreſſes the effect of an action naturally comes laſt; as, *Though you offer ever ſo good reaſons, you will not prevail with him.* The like may be ſaid of time, with regard to things done in it; as, *The Roman eloquence ſoon declined, when Cicero was dead.* And to name no more, the reaſon of a thing naturally follows that of which it is the reaſon; as thus: *All the pleaſures of life muſt be uncertain, ſince life itſelf is not ſecure.*

When this order is inverted, it may be ſtyled *artificial*. So, to keep to the inſtances already given, the two members in the firſt ſentence may be thus inverted: *What they blame in others men are apt to forgive themſelves.* In the ſecond, in this manner: *Socrates is a man, if he be a rational creature.* In the third, thus: *You will not prevail with him, though you offer ever ſo good reaſons.* And ſo in the reſt: as, *When Cicero was dead, the Roman eloquence ſoon declined*; and, *Since life itſelf is not ſecure, all the pleaſures of life muſt be uncertain.* The variety of inverſions in a ſentence may generally be greater or leſs in proportion to the number of its members. In the following ſentence of Cicero, the natural order ſeems to be this: *If that greatneſs of mind be void of juſtice, which ſhows itſelf in dangers and labours, it is blameable.* Which may be varied by changing the place of the firſt and third member, in the following manner: *That greatneſs of mind is blameable which ſhows itſelf in dangers and labours, if it wants juſtice.* Or by altering the place of all the three members thus: *That greatneſs of mind is blameable, if it be void of juſtice, which ſhows itſelf in dangers and labours.* But oftentimes one member may be included in another, as in the inſtance here given: *If that greatneſs of mind which ſhows itſelf in dangers and labours, be void of juſtice, it is blameable.* Here the relative member is included in the conditional, which is placed firſt, and the antecedent member follows both. But in Cicero it ſtands thus: *That greatneſs of mind, which ſhows itſelf in dangers and labours, if it want juſtice, is blameable*; where the relative and conditional members are both included in the antecedent member. The Latin tongue commonly admits of a much greater variety in the tranſpoſition of members, as well as in that of ſingle words, than ſuits with our idiom. In the following ſentence the natural order is much preferable, as it beſt ſuits with the proper elevation and cadency of the voice in its pronunciation: *I am willing to remit all that is paſt, provided it may be done with ſafety.* But ſhould we invert the members, and ſay, *Provided it may be done with ſafety, I am willing to remit all that is paſt*; the harmony of the cadency would be loſt. And if the latter member be included in the former, the alteration will ſtill be worſe; as, *I am willing, provided it may be done with ſafety, to forgive all that is paſt.* Here the inflection of the voice falls upon the ſame member as before, and deſtroys the beauty of the period by its elevation afterwards. Some ſentences admit of no involution of their members. Such are thoſe whoſe members are connected by conjunctive or disjunctive particles. As, *Virtue furniſhes the mind with the trueſt pleaſure in proſperity, and affords it the greateſt comfort in adverſity.* And, *A wiſe man is neither elated by proſperity, nor depreſſed by adverſity.* And the like may be ſaid of thoſe where the latter member begins with ſome illative or reditive particle. As in theſe inſtances: *The chief thing to be regarded in life is virtue, for all other things are vain and uncertain.* And, *Though fortune is always inconſtant, yet ſhe has many votaries.* Neither of the members in any of theſe ways of expreſſion, and ſome others which might be named, can be included one in the other. In all the examples hitherto given, the ſentences conſiſt only of ſimple members; and indeed compound members are not ſo often inverted, nor included one in an-

other, by reaſon of their length. However, we ſhall here produce one inſtance of each: *Whoever conſiders the uncertainty of human affairs, and how frequently the greateſt hopes are fruſtrated; he will ſee juſt reaſon to be always on his guard, and not to place too much dependence upon things ſo precarious.* This ſentence conſiſts of two compound members, which here ſtand in their natural order, but may be thus inverted: *He will ſee juſt reaſon to be always on his guard, and not place too much dependence on things ſo precarious; whoever conſiders the uncertainty of human affairs, and how often the greateſt hopes are fruſtrated.* In the following ſentence one compound member is included in another: *Let us not conclude, while dangers are at a diſtance, and do not immediately approach us, that we are ſecure; unleſs we uſe all neceſſary precaution to prevent them.* Here the natural order would be: *While dangers are at a diſtance, and do not immediately approach us; let us not conclude, that we are ſecure, unleſs we uſe all neceſſary precaution to prevent them.*

But there are ſome other conſiderations relating to order, which, being taken from the nature of things, equally ſuit all languages. So, in amplifying, there ſhould be a conſtant gradation from a leſs to a greater; as when Cicero ſays, *Ambition creates hatred, ſhyneſs, diſcords, ſeditions, and wars.* On the contrary, in extenuating, we ſhould deſcend from a greater to a leſs; as if, ſpeaking of the ancient laws of Rome, one ſhould ſay, *They were ſo far from ſuffering a Roman citizen to be put to death, that they would not allow him to be whipt, or even to be bound.* In conſtituting any whole, we put the parts firſt; as, *Invention, diſpoſition, elocution, and pronunciation, make up the art of oratory.* But in ſeparating any whole, the parts follow: as, *The art of oratory may be divided into theſe four parts; invention, diſpoſition, elocution, and pronunciation.* In every enumeration care muſt be taken not to mix the whole with the parts; but if it be mentioned at all, it muſt either be put firſt or laſt. So it would be wrong to ſay, *He was a man of the greateſt prudence, virtue, juſtice, and modeſty:* for the word *virtue* here contains in it the other three, and therefore ſhould not be inſerted among them. See LANGUAGE.

§ 3. *Of Juncture and Number.*

QUINTILIAN, ſpeaking of compoſition, repreſents a diſcourſe as very happy in that reſpect, when the *order*, *juncture*, and *number*, are all juſt and proper. The firſt of theſe, which gives rules for the due placing of the words and members of a ſentence, has been already explained. We now proceed to the other two, which relate to letters and ſyllables; the former treating of their connection, and the latter of their quantity.

I. As to *juncture*. A due attention is to be paid to the nature of the vowels, conſonants, and ſyllables in the connection of words, with regard to the ſound.

As to the *firſt*, when a word ends with a vowel, and the next begins either with a different vowel, or the ſame repeated, it uſually renders the pronunciation hollow and unpleaſant. For, as Quintilian has juſtly obſerved, "This makes a chaſm in the ſentence, and ſtops the courſe of it." For there muſt be ſome pauſe, in order to pronounce them both, or otherwiſe the ſound of one will be loſt. So, for inſtance, in pronuncing theſe words, *the other day*, unleſs you ſtop a little after the word *the*, the ſound of *e* will not be heard; and if it is dropt, it will occaſion a rougher ſound, from the aſpiration of *th* twice repeated ſo near together, as *th' other day*. Therefore to prevent both theſe inconveniences, we uſually ſay, *t' other day*. But the different conſonants, which together with the vowels make up thoſe ſyllables, often cauſe a conſiderable difference in the pronunciation, ſo as to render it more of leſs agreeable. As, if we ſay, *he overdid it*, the words *he over* have not ſo harſh a ſound, as *the other*; though ſtill they require ſome pauſe to keep them diſtinct. Beſides, ſome vowels meet more amicably, and admit of a ſofter pronunciation, than others. Thoſe which have the weakeſt and ſmalleſt ſound, follow beſt; becauſe they occaſion the leaſt alteration of the organ in forming the two ſounds. Such are *e* and *i*: and therefore, without any chaſm in the ſound, or heſitation of the voice, we ſay, *he is*. But where the action of the organs is greater, and the ſound ſtronger, the pronunciation is more difficult: as when we ſay, *tho' all*. For here is a contrary motion of the lips, which are firſt put forward in ſounding the *o*, and then drawn backward to pronounce the *a*; and therefore the ſound is much ſofter to ſay, *tho' every*, where their action is leſs. And the like ill effect commonly happens from the repetition of the ſame vowel: as if we ſay, *go on*; or, *you uſually act thus*. There is a conſiderable difference between theſe two expreſſions, in repeating the ſound of the vowel, and where either of them is doubled in a ſingle word. For then the ſame ſound only is protracted by one continued motion of the organ; as in the words *good*, and *deem*. But here the ſound is repeated again by a new action of the organ; which, if precipitated, obſcures the ſound of one of the vowels; and, if too much retarded, makes a chaſm in the pronunciation; either of which is unpleaſant to the ear.

But as the coalition of two vowels occaſions an hollow and obſcure ſound, ſo the meeting of ſome conſonants renders it very harſh and rough. Thus the words *king Xerxes*, and *public good*, when ſo placed have not only a roughneſs, but likewiſe a difficulty in their pronunciation, from the contrary action of the lips; which in the former are firſt back and then forward, but in the latter the contrary way, and in both of them with ſome conſiderable force. But this may very eaſily be avoided, by ſaying, with a little alteration in the words, *Xerxes the king*, and *the good of the public*. So likewiſe the words *ill company*, have a ſofter ſound than *bad company*, for the ſame reaſon. To multiply inſtances of this kind ſeems unneceſſary, which ſo frequently occur in all diſcourſes.

The repetition of the ſame ſyllable, at the end and beginning of words, is the laſt thing to be conſidered. And a little obſervation will convince us, that where this happens, it generally renders the ſound either confuſed or unpleaſant. Cicero was often rallied on account of this line; "*O fortunatam na'am me conſule Romam.*" Every one will eaſily perceive a diſagreeable ſound in the following expreſſion: "A man many times does that unadviſedly, of which he afterwards repents." The chime of the words *man many* both ſeems affected, and diſpleaſes the ear. But this will ſoon be remedied, if we ſeparate thoſe two words, and ſay, "A man does that many times unadviſedly."

From the ſhort account here given of this part of compoſition, it is eaſy to perceive what things are neceſſary to render it moſt complete and accurate; which are theſe following. If a word end with a vowel, the next ought to begin with a conſonant, or ſuch a vowel whoſe ſound may agree well with the former. But if a word conclude with a conſonant, either a vowel ſhould follow, or ſuch a conſonant whoſe pronunciation will ſuit with it. And laſtly, the ſame ſyllable ought not to be repeated at the end of one word, and the beginning of the next. It has been obſerved by ſome critics, that the following verſe at the beginning of Virgil's Æneid has all theſe properties: "*Arma virumque cano Trojæ qui primus ab oris.*" Where any word in this verſe ends with a vowel, the next begins with a conſonant; and where any one ends with a conſonant, the next begins with a vowel; and there is no repetition of the ſame ſound throughout the whole. But this is what rarely happens, eſpecially in our language, which abounds with conſonants. And what Quintilian ſays of the coalition of vowels, in treating upon this ſubject, ſeems applicable to the whole.

"This (says he) is a thing not much to be dreaded; and I know not whether the neglect of it, or too great a concern about it, be worse. It necessarily checks the vigour of the mind, and diverts it from matters of greater importance. And therefore, as it shows negligence to permit it, so to be in constant fear of it discovers a low genius." This was the opinion of that judicious writer. And as these things cannot always be attended to, it may be sufficient to avoid them, where they prove very offensive to the ear, and it may be done without some greater inconvenience. So in this sentence, *Honesty is the best policy*, the coalition of *t* and *p* in the two last words *best policy* produces a roughness in their pronunciation; but as the expression is strong, and cannot perhaps be well altered for the better, the sound here ought to give way to the sense.

II. *Number.* This respects the quantity of syllables, as *Juncture* does their quality. In the Greek and Roman languages every syllable has its distinct quantity; and is either long, short, or common: two or more of which joined together in a certain order make a foot, and a determinate number of these in a different order constitute their several sorts of metre. This variety of sounds gives a much greater harmony to their poetry, than what can arise only from the seat of the accent, and the similitude of sound at the end of two verses, which chiefly regulate our metre. And although their prose was not so confined with regard to the feet, either as to the kind or place of them, as their metrical compositions; yet it had a sort of measure, more especially in the rise and cadency of their periods. This they call *rhetorical number*. And accordingly the ancient writers upon this art acquaint us what feet are best suited to the beginning, middle, or conclusion of a sentence. Such rules are not applicable to our language, which has not that accurate distinction of quantity in its syllables. For we are apt to confound accent with quantity, and pronounce those syllables longest on which we lay the accent, though in their nature they are not so. As in the word *ádmirable*, where none but the first syllable *ad* is pronounced long; though that is only rendered so by position, and the two following are so by nature. And again, in the word *ávarice*, we sound the first *a* long for the same reason, and the second short; contrary to the nature of both those vowels. However, we shall offer a few things that may be of some use to modulate our periods and adjust their cadency.

A great number of monosyllables do not stand well together. For as there ought to be a greater distance in the pronunciation between one word and another, than between the syllables of the same word; such pauses, though short, yet, when too frequent, make the sound rough and uneven, and by that means spoil its harmony. And this may seem more necessary to be attended to, because the English language abounds so much with monosyllables. On the contrary, a continuation of many long words makes a sentence move too slow and heavily. And therefore such periods generally run best, which have a proper mixture of words of a different length. Besides, as every word has its accent, which with us stands for quantity, a number either of monosyllables, or long words, coming together, so far abates the harmony, as it lessens the variety.

Again, several words of the same ending do not stand well together, especially where the accent falls upon the same syllable in each of them. For this creates too great a jingle by the similitude of sound; and is apt to displease, from an appearance of affectation. Of this kind is the following sentence: *Nothing is more welcome, delightsome, or wholesome, than rest to a wearied man.* In such expressions therefore, if the order of the words cannot well be altered, some other word should be substituted in the room of one of them at least, to diversify the sound. So in the example here given, the sound might be varied by saying, *Nothing is more welcome, pleásant, or wholesome.*

But to add no more, if a sentence end with a monosyllable, it is apt to hurt the cadency, and disappoint the ear; whereas words of a moderate length carry a greater force with them, by the fulness of their sound, and afford the ear what it expected. And there is one sort of monosyllables more especially, which never stand well at the conclusion of a period, though we frequently find them there; and these are the signs of cases. Thus we say, *Avarice is a crime which wise men are too often guilty of.* But the cadency would doubtless be more agreeable if it were altered thus: *Avarice is a crime, of which wise men are too often guílty.* Every one must perceive, when the accent falls upon the last syllable in the sentence, as it does if it end with *of*, the sound is not so pleasant as when it rests upon the preceding syllable in the word *guílty*. Nor are very long words well suited either to the beginning or conclusion of a period; for they retard the pronunciation at first, and fall too heavy at the end.

Chap. III. *Of Dignity.*

Dignity consists in the right use of tropes and figures. It is not sufficient for an orator to express himself with propriety and clearness, or in smooth and harmonious periods; but his language must likewise be suited to the nature and importance of the subject. And therefore, as *Elegance* gives rules for the first of these, and *Composition* for the second; so does *Dignity* for the last of them. It is very evident, that different subjects require a different style and manner of expression; since, as Quintilian says, "What is magnificent in one discourse would be turgid in another; and those expressions which appear low upon a sublime subject, would suit letter matters: and as in a florid harangue a mean word is remarkable, and like a blemish; so any thing lofty and bright upon a trivial argument is disproportionate, and like a tumour upon an even surface." Now this variety in the manner of expression arises in a great measure from *tropes* and *figures*, which not only enliven and beautify a discourse, but give it likewise force and grandeur; for which reason this part of elocution seems to have been called *dignity*.

Tropes and figures are distinguished from each other in several respects. Tropes mostly affect single words, but figures whole sentences. A trope conveys two ideas to the mind by means of one word; but a figure throws the sentence into a different form from the common and usual manner of expression. Besides, tropes are chiefly designed to represent our thoughts, but figures our passions.

§ 1. *Tropes.*

A *trope*, which is a figure of words, has been usually defined to be *the change of a word from its proper signification to some other, with advantage, either as to beauty or strength.* The words, *with advantage*, are added in the definition, because a trope ought not to be chosen, unless there is some good reason for using it rather than the proper word. But in what manner, or how far, it can be said of all tropes in general, that they change the proper signification of words, will best appear by considering the nature of each kind of them separately. Now in every trope a reference is had to two things, which occasions two ideas; one of the thing expressed, and another of that thing to which it has a respect, and is supplied by the mind. For all tropes are taken either from things internally related, as the whole and a part; or externally, as cause and effect, subject and adjunct; or from some similitude that is found between them; or from a contrariety. The first of these is called *synecdoche*, the second *metonymy*, the third *metaphor*, and the last *irony*. We shall endeavour to illustrate this by examples. When we say, *Hannibal beat the Romans*; the meaning is, that Hannibal and his army did this. So that, although in some sense a part may here

be ſaid to ſtand for the whole, which makes it a *ſynecdoche*; yet, ſtrictly ſpeaking, the word *Hannibal* does not alter its ſenſe, but there is an ellipſis in the expreſſion, Hannibal being put for himſelf and his army. But if we ſay, *Cicero ſhould be read by all lovers of eloquence*; here indeed the word *Cicero* appears to be changed from its proper ſenſe, and to ſignify the books of Cicero; which is a *metonymy*, the author being put for his works; and therefore ſuch expreſſions need not be deemed elliptical. Again, if any one ſpeaking of a ſubtle and crafty man, ſhould ſay *he is a fox*; the meaning is, he is like a fox; which is a *metaphor*; where the word *fox* retains its proper ſenſe, and denotes that animal, to which the man is compared on account of his craft. Laſtly, if a perſon ſay to another, *Well done*; meaning that the thing was ill done, the word *well* keeps its own ſenſe; but from the manner of its pronunciation, or ſome other circumſtance attending the expreſſion, it will be evident that the contrary is intended: which is called an *irony*. From theſe inſtances it may appear in what latitude we muſt underſtand the common definition of a trope, which makes it to conſiſt in the change of a word from its proper ſenſe into ſome other. But though in reality there are but four kinds of tropes, which are diſtinguiſhed by ſo many different reſpects which things bear one to another; yet as theſe ſeveral reſpects are found in a variety of ſubjects, and attended with different circumſtances, the names of *tropes* have from hence been greatly multiplied; which, however, may all be referred to ſome or other of thoſe already mentioned, as will be ſhown when we come to treat of them in their order. And for diſtinction ſake we ſhall call the former *primary*, and the latter *ſecondary tropes*.

We now proceed to conſider the reaſons which have occaſioned the introduction of tropes. And theſe, as Quintilian obſerves, are three; *neceſſity*, *emphaſis*, and *beauty*.

1. Tropes were firſt introduced from *neceſſity*, deriving their origin unqueſtionably in a conſiderable degree from the barrenneſs of language, becauſe no language which we know contains a ſufficient number of proper words to expreſs all the different conceptions of our minds: but the principal cauſe of their introduction ſeems to be that extenſive influence which imagination poſſeſſes over every kind of ſpeech. The mind conſiders the ſame thing various ways; views it in different lights; compares it with other things; and obſerves their ſeveral relations and affections; wherein they agree, and in what they differ. From all which reflections, it is furniſhed with almoſt an infinite number of ideas; which cannot all of them be diſtinguiſhed and expreſſed by proper words, ſince new ones occur daily. And were this poſſible, yet would it be impracticable; becauſe the multitude of words muſt be ſo vaſtly great, that the memory could not retain them, nor be able to recall them as occaſion required. Tropes have in a good meaſure redreſſed both theſe inconveniences; for by means of them the mind is not burdened with a numberleſs ſtock of different words, and yet nothing ſeems to want a name. Thus ſometimes, where a word is wanting to expreſs any particular thing, it is clearly enough repreſented by the name of ſome other thing, by reaſon of the ſimilitude between them. At other times, the cauſe is ſignified by the effect; the ſubject by the adjunct; or the contrary. And the whole is often underſtood by a part, or a part by the whole. And thus by the uſe of tropes, the mind is helped to conceive of ſomething not expreſſed, from that which is expreſſed. It is much the ſame caſe, as when we have occaſion to ſpeak of a perſon, whoſe name we are either unacquainted with, or have forgot; for by deſcribing his perſon, abode, or ſome other circumſtances relating to him, thoſe we converſe with as well underſtand whom we mean, as if we mentioned his name. So the ſhepherd in Virgil, when he could not think of the name of Archimedes, deſcribes him by his works:

And what's his name who form'd the ſphere,
And ſhow'd the ſeaſons of the ſliding year?

Beſides, it ſometimes happens in a diſcourſe, that thoſe things are neceſſary to be ſaid, which, if expreſſed in their proper terms, would be offenſive; but being clothed with metaphors, may be conveyed to the mind with decency. Thus then the imagination never contemplates any one idea ſingle and alone, but always along with other ideas, which may be called its *acceſſories*, and which often operate more forcibly upon the mind than the principal idea itſelf does. In their nature, they are often more agreeable, and frequently alſo more familiar, to our conceptions; or perhaps they remind us of a greater variety of important circumſtances. Hence the name of the acceſſory is often preferred, as, *e. g.* when we want to point out the time in which a ſtate enjoyed its chief reputation, &c. the proper words might do, but the imagination ſuggeſts the flouriſhing period of a plant or tree; and we ſay "the Roman empire flouriſhed moſt under Auguſtus:" Catiline, we ſay, was the *head* inſtead of the *leader* of his party, becauſe the head is the principal part of the human figure.

2. A ſecond reaſon above-mentioned for the uſe of tropes was, *emphaſis*. Tropes do many times expreſs things with greater force and evidence than can be done by proper words. We receive much the greater part of our knowledge by our ſenſes. And ſimilitudes taken from ſenſible things, as in metaphors, very much aſſiſt the mind in its reflections upon thoſe things which do not come under the cognizance of the ſenſes. For it is certain, that we are ſooner and more ſtrongly affected with ſenſible objects, than with things of which we can have no ideas but from the internal operations of our own minds. Nay, ſometimes one bright and lively trope ſhall convey a fuller and more juſt idea of a thing than a large periphraſis. So when Virgil calls the Scipios *two thunderbolts of war*, he gives a more lively image of the rapid force and ſpeedy ſucceſs of their arms, than could have been conveyed by a long deſcription in plain words. And in many caſes the tropical uſe of words is ſo emphatical, and ſuited to the idea we deſign to excite, that in this reſpect it may be juſtly eſteemed the moſt proper. So, *incenſed with anger*, *inflamed with deſire*, *fallen into an error*, are all metaphorical expreſſions, uſed in a way of ſimilitude; and yet perhaps no proper words can be made uſe of, which will convey a more lively image of the thing we deſign to repreſent by them.

But *beauty* and ornament, as was obſerved before, have been another cauſe of the uſe of tropes. Some ſubjects require a more florid and elegant dreſs than others. When we deſcribe or applaud, ornaments of ſpeech and a gaiety of expreſſion are requiſite. And it is the buſineſs of an orator to entertain his hearers at the ſame time that he inſtructs them. Now Cicero, who was an admirable judge of the force and power of eloquence, has obſerved, that tropical expreſſions give the mind the greateſt delight and entertainment. "I have often wondered (ſays he) why tropes ſhould give greater pleaſure than proper words. I imagine the reaſon muſt be, either that there is an appearance of wit in neglecting what is at hand, and making choice of ſomething at a diſtance; or that the hearer is furniſhed with a different thought, without being led into a miſtake, which affords a very agreeable pleaſure; or that a whole ſimilitude is conveyed to the mind by a ſingle word; or that, particularly in the beſt and moſt lively metaphor, the image is preſented to our ſight, which is the quickeſt of our ſenſes." And therefore he ſuppoſes, that "as garments were firſt invented from neceſſity, to ſecure us from the injuries of the weather, but improved afterwards for ornament and diſtinction; ſo the poverty of language firſt introduced tropes, which were afterwards increaſed for delight." Beſides, a variety of expreſſion is

pleasing in a discourse. It is many times necessary that the same thing should be repeated; and if this be done in the same words, it will grow tiresome to the hearers, and sink their esteem of the speaker's ability. Therefore, to prevent this, it is proper the expression should be varied, that although the sense be the same, it may give the mind a new pleasure by its different dress.

We come now, in the last place, to lay down some directions proper to be observed in the choice of tropes.

And first, as every trope gives us two ideas; one, of the word expressed; and another, which, by means of that, the mind connects with it; it is necessary, that the relation between these two appear very plain and evident. For an obscure trope is always faulty, unless where some particular reason makes it necessary. And therefore tropes ought not to be too far-fetched, lest that should render them dark. For which reason Cicero says, he should not choose to call any thing destructive to a person's fortune, *the Syrtis of his patrimony*, but rather the *rock of it*; nor the *Charybdis of his estate*; but the *gulph of it*. For those who either did not know that the Syrtes were two quick-sands upon the coast of Africa, or that Charybdis was a gulph in the strait of Sicily, both of them very destructive to mariners, would be at a loss to understand the meaning of the metaphor. Besides, metaphors taken from things we have seen, affect the mind more forcibly than those which are taken from such things as we have only heard of. Now there is scarce any one who has not seen a rock or a gulph; but there are very few persons, comparatively, who have been either at Charybdis or the Syrtes. It is necessary therefore in a good trope, not only that there be a near affinity between the two ideas, but likewise that this affinity be very obvious and generally known, so that the word be no sooner pronounced but both images do immediately present themselves to the mind.

Again, as a trope ought to be very plain and evident, so likewise should it bear a due proportion to the thing it is designed to represent, so as neither to heighten nor diminish the just idea of it. Indeed, sometimes when we speak of things indefinitely, we say too much, lest we should seem to say too little. And this manner of speaking is called an *hyperbole*; which is not uncommon in the sacred writings. So, for instance, Saul and Jonathan are said to be *swifter than eagles, and stronger than lions*. But even in this way of expression a proportion is to be observed. For some very considerable and unusual excess of the thing in its kind is at least designed by it; which, perhaps, cannot, or however is not necessary to be defined. And therefore Quintilian blames Cato for calling the top of an hill a *wart*; because the proportion between the two ideas is nowise adequate. And so, on the contrary, Aristotle censures Euripides for calling *rowing the empire of the oar*. Poets indeed are allowed a greater liberty in this respect; but an orator should be modest in his expressions, and take care that he neither so heighten nor diminish the natural ideas of things by tropes, as to lead his hearers into mistakes.

But further: As a moderate use of tropes, justly applied, beautifies and enlivens a discourse; so an excess of them causes obscurity, by running it into abstruse allegories and riddles. Tropes are not the common and ordinary dress of our thoughts, but a foreign habit: and therefore he who fills his discourse with a continued series of them, seems to act like one who appears in public in a strange dress; which no man of character would choose to do.

Moreover, as one use of tropes is pleasure and entertainment, we should endeavour to make choice of such as are smooth and easy. But if at any time we think it necessary to use a harsh trope, it is proper to soften it by some precaution. For, as Cicero very handsomely says, *a trope should be modest, since it stands in a place which does not belong to it; for which reason it should seem to come thither by permission, and not by force.* And therefore, when he thought it harsh to say, *The death of Cato made the senate an orphan*; he guards the expression by saying, *The death of Cato has (if I may be allowed to say so) rendered the senate an orphan.*

And, to add no more, care should be taken how we transfer tropes from one language into another. For as they are frequently taken not only from natural things, or such notions as are common to the generality of mankind, but likewise from the manners, customs, and occurrences of particular nations: so they may be very plain and obvious to those among whom they took their rise, but altogether unintelligible to others who are unacquainted with the reason of them. It was customary for the Roman soldiers to carry their money in their girdles; hence it was the same thing with them to say, *a person had lost his girdle*, as that *he had lost his money*. And because the Romans wore the *toga*, which was a long gown, in time of peace, and a different garb when engaged in war, their writers sometimes use the word *toga* to signify peace. But as neither of these customs is in use among us, so neither would the tropes suit our language, or be generally understood by us. And even in such tropes as are taken from the common nature of things, languages very much differ. There is a very beautiful trope in the account of St. Paul's shipwreck, where it is said, *The ship was caught, and could not bear up into the wind*. The original word, that we translate *bear up*, is ανλοφθαλμειν; and properly signifies, *to look or keep its eyes against it*; which is a very strong and lively image, taken from animate beings, and when applied to men often signifies *to withstand* or *resist*: as, ανλοφθαλμειν πολεμιω, *to resist an enemy*; and Plutarch says of Demosthenes, that he could not ανλοφθαλμειν τω αργυριω, *look against* or *resist the power of money*. Nothing is more common with Latin writers, than to call men of a public spirit and true patriots, *lumina et ornamenta reipublicæ*, that is, *the lights and ornaments of the state*. And we have borrowed from them the use of both these metaphors. But because tropes and figures illustrate and heighten the style, they call them also, *lumina orationis*, or *the lights of a discourse*. It sometimes happens, that not only the tropical sense of a word is taken from one language into another, and not the proper signification of the same word. So *scrupulus* in Latin properly signifies *a little stone, which getting into the shoe hurts a person as he walks*; hence it is applied to the mind, and used to express *a doubt, or uneasy thought that gives it pain*. We have borrowed this latter sense of the word, but not the former.

Art. I. Primary Tropes.

I. *Metaphor.* A metaphor, as usually defined is, *A trope, which changes words from their proper signification to another different from it, by reason of some similitude between them.* But that a word, when used metaphorically, does not alter its signification, but retains its proper sense, was shown above. However, it may not be amiss to explain this matter more fully, and set it in a clearer light. Every *metaphor*, then, is nothing else but a short similitude. Cicero calls it, *a similitude reduced to a single word*. And Quintilian to the same purpose says, that "a metaphor is a short similitude, and differs from it only in this, that the former is compared to the thing we design to express, and the latter is put for it. It is a similitude, when I say of a man, he has acted like a lion; and a metaphor, when I say he is a lion." Thus far Quintilian. Now in every similitude three things are requisite; two things that are compared together; and a third, in which the similitude or likeness between them consists. And therefore, to keep to this example, when Horace calls a Roman soldier *a lion*, if the word *lion* did not retain its proper sense, there could be no similitude; because there would not be two things to be compared together with respect to a third, which is necessary in every similitude, and was designed by this expression. The sense of which is plainly this: *That as a lion*

ſeizes his prey with the greateſt fierceneſs, ſo a Roman ſoldier with like rage and fury attacked his enemies. In the ſame manner, when Cicero calls Piſo *the vulture of the province*, his meaning is, that he was like a vulture, or acted in ſuch a manner as a vulture acts, that is, rapaciouſly. So that the real difference between a metaphor and a ſimilitude conſiſts in this; that a metaphor has not thoſe ſigns or compariſon which are expreſſed in a ſimilitude. But ſome perſons have run into miſtakes in reaſoning from tropes of this kind. For they have ſo argued from metaphorical words, as if all the affections and properties of the things expreſſed by them might be attributed to thoſe other things to which they are applied, and by that means have ſtrained the compariſon (which has uſually but one particular view), in order to make it tally in other reſpects, where there is not that ſimilitude of ideas. We will endeavour to make this evident by another example from Cicero, where he calls M. Antony *the torch of the ſtate*. The ſimilitude between Antony and a torch lay in this: *That as a torch burns and deſtroys every thing within its reach, ſo Antony brought devaſtation and ruin wherever he came.* Now a torch has not only a property to burn, but alſo to give light; but the ſimilitude would not hold in this reſpect, nor was it at all deſigned. For Cicero never calls a wicked profligate man, as Antony was, *the light of the ſtate*; though he often gives that character to good and virtuous men, who by their examples do as it were enlighten others, and ſhow them the way to be happy themſelves and uſeful to others. But though metaphors are uſually taken from a ſimilitude between two things, as in the inſtances here mentioned; yet ſometimes they are founded in the ſimilitude which two things bear to two others in ſome particular reſpect, by means whereof what properly belongs to one of them is transferred to the other: the former of which are called *ſimple metaphors*, and the latter *analogous*. Hence the rudder of a ſhip may be called its *reins*; for what the reins are to a horſe, that the rudder is to a ſhip in guiding and directing it. So that here is a double ſimilitude, one between a ſhip and an horſe, and another between the rudder of the former and the reins of the latter; and from the analogy between the uſe of the rudder to the one and reins to the other, the reins, which belong properly to the horſe, are applied to the ſhip. Again, ſome metaphors are reciprocal, in which the ſimilitude holds either way. Thus to ſteer and to govern are uſed reciprocally both of a ſhip and a ſtate: the proper expreſſions being, *to ſteer a ſhip*, and *govern a ſtate*; and the contrary metaphorical. But though we ſay, *the foot of a mountain*, borrowing the ſimilitude from animals; yet we do not ſay, on the contrary, *the bottom of an animal*, meaning his feet; and therefore that metaphor is not reciprocal. From this account therefore of the nature of a metaphor, it may be ſaid to be, *The application of a word by way of ſimilitude to ſome other thing than what it properly ſignifies.* And the plainer this ſimilitude appears, the greater beauty there is in the trope.

The uſe of metaphors is very extenſive, as large as univerſal nature. For there are ſcarce any two things which have not ſome ſimilitude between them. However, they may all be reduced to four kinds; which was the ſecond thing propoſed to be conſidered.

The firſt kind of metaphors therefore may be taken from ſimilitudes between animate beings. As where thoſe things, which properly relate to brutes, are accomodated to men; or thoſe which belong to men are applied to brutes. Of the former ſort is that joke of Cicero: *My brother being aſked by Philip, why he barked ſo?* anſwered, *Becauſe he ſaw a thief.* Here *barking*, the property of a dog, is applied to a man: And the reply does not ſeem to carry more ſeverity or harſhneſs with it than the queſtion. By the latter ſort we ſay, *a crafty fox*, and *a generous horſe*; which are affections that properly relate to men. And to this kind of metaphors may thoſe likewiſe be referred, when that which properly belongs to the ſenſes is applied to the mind. Thus we often ſay, *that we ſee a thing*, when we mean *that we underſtand* or *apprehend it.* And in the ſame ſenſe we ſay, *that we hear ſuch a thing*, or *perſon.* And by the like manner of expreſſion, a perſon is ſaid *to ſmell out a thing.* And thoſe who have a genius or diſpoſition for any art or ſcience, are ſaid *to have a taſte for it*; and ſuch as have entered upon the ſtudy of it, are ſaid *to have a touch of it.* Theſe are common ways of ſpeaking in moſt languages, and very expreſſive of what is intended by them. And we may alſo bring thoſe metaphors under this head, by which the properties and affections of men are attributed to the Deity: as, when God is ſaid *to hear, ſee, be angry, repent*, and the like; which are forms of expreſſions very frequent in the ſacred writings.

A ſecond kind of metaphors lies between inanimate things, whether natural or artificial, which bear ſome ſimilitude to each other. And this head is very extenſive. Thus we ſay *floods of fire*, and *clouds of ſmoke*, for large quantities. And ſo likewiſe, *to inflame an account*, that is, to heighten or increaſe it; with innumerable others of the like ſort. In the two firſt of theſe inſtances, the terms proper to one element are applied to another; and as thoſe elements of fire and water are oppoſite to each other, they ſhow the extenſiveneſs of this trope, that there are no things in nature ſo contrary, but may come within the limits of it, and be accomodated to each other in a way of ſimilitude. In the laſt example, a natural action is applied to what is artificial.

A third ſort of metaphors is, when inanimate things are applied to animals, on account of ſome like properties between them. Thus Homer calls Ajax, *the bulwark of the Greeks*, on account of his valour, which like a wall defended them from the Trojans. And nothing is more common with Cicero, than to brand ill men with the character of being *the peſt of the ſtate*, by reaſon of the miſchief which they bring to the public. So likewiſe he calls Zeno the philoſopher *an acute man*, for his great diſcernment and quick perception of things; fetching the alluſion from metals when brought to an edge or a point. As, on the contrary, old Chremes in Terence calls himſelf a *ſtone*, for want of apprehenſion. And we ſay, *a gay perſon*, and *a bright genius*, by this kind of metaphor.

The fourth and laſt kind of metaphors is that by which the actions and other attributes of animals are accomodated to inanimate things. Thus Cicero, ſpeaking of Clodius, ſays: "The very altars, when they ſaw that monſter fall, ſeemed to move themſelves and aſſert their right againſt him. Here the words *ſaw, move*, and *aſſert*, are all metaphors taken from the properties of animals. And Virgil, when he would repreſent the impetuous force and rapidity of the river Araxes, ſays *it diſdained a bridge.* And it is a very uſual epithet, which Homer gives to words, to call them πτερόεντα or *winged*, to intimate the ſwiftneſs of ſpeech.

Laſtly, as to the choice of metaphors, thoſe are eſteemed the fineſt and ſtrongeſt, which *give life and action to inanimate things.* The reaſon of which is, becauſe they do as it were invigorate all nature, introduce new forms of beings, and repreſent their images to the ſight, which of all the ſenſes is the quickeſt, moſt active, and yet moſt unwearied. What can be more moving, or in ſtronger terms expreſs the villany of Clodius, than when Cicero ſays, "The very altars of the gods ſeemed to exult at his death." And the ſame great orator particularly commends thoſe metaphors, for their ſprightlineſs and vivacity, which are taken from the ſenſe of ſeeing; as when we ſay, *a bright thought*, or *a gay expreſſion.*

However, care muſt be taken not to venture upon too bold and

daring metaphors. Poets indeed claim greater liberty in this reſpect, whoſe view is often to amuſe, terrify, or delight, by heightening the juſt and natural images of things. But it is expected the orator ſhould reaſon coolly, though ſtrongly and forcibly; and not by theatrical repreſentations ſo tranſport the mind, as to take it off from reflection, unleſs perhaps on ſome particular occaſion. And yet, on the other hand, metaphors ought not to ſink below the dignity of what they are deſigned to expreſs; but the idea they convey ſhould at leaſt be equal to the proper word in the place of which they are ſubſtituted.

But there is a very great difference in the choice of metaphors, as they are deſigned either to praiſe or diſpraiſe. One thing may be compared to another in a great variety of reſpects. And the ſame thing may be made to appear either noble or baſe, virtuous or vicious, by conſidering it in a different light. Such metaphors, therefore, as are choſen to commend, muſt be taken from great and laudable things; and on the contrary, thoſe which are deſigned to diſcommend, from things vile and contemptible. Ariſtotle gives us a very pleaſant example of this in the poet Simonides. A certain perſon, who had carried the prize at a race of mules, offered him a reward to write a poem in honour of that action. Simonides thought he did not bid high enough; and therefore put him off with ſaying, the ſubject was too mean to write in praiſe of mules, which were the offſpring of aſſes. But upon his being offered a larger ſum, he undertook the taſk; and, as Ariſtotle obſerves, when he has occaſion to ſpeak of the mules in that poem, he does not mention them by that name, but calls them *the daughters of fleet and generous horſes*, though he might with as much propriety have called them *the daughters of dull aſſes*. But it was the poet's buſineſs, in praiſing, to take the moſt advantageous part of the character. Where things are capable of ſuch different turns, metaphorical expreſſions are generally moſt beautiful. And ſometimes the ſame metaphor may be applied contrary ways, both in praiſe and diſpraiſe, as it will ſuit different properties of the thing to which it refers. So a *dove*, in a metaphorical ſenſe, may repreſent either *innocence* or *fear*; and an *iron heart* may denote either *courage* or *cruelty*; as an *hard head*, *ſtrength* or *weakneſs of thought*. And this ambiguity in the application of metaphorical words often affords occaſion for jeſts and conciſe wit. We obſerved before, that Cicero never calls ill men, *lights of the ſtate*. But he once in this manner calls Sextus Clodius, *the light of the ſenate*. For when his kinſmen Publius Clodius had been killed by Milo, and his corpſe was brought to Rome, Sextus raiſed the mob, and in a tumultuous manner carried it into the ſenate-houſe, where they burnt it, and by that means ſet the building on fire: For which ſeditious action Cicero paſſes that joke upon him, under the metaphor of light, which elſewhere he always uſes in a good ſenſe.

But to proceed: All forced and harſh metaphors ſhould be avoided; the one being no leſs diſagreeable to the mind than the other to the ear. Nor ſhould they come too thick in a diſcourſe. In a word, they ought not to be uſed, but either where a proper word is wanting, or they are more ſignificant or beautiful than the proper word.

II. *Metonymy.* This, as defined by Quintilian, is, *the putting one word for another*. But Voſſius deſcribes it more fully, when he calls it, "A trope, which changes the name of things that are naturally united, but in ſuch a manner as that one is not of the eſſence of the other." That a metonymy is thus diſtinguiſhed from the other tropes, has been ſufficiently ſhown already in the two laſt chapters. When it is ſaid, *to put one word for another*, or, *to change the names of things*, the meaning is, that the word ſo uſed, changes its ſenſe, and denotes ſomething different from its proper ſignification. Thus, when *Mars* is put for *war*, and *Ceres* for *corn*, they loſe their perſonal ſenſe, and ſtand for the effects of which thoſe deities were ſaid to be the cauſe. So likewiſe when Virgil ſays, "*He drank the frothing bowl*," the word *bowl* muſt neceſſarily ſignify the liquor in the bowl. And when in another place, deſcribing the temple of Juno at Carthage, in which the actions of the Trojan war were repreſented, and the images of the heroes, he makes Æneas, upon diſcovering that of Priam among the reſt, cry out, "*Lo here is Priam!*" it is plain the word *Priam* there muſt ſtand not for his perſon, but his *image* or *figure*. And this property of changing the ſenſe of the word appears peculiar to metonymy. In treating upon a metaphor, we obſerved the miſtake of thoſe who teach, that a word uſed metaphorically loſes its proper ſignification; whereas it only changes its place, but not its ſenſe; being applied to a thing to which it does not naturally belong, by way of ſimilitude. And as the not attending to this has run ſome perſons into very great abſurdities, in treating upon metaphorical expreſſions, and reaſoning from them in the tropical ſenſe; ſo the like has happened to others in ſome inſtances of a metonymy, where, by miſapprehending their true nature, they have reaſoned from them in the literal ſenſe, as we ſhall ſhow preſently. A metonymy is not ſo extenſive as a metaphor, nor altogether ſo neceſſary: becauſe nothing is ſaid by a metonymy, which cannot be expreſſed in proper words; whereas metaphors are often uſed for want of proper words to expreſs ſome ideas. However, metonymies are very uſeful in language; for they enrich a diſcourſe with an agreeable variety, and give both force and beauty to an expreſſion. And what we obſerved with relation to a metaphor, is true alſo of this trope; that ſome metonymies, even in common diſcourſe, are more frequently made uſe of than the proper words in whoſe room they are put. So, *pale death*, *a blind way*, and *a happy ſtate*, are very common expreſſions with us. And it is more uſual to ſay, *This is ſuch a perſon's hand*, or *I know his hand*, than his writing, when we intend this latter ſenſe of the word.

We now proceed to the diviſion of metonymies; which are commonly diſtinguiſhed into four kinds, from the different manner in which things are naturally, but externally, united to one another. Now things are thus united, or one thing depends upon another, either with reſpect to its production, or in the manner of its exiſtence when produced. In the former way the effect depends upon its cauſe, and in the latter, the adjunct upon its ſubjects. And hence ariſe four ſorts of metonymies, which receive their names from the *cauſe* and *effect*, the *ſubject* and the *adjunct*.

It is called a *metonymy* of the *cauſe*, when the external cauſe is put for the effect. The external cauſe is twofold, the agent and end, which are uſually called the *efficient* and *final cauſe*. Of the former kind are ſuch metonymies, where the inventor or author is put for what was invented or effected by him. Thus, as we ſaid before, *Ceres* is ſometimes put for *corn*, the uſe of which ſhe was ſaid firſt to have introduced; and *Mars* for *war*, over which he was thought to preſide. And by this way of ſpeaking, any artiſt or writer is put for his work. So Juvenal, blaming the luxury and profuſeneſs of the Romans, ſays, *There are few tables without Mentor*; that is, which were not made by him, or after his manner. And our Saviour ſays, in the parable of the rich man and Lazarus, *They have Moſes and the prophets*, meaning the books of Moſes and the prophets. But under this ſort of metonymy is included not only the agent, ſtrictly ſo called, but alſo any means or inſtruments made uſe of in the doing of a thing, when put for the thing done. Thus, *polite literature* is called *humanity*, becauſe it cultivates and improves the human mind. And in that expreſſion of Cicero, *Words move nobody but him who underſtands the tongue*; the word *tongue*, which is the inſtrument of ſpeech, is put for *ſpeech* or *language*. And in the like ſenſe, *arms* are ſometimes put for *war*, and the

ſword for *ſlaughter*. By the ſame kind of metonymy likewiſe any affection or quality is put for its effect. As when it is ſaid, *the end of government is to maintain juſtice*; that is, *ſuch mutual offices among men as are the effects of juſtice*. And ſo likewiſe in that of Cicero, *It is the buſineſs of magiſtrates to check the levity of the multitude*, by which he means tumults occaſioned by their levity. Moreover, as human affections are attributed to the Deity in a metaphorical ſenſe, ſo ſeveral parts of the human body are likewiſe aſcribed to him by this kind of metonymy. Thus, his *hand* and his *arm* are uſed to expreſs his power, as his *ear* and *eye*, his *care* and *providence*, theſe being the inſtruments of ſuch effects in mankind. Metonymies of the final cauſe are thoſe by which the end in doing a thing is put for the thing done. As when we ſay, *The watch is ſet*, meaning the *watchmen*, who are appointed for that purpoſe. And ſo likewiſe that expreſſion, *to make an example*, as it ſignifies to *puniſh*, in order to deter others from the like crimes by ſuch an example. As alſo that of Virgil, "*Phillis ſhould garlands crop*;" by which are meant *flowers* to make garlands.

The ſecond kind of metonymy puts the effect for the efficient cauſe, whether the agent, or only the means and inſtrument. So Virgil calls the two Scipios *the deſtruction of Libya*, becauſe they were the agents who effected it. And Horace compliments his patron Mæcenas with the titles of being *his guard and honour*; that is, his guardian, and the author of his honour. But when Cicero tells the citizens of Rome, that *the death of Clodius was their ſafety*, he means the occaſion only of their ſafety. And elſewhere he calls that *a dark hope* and *blind expectation*, the effect of which was dubious and uncertain to thoſe who entertained it. And in like manner, the ſons of the prophets, when they were eating the pottage which Eliſha had ordered to be ſet before them, cried out, *There is death in the pot*; that is, *ſome deadly thing*, as is preſently after explained. And thus ſweat, which is the effect of labour, is ſometimes put for labour. As in the threat denounced againſt Adam, *In the ſweat of thy face ſhalt thou eat bread*, that is, by labour in cultivating the ground. And, in alluſion to this way of ſpeaking, Antony the orator tells Craſſus, "the improvement of the ſtyle by conſtant exerciſe, as he preſcribed, was a thing of much ſweat." And *virtue is ſaid to be gained by ſweat*, that is, continued care and exerciſe in ſubduing the paſſions, and bringing them to a proper regulation. But in theſe two expreſſions there is likewiſe a metaphor, the effect of bodily labour being applied to that of the mind. In all theſe inſtances, the effect is put for the efficient cauſe.

The third kind of metonymy is, when the ſubject is put for the adjunct. By ſubject here, in a large ſenſe of the word, may be underſtood that wherein ſome other thing is contained, or about which it is converſant; as likewiſe the poſſeſſor with reſpect to the thing he poſſeſſes; and the thing ſignified, when put for the ſign of it. Now, by the firſt of theſe ways of ſpeaking, the ſeat of any faculty or affection is uſed for the faculty or affection itſelf. So it is uſual to ſay, *a man of a clear head*, when we mean a clear mind or underſtanding; the ſeat of the mind being ſuppoſed to be in the head. And a perſon is ſaid *to have a warm heart*, becauſe the heart has been thought the ſeat of the affections. In like manner, the place where any actions are performed is put for the actions done in it. As when Cicero ſays, "Do not always think of the forum, the benches, the roſtra, and the ſenate;" meaning the diſcourſes which were uſually made in thoſe places. So likewiſe the country, or place of reſidence, is put for the inhabitants, as in that paſſage of Cicero: "And to omit Greece, which always claimed the pre-eminence for eloquence, and Athens, the inventreſs of all ſciences, where the art of ſpeaking was invented and perfected; in this city of ours (meaning Rome), no ſtudies have prevailed more than that of eloquence:" where the words Greece and Athens ſtand to denote the inhabitants of thoſe places. And hither may alſo be referred thoſe expreſſions in which the time is put for the perſons living in it; as, *the degeneracy of the preſent age, the virtue of former times*. In the ſecond way above-mentioned, the object is uſed for the perſon or thing employed about it: As when Cicero ſays, "In time of battle the laws are ſilent;" where by *laws* he intends the *judges*, who pronounce ſentence according to law. By the third of theſe ways, in which the poſſeſſor is put for the thing he poſſeſſes, we ſay, *to devour, deſtroy*, or *ruin a man*, meaning not his *perſon* but his *eſtate*. And mythologiſts explain the fable of Actæon by this trope, who is ſaid to have been devoured by his dogs: for by dogs they underſtand flatterers and paraſites, who conſumed his eſtate, and brought him to beggary. By the laſt way before recited, which puts the thing ſignified for the ſign, ſtatues and pictures are called by the names of the perſons which they repreſent; as in that jeſt of Cicero upon his brother Quintus, when, as Macrobius relates, "being in the province which his brother had governed, and ſeeing a large portrait of part of his body, holding a ſhield, though Quintus was but a little man, he ſaid, My half brother is bigger than my whole brother." The Popiſh doctrine of tranſubſtantiation is founded upon an abuſe of this trope. For when our Saviour, ſpeaking of the bread and wine at that time before him, ſays, "This is my body, and this is my blood," his plain meaning is, they were the ſigns of his body and blood, the thing ſignified being put for the ſign by this ſort of metonymy. But the Papiſts take the expreſſion literally, which muſt doubtleſs be very abſurd; ſince the words relate to the time then preſent, while Chriſt was yet living, and ſpoke them; when it was impoſſible for the bread and wine to be converted into his body and blood, it being evident to all who were preſent, that thoſe elements, and his body, exiſted ſeparately at the ſame time. But if the words are explained by this trope, the ſenſe is plain and eaſy, and the way of ſpeaking familiar to all writers. Whereas they who plead for the literal ſenſe might with equal reaſon aſſert, that thoſe expreſſions above-mentioned are to be taken literally, in which ſeveral parts of the human body, as the hand, the arm, the ear, and the eye, are aſcribed to the Deity; or that, when our Saviour in a metaphorical ſenſe calls himſelf *a vine*, and *a door*, theſe words were deſigned to be applied to him ſtrictly and properly, and not by way of ſimilitude only, as is the caſe in all metaphors.

The fourth kind of metonymy is that wherein the adjunct is put for the ſubject, which is done in the ſame variety of ways as the former. It is therefore a metonymy of the adjunct, when the thing contained is put for that which contains it. As when Virgil ſays, "They lie down upon purple;" that is, upon couches dyed with purple. And again, "They crown the wine;" meaning the bowl which contained the wine, it being the cuſtom of the ancients to deck their bowls with garlands at their entertainments. By theſe tropes likewiſe virtues and vices, are put for the perſons in whom they are found. As in that beautiful paſſage of Cicero, where, comparing the profligate army of Catiline with the forces of the ſtate, he ſays, "On this ſide modeſty is engaged, on that impudence; on this chaſtity, on that lewdneſs; on this integrity, on that deceit; on this piety, on that profaneneſs; on this conſtancy, on that fury; on this honour, on that baſeneſs; on this moderation, on that unbridled paſſion; in a word, equity, temperance, fortitude, prudence, and all virtues, engage with injuſtice, luxury, cowardice, raſhneſs, and all vices." And to this trope thoſe expreſſions are to be referred, in which any thing is put for the object about which it is converſant. As in that ſaying of the wiſe man, "Hope deferred makes the heart ſick;" where hope is put for the thing hoped for.

And thus Suetonius calls the emperor Titus *the love and delight of mankind*, whoſe mild and obliging temper rendered him the object of thoſe agreeable affections to all perſons under his government. A third uſe of this trope is by putting a thing for the time in which it was done. Thus we ſay of a perſon, *he has ſerved ſo many campaigns*, meaning ſo many ſummers, that being the uſual time in which armies are drawn out into the field. Laſtly, by this metonymy, the ſign is put for the thing it ſignifies; as, *the ſceptre* for *the regal dignity*, and *the ſword* for *the authority of the magiſtrate*.

III. *Synecdoche*. This is a trope by which either the whole of a thing is put for a part of it, or a part for the whole; ſo that the two things, whoſe ideas are preſented to the mind in this trope, are internally related to each other: by which, as has been ſhown already, it is diſtinguiſhed from all the other tropes. In a *ſynecdoche* the word retains its proper ſenſe, and the expreſſion is elliptical, as will appear by the ſeveral ſpecies of it, wherein the ellipſis in moſt of the examples is very obvious; and may with no great difficulty be ſupplied. Now a thing may be conſidered as a whole in three different reſpects, which logicians call an *univerſal*, *eſſential*, and *integral whole*. An univerſal whole is any genus with regard to its ſeveral ſpecies; as, an *animal* with reſpect to *mankind* and *brutes*, or *philoſophy* with reſpect to the ſeveral *arts* and *ſciences* compriſed under it. An eſſential whole conſiſts of matter and form; as, a *man* of *body* and *ſoul*. And an integral whole is any body or quantity, with reſpect to the ſeveral parts of which the matter of it is compoſed, and into which it may be divided: as, an *human body* with reſpect to its *ſeveral members*; or a *year*, as diviſible into *months*, *weeks*, and *days*. And thus rhetoric is an integral whole in reſpect to the four parts that compoſe it; namely, invention, diſpoſition, elocution, and pronunciation. So likewiſe any aggregate body, as a civil community, which is diviſible into thoſe who govern and are governed; or any army, conſiſting of the general and his ſoldiers. As a whole therefore, in each of theſe acceptations of the word, is frequently put for a part, and a part for the whole; hence ariſe ſix ſpecies or ſorts of ſynecdoche.

The firſt of theſe puts the genus for the ſpecies.—Thus, virtue in general is ſometimes uſed to denote ſome particular ſort of virtue. As when Cicero mentions virtūe as one of the four qualifications neceſſary in a general, he means greatneſs of mind. And ſo perſons are often commended for inſtances of virtue ſhown in their conduct, which reſpect only ſome ſingle virtue, as juſtice, temperance, or the like: And in this ſenſe Cicero calls Clodius *a deadly animal*. So when our Saviour commiſſions his apoſtles to *preach the goſpel to every creature*, the meaning is, *every rational creature*. And thus likewiſe, *to talk to a perſon* ſometimes denotes the ſame thing as to *blame* him, which is one way of talking.

The ſecond kind of ſynecdoche puts the ſpecies for the genus. Thus *bread* denotes any kind of food: as when a perſon is ſaid *to get his bread by his labour*. In the ſame way of ſpeaking, *money* is put for any kind of wealth in general. And it is an uſual expreſſion to ſay, that *wine deſtroys more than the ſword*; that is, than any *hoſtile arms*. And the legal form of baniſhment among the Romans was, to prohibit perſons *the uſe of fire and water*; that is, *the moſt common and ordinary neceſſaries of life*, in which all others were included.

The third ſpecies of this trope is, when the eſſential whole is put for one of its parts; that is, either for the matter or form. Thus, in the evangeliſt, Mary Magdalen ſays, *They have taken away my Lord, and I know not where they have laid him*, meaning his *body*.—So it is uſual to ſay of a deceaſed perſon, *He was buried at ſuch a time*. And in the inſcriptions of ſepulchral monuments we frequently meet with this expreſſion, *Here lies ſuch an one*; that is, his *corpſe*. Nor are inſtances uncommon in which the whole being is put for the form. Thus, when Cicero ſays, *Thoſe perſons live, who have fled from the confinement of the body, as from a priſon*; by *perſons* muſt neceſſarily be underſtood their *ſouls*, which are here diſtinguiſhed from and ſet in oppoſition to their *bodies*. And ſo Virgil repreſents Æneas as meeting with Dido and ſome of his Trojan friends in the infernal regions; by which are meant their *ghoſts*.

The fourth kind of ſynecdoche is, when either the matter or form is put for the whole being. Thus *ſilver* and *gold* are uſed to ſignify money made of thoſe metals; as when we ſay, *I have ſo much ſilver*, or *ſo much gold*. And the word *ſoul*, both in our own and other languages, is put for the *whole perſon*. So with us, *a merry ſoul*, and *a dull ſoul*; in Cicero, *dear ſouls*; and in Horace, *candid ſouls*, are all uſed in this tropical ſenſe. But this way of ſpeaking occurs nowhere more frequently than in the ſacred writings. Thus, for inſtance, it is ſaid, *All the ſouls which came with Jacob into Egypt*, meaning the *perſons*. And again, *The ſoul that ſinneth it ſhall die*; from which expreſſion, and others of the like import, ſome perſons, by not attending to the nature of this trope, have been erroneouſly led to infer that the ſoul is naturally mortal. But ſometimes only part of the matter ſtands to expreſs the whole eſſence or being. So we imitate the Latins in uſing the word *caput* or *head* to denote either a *perſon* or *thing*. For, as with them *lepidum caput*, ſo with us *a witty head*, ſignifies the ſame as *a man of wit*. And in the ſame ſenſe, *ſo many head of cattle* means *ſo many entire cattle*.

By the fifth ſort of ſynecdoche the whole of any material thing or quantity, whether continued or diſcrete, is put for a part of it. So when Cicero ſays, *A war is kindled through the whole world*, in compliment to his country, he calls the Roman empire *the world*. And this expreſſion is alſo uſed by hiſtorians. Thus Cornelius Nepos, ſpeaking of the quarrel between Mark Antony and Auguſtus, tells us, that *each of them deſired to be lord of the world*. And in like manner St. Luke ſays, *There went out a decree from Cæſar Auguſtus, that all the world ſhould be taxed*. So in St. Paul's ſhipwreck, it is ſaid, *They ran the ſhip aground*, that is, *the head of her*, for it is plain by what follows, that the ſtern was looſe. And as to diſcrete quantity, our Saviour, uſing this trope, ſaid he ſhould be *three days and three nights in the heart of the earth*. Though he did not continue three whole days and nights in the grave, but only part of the firſt and third day, and the whole ſecond day, with the two whole nights between the firſt and third day, according to our way of reckoning. For he was buried on Friday in the afternoon, and reſted in the grave that night, with the following day, which was the Jewiſh Sabbath, and was riſen on the morning of the next day. So that we muſt neceſſarily have recourſe to this ſynecdoche, which puts the whole for the part, to clear up that event.

By this kind of ſynecdoche, alſo, the plural number is ſometimes put for the ſingular. Thus St. Matthew ſays, *The thieves who were crucified with our Saviour reviled him*: though it is plain from St. Luke, that only one of them did ſo. It may alſo be referred to this trope, when a certain number is put for an uncertain one. So it is an uſual way of expreſſion to ſay, *I have ſeen or done ſuch a thing an hundred or a thouſand times*; when perhaps ſo many are not really intended, but only in general ſome conſiderable number.

The ſixth and laſt kind of ſynecdoche puts a part of any material thing or quantity for the whole of it. So we ſay of a man, *He ſhelter's himſelf under ſuch an one's roof*; that is, *in his houſe*. And of a fleet, that it *conſiſts of ſo many ſail*; meaning, *ſo many ſhips*. And by this trope, that is aſcribed to a ſingle perſon which was done by the aſſiſtance of others, and in conjunction with them: As when it is ſaid, that *Hannibal killed forty thouſand Romans at the battle of Cannæ*: For an army is

an aggregate body, of which the general is the head, and conſequently the chief part of it. And to this kind of ſynecdoche may alſo be referred ſuch expreſſions in which the ſingular number is put for the plural: as if one ſhould ſay, *A man is liable to be miſled by the influence of irregular paſſions*; meaning *all men*, or *mankind in general*. Or when leſs than the real number is put for any round number: Thus ſome ancient writers, when they ſpeak of the Grecian armada that came againſt Troy, call it a fleet of *a thouſand ſhips*; though, according to Homer's liſt, it contained 1186. And ſo likewiſe the Greek interpreters of the Old Teſtament are uſually called the *Seventy*; whereas, in reality, they were ſeventy-two.

IV. *Irony*. This is *a trope in which one contrary is ſignified by another*: As if any one ſhould ſay, *Well done*; when at the ſame time his deſign is to intimate that the thing was *ill done*. So that, by this manner of expreſſion, the ſpeaker appears to mean ſomething contrary to the ſenſe of the word he makes uſe of. Not that the word is changed from its uſual ſignification; but by the circumſtances attending the expreſſion, we perceive the contrary to what is ſpoken is intended. Quintilian obſerves, that an irony may be known one of theſe three ways: "By the manner of pronunciation, or from the nature of the perſon or the thing. For (as he adds) where any of theſe do not ſuit with the words, it is plain the ſpeaker intends the contrary." The irony is very plain from the manner of pronunciation in that paſſage of Terence, where Simo, ſpeaking to his ſervant by way of reproof, ſays, "You have taken great care indeed." From the circumſtances of the perſon, when Cicero, addreſſing to Catiline, ſays, "He went to your companion, that *excellent man*, Marcus Marcellus." When he calls him an *excellent man*, it is evident he means the contrary; becauſe no good man would be a companion of Catiline. And when he begins his oration for Ligarius with ſaying, "Cæſar, this is a *new* crime, and never heard of till now," the thing he is ſpeaking of ſhows it to be an irony; for it was not new, as all who were preſent very well underſtood.

The ſubjects of irony are vices and follies of all kinds. And this way of expoſing them is often more effectual than ſerious reaſoning: For many perſons, who, either from temper or want of reflection, cannot be moved by the force of an argument, are not proof againſt the poignancy of wit and railliery. And therefore we find the moſt grave and ſerious perſons have not declined the uſe of this trope upon proper occaſions. Socrates, whom the oracle pronounced the wiſeſt man of his age, gave ſo much into it, that he got the name of εἴρων, that is, the *droll*. In the ſacred writings we have a remarkable inſtance of it in the prophet Elijah, where he challenges the prieſts of Baal to prove the truth of their deity: For it is ſaid expreſsly, "He mocked them, and ſaid, Cry aloud, for he is a god; either he is talking, or he is purſuing, or he is on a journey, or peradventure he ſleepeth, and muſt be awaked." And Solomon takes the like method to expoſe the follies of youth by this ironical apoſtrophe, "Rejoice, O young man, in thy youth," with what follows, which is all ironical. Nay, our Saviour himſelf thought fit thus to reprove the Jewiſh doctors, when he ſays, "Full well ye reject the commandment of God, that ye may keep your own tradition: Where, by the words *full well*, or, as it is in the original, καλῶς, it is very evident that a ſevere reprimand was intended.

An irony is uſed on a variety of occaſions, as we ſhall ſhow from ſome inſtances in Cicero. Sometimes he applies it in a way of jeſt and banter: As when he ſays, "We have much reaſon to believe the modeſt man would not aſk him for his debt, when he purſues his life." At other times by way of inſult and deriſion: Thus when he would repreſent the forces of Catiline as mean and contemptible, "O terrible war, (ſays he) in which this band of rakes are to march under Catiline! Draw out all your garriſons againſt this formidable body." Again, at other times, to give the greater force to his argument, he would ſeem as it were by this trope to recall and correct what he had ſaid before; as in his oration for Milo: "But it is fooliſh in us to compare Druſus, Africanus, Pompey, and ourſelves, with Clodius; all our calamities were tolerable, but no one can patiently bear the death of Clodius." Now the character of Clodius was ſo well known, that all who were preſent muſt be ſenſible he meant the contrary. And, to name no more, an irony is never uſed to greater advantage, than when it is followed immediately by ſomething very ſtinging. Thus, ſpeaking of Piſo, he ſays, "You have heard this philoſopher: he denies that he was ever deſirous of a triumph." And then addreſſing himſelf to him, he immediately adds, "O wretch! when you deſtroyed the ſenate, ſold its authority, ſubjected your conſulate to the tribune, overturned the ſtate, betrayed my life and ſafety for the reward of a province; if you did not deſire a triumph, what can you pretend you did not deſire?" This muſt effectually confound the falſe gravity at that time aſſumed by Piſo.

Art. II. Secondary Tropes.

Secondary Tropes are ſo called, becauſe they are all of the ſame nature with the former, and may be referred to ſome or other of them, though they have received different names.

They are chiefly eight in number; *Antonomaſia*, *Communication*, *Litotes*, *Euphemiſm*, *Catachreſis*, *Hyperbole*, *Metalepſis*, and *Allegory*. The three firſt of theſe are ſimple tropes, and may all be referred to a *Synecdoche*. But the five laſt are of a mixed or complex nature, and not confined to any one of the primary tropes; as will appear in treating upon them in order.

I. A common or general word is ſometimes uſed for the proper name of ſome particular thing or perſon which upon any account is eminent and remarkable. So we ſay, *He is gone to the city*, or *he came from the city*, that is, *London*. And by the *Scriptures* we mean the *Bible*. So likewiſe, in ſpeaking of perſons, *the orator* is uſed for Cicero, *the poet* for Homer or Virgil, and *the philoſopher* for Ariſtotle: and it is not unuſual to ſay *the apoſtle*, when we mean St. Paul. On the contrary, the proper names of things or perſons are ſometimes applied to any other of the ſame character. Thus we uſe the word *goſpel* for any certain and undoubted truth. And *Carthaginian faith* proverbially ſtood for the greateſt falſehood and deceit among the Romans. With the Greeks, *Hercules* ſignified a *ſtrong man*, *Neſtor* a *wiſe man*, and *Irus* a *beggar*; and the names of *Samſon*, *Solomon*, and *Job*, now anſwer the like characters. Both theſe ways of expreſſion are often very emphatical, and heighten the idea more than where things are expreſſed by their own name. To call a good orator *Cicero*, or an excellent poet a *ſecond Virgil*, includes not only an encomium upon the arts themſelves, but leads the mind to what is moſt perfect in them, and was peculiar to thoſe perſons. Theſe forms of ſpeech are called *antonomaſia*, and come properly under a ſynecdoche; for in the former the whole is put for a part, and in the latter a part for the whole.

II. Nothing is more common with orators, than a change of perſons. Sometimes, to avoid envy, and prevent the imputation of pride, in aſſuming to themſelves the praiſe of any laudable action, they aſcribe it to their hearers, and do not ſay, *we*, but *ye did ſo and ſo*. At other times, when it is neceſſary to remind them of ſomething which they have done amiſs, or to caution them againſt ſome wrong ſtep for the future; to prevent giving offence, they take it upon themſelves, or at leaſt join themſelves with them, and do not ſay, *you have done this*, or *do not you do this*; but, *we have done it*, or *let us not do it*. And again, at other times, in compliment to their hearers, they join them as partners in the commendable actions or virtues of other

perſons; as when the whole body of the people is brought in to ſhare the praiſe ariſing from the ſucceſs of wiſe counſels or victorious arms. Such ways of ſpeaking often occur both in Demoſthenes and Cicero. They are called *communication*, and come properly under a ſynecdoche of the whole.

III. On the contrary, there is a mode of ſpeech, in which, by denying the contrary, more is intended than the words expreſs. This way of ſpeaking is called *litotes*; and is often uſed for ſake of modeſty where a perſon is led to ſay any thing in his own praiſe, or to ſoften an expreſſion which in direct terms might ſound harſh or give offence. As if one ſhould ſay, *I do not commend you for that*; meaning, *I greatly diſcommend* or *blame you for it*: where more being underſtood than the words expreſsly denote, it is properly a ſynecdoche of the part. Not that this manner of ſpeaking is always to be ſo interpreted; but where it is not, there is no trope; which muſt be judged of by the circumſtances of the diſcourſe. But that it frequently is ſo uſed, might be eaſily ſhown from many inſtances; though it will be ſufficient to mention two or three. Cicero ſpeaking of Cotta, calls him *no mean orator*, whom he had juſt called *a very great orator*. And he ſays of Varro, that, "he purſued his ſtudies not without induſtry;" and afterwards gives him the character "of a man of the greateſt application." Which paſſages, compared together, plainly ſhow the import of thoſe negative expreſſions. And a friend of Cicero, writing to him, begins his letter thus: "Although I am ſenſible the news I ſend you will not be very pleaſant." This news was concerning the death of another friend of Cicero's; and thereby the words *not very pleaſant*, muſt, to be ſure, be meant *very unpleaſant and melancholy*; but he choſe that expreſſion in the beginning of his letter, as the ſofteſt and leaſt ſhocking, the better to prepare him for the following account of what that news was. And in this way interpreters explain that paſſage in St. Matthew: *And thou Bethlehem in the land of Judah are not the leaſt among the princes of Judah*; where, by *not the leaſt*, they underſtand the *greateſt*, or *very great*, upon account of the honour it received by the birth of our Saviour, as the words immediately following plainly intimate.

IV. When any diſpleaſing or ungrateful thing is expreſſed by a more ſoft and agreeable word, it is called *euphemiſm*. And as the word made uſe of is either contrary to the proper word, or only different from it, it may be referred to different tropes. The Latins have a ſoft way of expreſſing their diſregard to a perſon, by ſaying *valeat*; which we have borrowed from them, and ſay, *fare him well*. When the contrary being intended to what is expreſſed, it comes properly under an *irony*. And as the word *death* carries in it an idea that is diſagreeable to human nature, inſtead of ſaying a perſon is dead, we often ſay *he is deceaſed*, or *departed*; which we have alſo taken from the Latins, who uſe the words *deceſſit* and *obiit* in the ſame ſenſe. So that in both languages it comes under a ſynecdoche of the whole; to depart out of life being one ſort of departure. But when the evangeliſt ſpeaking of Stephen, who was ſtoned to death, expreſſes it by ſaying that *he fell aſleep*; this is a beautiful metaphor, taken from the ſimilitude between the death of a good man and ſleep.

V. *Catachreſis* ſignifies in general any harſh trope, though it is moſt commonly found in metaphors. It is principally uſed by poets, who make choice of it for novelty, or to enforce an expreſſion, where the proper word does not ſeem ſtrong enough. As when Milton, in deſcribing the angel Raphael's deſcent from heaven, ſays, he

"*Sails between worlds and worlds*;"

where the novelty of the word enlivens the image more than if he had ſaid *flies*. But it is ſometimes found in the graveſt authors, and even in the ſacred writings. So we read of the *blood of the grape*. And Solomon ſays, *the horſe-leech hath two daughters*. In all theſe inſtances the trope is a metaphor. But when St. John ſays in the Revelations, *I turned to ſee the voice that ſpake to me*, it is here a metonymy of the adjunct; the word *voice* being put for the perſon who uttered it. In St. Matthew we read of *Simon the leper*; not that he was then a leper, but had been ſo, and was cured; which is a *ſynecdoche* of the part. And when a criminal is ſaid *to have had his reward*, that is, his puniſhment, it is an *irony*.

VI. *Hyperbole* is the boldeſt of all tropes; for it exceeds the ſtrict bounds of truth, and repreſents things either greater or leſs, better or worſe, than they really are. But the repreſentation is made in ſuch a manner as not to impoſe on the hearers. For an *hyperbole* is not uſed to define or deſcribe any thing accurately, but only to magnify or depreſs it in a conſiderable degree, when we either cannot or do not chooſe to repreſent it exactly. The exceſs in this trope is called *auxeſis*; as when we ſay of any thing that is very high, *it reaches to the ſkies*. The defect, or contrary extreme, is termed *meioſis*: So we ſay of a very lean perſon, *he is nothing but ſkin and bones*, or *a mere ſkeleton*. It is principally metaphorical, but ſometimes taken from other tropes. When Saul and Jonathan are ſaid to have been *ſwifter than eagles, and ſtronger than lions*, the expreſſion is founded in ſimilitude, and is therefore a metaphor. When, inſtead of ſaying Cato was a very virtuous man, the hiſtorian calls him *the image of virtue*; it is an hyperbolical metonymy of the adjunct for the ſubject. And when we read in the Moſaic hiſtory *of cities fenced up to heaven*, there is a *ſynecdoche*. But if a man of weak ſight be ſaid *to be eagle-eyed*, it is an *irony*. Thoſe hyperboles which are expreſſed comparatively, are commonly moſt emphatical, becauſe they ſhow a peculiarity in the exceſs. To ſay a thing is *as light as a feather*, carries the idea very far; but to ſay *it is lighter*, not only carries it ſtill farther, but alſo heightens it, by leaving the mind at an uncertainty where to fix the limits.

VII. Sometimes two or more tropes, and thoſe of a different kind, are contained under one word; ſo that ſeveral gradations, or intervening ſenſes, come between the word that is expreſſed, and the thing deſigned by it. And this is called a *metalepſis*. The conteſts between Sylla and Marius proved very fatal to the Roman ſtate. Julius Cæſar was then a young man. But Sylla obſerving his aſpiring genius, ſaid of him, "In one Cæſar there are many Mariuſes." Now in this expreſſion there is a metalepſis. For the word *Marius*, by a *ſynecdoche* or *antonomaſia*, is put for any ambitious and turbulent perſon; and this again, by a *metonymy* of the cauſe, for the ill effects of ſuch a temper to the public. So that Sylla's meaning, diveſted of theſe tropes, was, that Cæſar would prove the moſt dangerous perſon to the Roman ſtate that ever was bred in it: which afterwards proved true in the event. So when Virgil, deſcribing that part of the African coaſt where Æneas arrived with his ſhips, ſays, *A dark wood hung over it*; the word *dark*, by a metonymy of the effect, is put for *ſhady*, and that again by the ſame trope for *thick*; for his meaning is, *a thick wood*. But the words of Dido, in the ſame poet, contain a larger gradation, when ſhe ſays,

Happy, ah truly happy, had I been,
If Trojan ſhips our coaſts had never ſeen.

In which expreſſion, firſt by a metonymy of the adjunct, the ſhips are put for the Trojans in the ſhips: and theſe, by a ſynecdoche of the whole, for Æneas, who was one of them; and again his arriving on the coaſt, by a metonymy of the cauſe, for her ſeeing him; and laſtly, her ſeeing him, by the ſame trope, for the paſſion ſhe had for him. So that her meaning is, ſhe had been happy, if ſhe had never entertained a paſſion for Æneas. This trope is more frequently to be met with

in poets than in orators, as they take greater liberty in uſing diſtant alluſions than is ſuited to that perſpicuity of expreſſion which is required in oratory. But as Quintilian has well obſerved, all the intermediate links of the chain in this trope are of no further uſe than to lead the mind gradually from the firſt to the laſt, the better to perceive their connection. As in the example laſt mentioned, relating to Dido, if we drop all the intervening ſteps, and connect the words expreſſed with what is directly intended, they will be found to contain a very remote cauſe put for the effect, which comes under a metonymy. On the contrary, in the ſecond example, where *dark* ſtands for *thick*, the effect is put for a remote cauſe. And the firſt, which is founded in a ſimilitude of temper between Cæſar and Marius, belongs to a *metaphor*.

VIII. *Allegory*. As a metalepſis compriſes ſeveral tropes in one word, ſo this is a continuation of ſeveral tropes in one or more ſentences. Thus Cicero ſays, "Fortune provided you no field, in which your virtue could run and diſplay itſelf:" where the words *field* and *run* are metaphors taken from corporeal things, and applied to the mind. And in another paſſage, ſpeaking of himſelf, he ſays, "Nor was I ſo timorous, that after I had ſteered the ſhip of the ſtate through the greateſt ſtorms and waves, and brought her ſafe into port, I ſhould fear the cloud of your forehead, or your colleague's peſtilent breath. I ſaw other winds, I perceived other ſtorms, I did not withdraw from other impending tempeſts; but expoſed myſelf ſingly to them for the common ſafety." Here the ſtate is compared to a ſhip, and all the things ſaid of it under that image are expreſſed in metaphors made uſe of to ſignify the dangers with which it had been threatened. And indeed allegories generally conſiſt of metaphors; which being the moſt beautiful trope, a number of them well choſen and put together is one of the fineſt and brighteſt ornaments in language, and exceeds a ſingle metaphor in luſtre, as a conſtellation does a ſeparate ſtar. It is true, that allegories are ſometimes found in other tropes: but this is very rare. In that known expreſſion of Terence, the tropes are all metonymies: *Without Ceres and Bacchus, Venus grows cold*; that is, diveſted of the tropes: *Without meat and drink, love dies*. And Samſon's riddle is made up of ſynecdoches: "Out of the eater came forth meat, and out of the ſtrong came forth ſweetneſs." But there is no ſmall ſkill required in the right management of allegories. For care ſhould be taken, that the ſame kind of trope be carried through the whole, ſo as to compoſe one uniform and conſiſtent ſet of ideas: otherwiſe they dreſs up a chimera, a thing that has no exiſtence, and of which the mind can form no perception. And, as Quintilian ſays very juſtly, "to begin with a tempeſt and end with a fire, would be very ridiculous and unnatural." It is likewiſe very neceſſary that the alluſions be all plain and evident, eſpecially where the name of the thing alluded to is not expreſſed. Theſe are called *pure allegories*. As that of Cicero: "So it happens, that I, whoſe buſineſs it is to repel the darts, and heal the wounds, am obliged to appear before the adverſaries have thrown any dart; and they are allowed a time to attack us, when it will not be in our power to avoid the aſſault; and if they throw a poiſonous dart, which they ſeem prepared to do, we ſhall have no opportunity to apply a remedy." The tropes here are all taken from military affairs, without any intimation what they are applied to. But that is plain from the context of the diſcourſe. For he is ſpeaking of the diſadvantages he laboured under in defending his client againſt thoſe of the oppoſite ſide, and ſo applies to the bar thoſe terms which were proper to the field. But where the reference is not evident, it becomes a riddle: which is nothing elſe but an obſcure allegory. To avoid this, therefore, the beſt writers generally uſe what they call *mixed allegories*; that is, ſuch wherein the proper name of the thing is expreſſed, which the whole ſimilitude reſpects. Of this kind is that in the ſpeech of king Philip of Macedon, given us by Juſtin, where he ſays, "I perceive that cloud of a dreadful and bloody war ariſing in Italy, and a thunder-ſtorm from the weſt, which will fill all places with a large ſhower of blood, wherever the tempeſt of victory ſhall carry it." The proper words *war*, *blood*, and *victory*, being joined to the tropes *cloud*, *ſhower*, and *tempeſt*, in this ſentence, render the ſeveral parts of the ſimilitude plain and evident. Quintilian thinks thoſe allegories moſt beautiful, where the whole ſimilitude is expreſſed, and thoſe words, which in their proper ſenſe relate to one of the two things between which the compariſon is made, are allegorically applied to the other: As when Cornelius Nepos ſays of Atticus, "If that pilot gains the greateſt reputation who preſerves his ſhip in a boiſterous and rocky ſea; ought not he to be thought a man of ſingular prudence, who arrived in ſafety through ſo many and ſo great civil tempeſts?" Theſe are the allegories with which orators are chiefly concerned.

§ 2. *Of Figures.*

THIS term ſeems to have been borrowed from the ſtage, where the different habits and geſtures of the actors, ſuitable to the ſeveral characters they ſuſtained, were by the Greeks called σχήματα, and by the Latins *figuræ*: And it is not unuſual with us to ſay of a perſon, both with reſpect to his dreſs and action, that he makes *a very bad*, or *a very graceful, figure*. And as language is the dreſs, as it were, of our thoughts, in which they appear and are repreſented to others; ſo any particular manner of ſpeaking, may, in a large ſenſe of the word, be called its *figure*, in which latitude writers ſometimes uſe it. But rhetoricians have reſtrained the ſenſe of the word to ſuch forms of ſpeech as differ from the more common and ordinary ways of expreſſion; as the theatrical habits of actors, and their deportment on the ſtage, are different from their uſual garb and behaviour at other times. A *figure*, therefore, in the ſenſe it is uſed by rhetoricians, is, *A mode of ſpeaking different from, and more beautiful and emphatical than, the ordinary and uſual way of expreſſing the ſame ſenſe*; or, in other words, *That language which is ſuggeſted either by the imagination or the paſſions*. Now as the habits and geſtures of our bodies are in a manner infinitely variable, ſo it is plain that the different forms of ſpeech are almoſt innumerable. But every alteration from the common manner ought not to be eſteemed a figure, nor deſerves that character. It muſt contain ſome beauty, or expreſs ſome paſſion, to merit a place among rhetorical figures, and be marked out for imitation.

The ſubject of *figures* ſeems to have been one of the laſt things which was brought into the art of oratory, in order to complete it. Ariſtotle, who treats ſo accurately upon other parts, ſays very little of this. But the Greek writers who came after him have abundantly ſupplied that deficiency. It is to them we owe the chief obſervations that have been made on this ſubject. They took notice of the ſeveral modes and turns of expreſſion, obſerved their force and beauty, and gave them particular names by which they might be known and diſtinguiſhed from each other. And indeed they have treated the matter with ſuch minuteneſs and ſubtilty, that Quintilian ſeems, not without reaſon, to think they have multiplied figures to an exceſs. But though it was ſo late before they were taken notice of, and introduced into the art of ſpeaking, yet the uſe of them in diſcourſe was doubtleſs very ancient. The author of Homer's life, which ſome have aſcribed to Plutarch, has ſhown, by examples taken out of him, that there is ſcarce a figure mentioned by rhetoricians, but is to be met with in that moſt ancient poet. And, if we conſider the nature of ſpeech, we ſhall eaſily perceive that mankind muſt have been under a neceſſity very early to introduce the uſe of *tropes* for ſupplying the want of proper words to expreſs their ſimple ideas: ſo the like neceſſity muſt

have put them upon the uſe of figures to repreſent their different paſſions. Though both of them were afterwards increaſed, and improved in ſuch a manner as to become the chief ornaments of language. The paſſions of men have been always the ſame; they are implanted in us by nature, and we are all taught to diſcover them by the ſame ways. When the mind is diſturbed, we ſhow it by our countenance, by our actions, and by our words. Fear, joy, anger, alter the countenance, and occaſion different emotions and geſtures of the whole body. And we know with what paſſion a man is affected, by hearing his words, though we do not ſee him. He does not expreſs himſelf as he uſually does at other times when cool and ſedate. Objects appear to him in a different view, and therefore he cannot but ſpeak of them in a different way. He interrogates, he exclaims, he admires, he appeals, he invokes, he threatens, he recals his words, repeats them, and by many other different turns of expreſſion varies his ſpeech no leſs than his countenance, from his common and ordinary manner. Now as nature ſeems to teach us by theſe figurative expreſſions how to repreſent the different commotions of our minds, hence ſome have thought fit to call figures *the language of the paſſions.* And as theſe are given us, among other wiſe ends, to excite us the better to provide for our preſervation and ſafety, this is done ſometimes by force of arms, and at other times by diſcourſe. And therefore Cicero very handſomely compares the conduct of an orator to the exerciſes of the palæſtra; in which, as each combatant endeavours not only to defend himſelf, and attack his adverſary, but likewiſe to do both with decency; ſo the principal weapons of an orator, as he repreſents them, are figures, which being no leſs the ornaments of language than images of our paſſions, anſwer all theſe purpoſes. Beſides, figures chiefly diſtinguiſh the different kinds of ſtyle, furniſh it with an agreeable variety, and often ſerve to repreſent things in a clear and forcible manner.

From this ſhort account of the nature of figures, the advantage of them to an orator is very evident. They are a ſort of natural eloquence, which every one falls into without attending to it, ſuitably to that temper of mind with which he is affected himſelf, and is deſirous to affect others. In a cool and ſedate diſcourſe, ſuch figures as convey our ſentiments with the greateſt ſtrength and evidence are moſt proper. And there are others, which are ſuited to brighten and enliven more gay and ſprightly ſubjects. Others again are more peculiarly adapted to expreſs the diſorders and perturbations of the mind. To repeat the ſame thing again would many times be deemed a tautology and impertinent; but to do this when the mind is ruffled, is not only allowable, but the repetition renders it more ſtrong and affecting. So likewiſe to interrogate, exclaim, or admire, under the influence of a paſſion, impreſſes the hearers, and diſpoſes them to attention; whereas at another time perhaps ſuch ways of ſpeaking would ſcarce be conſiſtent with prudence. There is a natural ſympathy in mens minds, which diſpoſes them to receive impreſſions from thoſe with whom they converſe. Thus one gay and pleaſant companion gives a cheerfulneſs and vivacity to a whole company; whereas, on the contrary, one who is dull and phlegmatic damps the ſpirits of all about him, and affects them with the ſame gloomy temper. Figures are peculiarly ſerviceable to an orator for anſwering theſe different intentions. And as he finds them in life, from thence he muſt copy them; as a painter does the features of the countenance, and the ſeveral parts of the body; figures being to the one what lines and colours are to the other. The deſign of Catiline to deſtroy the Roman ſtate and burn the city, is a ſtory well known. There was an army drawn together at a proper diſtance to favour the undertaking; and others were left in Rome, who had their parts aſſigned them for burning the city, and deſtroying thoſe who ſhould eſcape the flames. And in a word, every thing was ready for putting in execution this horrid and barbarous ſcheme. So that nothing retarded it but the taking off Cicero, who was then conſul, which was thought neceſſary to be done firſt. Cicero, upon information of the deſign againſt his life, finds means to prevent, and the ſame day calls together the ſenate. And Catiline, who was a man of conſummate boldneſs, had the confidence to appear in that aſſembly. Upon their meeting, Cicero, opens to them the whole affair of the conſpiracy, and the deſign againſt himſelf, in a moſt warm and pathetic harangue. In which he had two things in view; to raiſe the indignation of the ſenate againſt the conſpirators, and particularly againſt Catiline; and, either by terrifying or exaſperating him, to oblige him to leave the city. Now he does not begin this ſpeech in his uſual manner at other times, by addreſſing to his audience, beſpeaking their favour and attention, or letting them gradually into the deſign of what he was about to ſay; but as Catiline was preſent, he immediately falls upon him with vehemence, in the following manner: "How far, Catiline, will you abuſe our patience? How long will your fury inſult us? What bounds will you ſet to your unbridled rage? Does neither the night-guard of the palace, nor the city-watch, nor the peoples fear, nor the agreement of all good men, nor the meeting of the ſenate in this fortified place, nor the countenances and and looks of this aſſembly, at all move you? Do not you perceive your deſigns are diſcovered, and that all who are preſent know of your conſpiracy? Who of us, do you think, is ignorant of what you did the laſt night, and the night before, where you was, who were with you, and what you reſolved on? O times, O manners! The ſenate knows this, the conſul ſees it; and yet this man lives!—lives? nay, comes into the ſenate, joins in the public counſels, obſerves and marks out each of us for deſtruction!" And in the ſame impetuous ſtrain he proceeds through his whole ſpeech, interſperſing a great variety of the like ſtrong and moving figures. And the diſcourſe had its deſired effect: for when Catiline ſtood up afterwards to make his defence, the whole ſenate was ſo inflamed, and their reſentments againſt him roſe ſo high, from what Cicero had ſaid, that they had not patience to hear him ſpeak; upon which he left both them and the city. Had Cicero, inſtead of venting his juſt indignation againſt the author of ſo barbarous and inhuman a deſign, in the manner he did, by figures ſuited to ſtrike the paſſions of his hearers; had he, inſtead of this, attempted to reaſon with him, and told the ſtory in a cold and lifeleſs manner, he would have expoſed himſelf to the contempt of Catiline; and by leaving the ſenate little or nothing moved at what he ſaid, prevented perhaps their coming to thoſe ſpeedy and vigorous reſolutions which were neceſſary at ſo critical a juncture. Let us ſuppoſe him to have expoſtulated with Catiline in much the ſame words as before, but thrown into a different form, and diveſted of thoſe pathetic figures. As thus: "Catiline, you have really abuſed our patience to a great degree. You have inſulted us with your furious proceedings a long while. You ſeem to have fixed no bounds to your unbridled rage. Neither the night-guard of the palace, nor the city-watch, nor the peoples fear, nor the agreement among good men, nor the calling together of the ſenate in this fortified place, nor the countenances and looks of this aſſembly, appear to move you in the leaſt. I aſſure you we are all of us appriſed of what you did the laſt night, and the night before, where you was, and who were with you, and what reſolutions you came to. Theſe are ſad times, the age is very degenerate; that the ſenate ſhould know all this, the conſul ſee it; and yet that this man ſhould live, come into the ſenate, hear all our debates, and mark us out to deſtroy us." You ſee the ſenſe is entirely the ſame, and the words too in a great meaſure; ſo that there is little more than an alteration in the form of them. And yet who does not perceive how flat and languid ſuch a way of talking muſt have appeared at that time? and how much it loſes of that ſpirit and

energy, which ſhows itſelf in Cicero's manner of expreſſion? Had he delivered himſelf thus, it might indeed have made the ſenate look upon Catiline as an abandoned wretch, loſt to all virtue and goodneſs, and perhaps have moved ſome to pity him on that account; as we are eaſily induced to compaſſionate perſons in ſuch circumſtances, eſpecially when deſcended from noble and virtuous anceſtors, which was his caſe. But ſure it would have been ill ſuited to fire their minds with that generous regard for their country, and the neceſſary precautions for its ſecurity, which the circumſtances of the ſtate then required. Nor would Catiline have been at all deterred by it, but rather encouraged in the proſecution of his deſigns, from the little effect a ſpeech ſo managed muſt probably have had upon the minds of the ſenators. But Cicero knew very well that the paſſions of mankind are the ſprings of action: that it is many times not ſufficient for an orator to convince their minds, by ſetting the truth in a clear light; but he muſt alſo raiſe their hopes, alarm their fears, inflame their anger, or excite ſome other ſuitable paſſion, before they will be brought to act with that zeal and fervour which the caſe may require. And as he was admirably well ſkilled in this art of touching the paſſions, he ſeldom fails to fix upon the proper methods of doing it, and makes choice of ſuch figures and modes of ſpeaking as in the ſtrongeſt manner repreſent the emotions of his own mind. For every paſſion is not to be expreſſed by the ſame figures, any more than it is drawn by the ſame lines, or painted with the ſame colours. When Dido finds that Æneas is about to leave her, ſhe uſes all her arts to detain him. And as perſons in great diſtreſs are ſeldom at a loſs to expreſs their condition in the moſt affecting way; ſhe diſcovers her fear, anger, revenge, with the whole crowd of diſorders which then poſſeſſed her mind, in a variety of moving figures, ſuited to raiſe the counter paſſions in his breaſt, as is finely repreſented by Virgil in that artful ſpeech he has made for her, which we forbear to recite for no other reaſon but the length of it. But what particular figures are moſt accommodated to anſwer the ſeveral ends propoſed by them, will beſt appear when we come to treat of them ſeparately.

We ſhall therefore now proceed to lay down a few directions for the proper uſe of figures. And firſt they ſhould always be accommodated to the ſentiments, and riſe in proportion to the images deſigned to be conveyed by them. So far as they are founded in reaſon, they are ſuited to impreſs the mind; but where the language outſtrips the thought, though it may pleaſe the ear, and ſome weak perſons may be carried away with the pomp of words, yet an intelligent hearer will ſoon ſee through the thin and airy dreſs. It is the ſenſe which gives weight to the figure, as that by ſtriking the imagination awakens the mind, and excites it to act in conformity to reaſon. Again, in the uſe of pathetic figures, it is generally better to be nervous than copious, that the images, by their cloſer union, may impreſs the mind with greater force and energy; though in ſuch figures as are deſigned for ornament or illuſtration, a more diffuſive way of painting is ſometimes agreeable. But farther, the too frequent uſe of figures ought to be avoided. For what was obſerved in relation to tropes, is alſo true with reſpect to theſe; that a great number of them is apt to darken and obſcure the ſtyle. And beſides, Cicero's reflection in this caſe is very juſt, That "it is hard to ſay, what ſhould be the reaſon that thoſe things, which moſt affect us with a ſenſible pleaſure, and at firſt ſight ſooneſt move us, do likewiſe ſooneſt cloy and ſatiate us." But that it is ſo, we find by common experience. Laſtly, figures ſhould be ſo interwoven in a diſcourſe, as not to render the ſtyle rough and uneven, ſometimes high and at other times low; now dry and jejune, then pompous and florid. In a word, they ſhould rather ſeem to ariſe from nature than art; to offer themſelves, than to be the effect of ſtudy; and to appear not like patches upon a face, but the agreeable beauty of a ſound and healthful complexion. But of this we ſhall have occaſion to ſpeak more at large hereafter, in treating upon the different kinds or characters of ſtyle.

As to the diviſion of figures, which is what remains to be conſidered, they are uſually divided into two ſorts, figures of words, and figures of ſentences. The difference between them conſiſts in this; that in the former, if you alter the words, or ſometimes only the ſituation of them, you deſtroy the figure; but in the latter the figure remains, whatever words are made uſe of, or in what manner ſoever the order of them is changed. Thus when the name of a perſon or thing is repeated, to intimate ſome known property or quality belonging thereto, it is a verbal figure called *ploce*. Cicero was a true patriot and hearty lover of his country. And therefore we ſhall uſe this figure in ſaying, that *at the time of Catiline's conſpiracy Cicero appeared like Cicero*. The ſenſe would remain the ſame, but the figure would be loſt if we ſhould alter the words, and ſay, *at that time Cicero appeared like himſelf*. So when two or more ſentences, or members of a ſentence, end with the ſame word, it is called *epiſtrophe*; as when we ſay, *To loſe all reliſh of life, is in effect to loſe life*. But if only the order of the words be changed in the latter clauſe thus, *To loſe all reliſh of life, is to loſe life in effect*; the figure vaniſhes. And this is the nature of the verbal figures. But it is not ſo in figures of ſentences; they continue in the ſame, whatever alterations are made in the words. An orator ſometimes thinks it proper to change the form of his diſcourſe, and addreſs himſelf to his audience, or an abſent perſon, or elſe perhaps to introduce ſome other perſon as ſpeaking to them whoſe words may be ſuppoſed to carry greater weight and authority with them than his own. The former of theſe is called *apoſtrophe*, and the latter *proſopopœia* or *imagery*; which require no certain words or order of expreſſion.

Art. I. Verbal Figures.

These may be diſtinguiſhed into three ſorts, as they conſiſt in a *deficiency* of words, a *redundancy*, or a *repetition*.

I. Of the firſt ſort are *ellipſis* and *aſyndeton*.

Ellipſis, is when one or more words are wanting in a ſentence to complete the conſtruction, and fully expreſs the ſenſe. This figure is often uſed in proverbial ſpeeches: as when we ſay, *Many men, many minds*; that is, *have many minds*; and, *The more danger, the more honour*; that is, *gains more honour*. But where more is intended by ſuch expreſſions than mere brevity, and eſpecially when they are the effect of ſome paſſion, the figures receives another name, and is called *apoſiopeſis*, which is placed among the figures of ſentences, where we ſhall conſider it.

Aſyndeton, is when the particles that connect the members of a ſentence one with another are left out, to repreſent either the celerity of an action, or the haſte and eagerneſs of the ſpeaker. Thus Cæſar expreſſes his ſpeedy conqueſt of Pharnaces: *I came, I ſaw, I conquered*. If he had inſerted the copulatives, and ſaid, *I came, and I ſaw, and I conquered*, it would have retarded the expreſſion, and not given ſo full and juſt an idea of the ſwiftneſs of the action. In the laſt article we took notice of the vehement and impetuous manner in which Cicero attacked Catiline in his firſt oration, where his deſign was to fire the minds of the ſenate againſt him, and oblige him to leave the city, both which points he gained by that ſpeech. The next day, therefore, when Catiline was gone, he calls together the body of the citizens, and makes a ſpeech to them, which in a ſort of rapture or tranſport of mind he thus begins, by acquainting them with the departure of Catiline, *He is gone, departed, eſcaped, broke out*; intimating at the ſame time both the exceſſive rage in which Catiline left Rome, and the great pleaſure with which he was himſelf affected on that account. This conciſe way of ſpeaking adds likewiſe a conſiderable emphaſis to an expreſſion, and by bringing the

ſeveral parts of a thing nearer together affects the mind with greater force. Thus Cicero ſets Cato's character in a very ſtrong and beautiful light by the uſe of this figure. "Nature itſelf (ſays he) has made you a great and excellent man for integrity, gravity, temperance, magnanimity, juſtiee, in a word, for all virtues."

II. The ſecond ſort of verbal figures is contrary to theſe, and conſiſts in a redundancy or multiplicity of words; which are likewiſe two, *pleonaſmus* and *polyſyndeton*.

When we uſe more words than are neceſſary to expreſs a thing, it is called *pleonaſmus*. This is done ſometimes for greater emphaſis, as when we ſay, *Where in the world is he?* At other times it is deſigned to aſcertain the truth of what is ſaid: So the ſervant in Terence, when the truth of what he had related was called in queſtion, replies, *It is certainly ſo; I ſaw it with theſe very eyes.*

When the ſeveral parts of a ſentence are united by proper particles, it is called *polyſyndeton*. This adds a weight and gravity to an expreſſion, and makes what is ſaid to appear with an air of ſolemnity; and by retarding the courſe of the ſentence, gives the mind an opportunity to conſider and reflect upon every part diſtinctly. We often meet with this figure in Demoſthenes, which very well ſuits with the gravity of his ſtyle. So he encourages the Athenians to proſecute the war againſt King Philip of Macedon, from this conſideration, that now "they had ſhips, and men, and money, and ſtores, and all other things which might contribute to the ſtrength of the city, in greater number and plenty than in former times." Every article here has its weight, and carries in it a proper motive to animate them to the war. But if you remove the copulatives, the ſentence will loſe much of its force.

III. The third kind of verbal figures conſiſts in a *repetition*. And either the ſame word in ſound or ſenſe, is repeated; or one of a like ſound, or ſignification, or both.

Of the former ſort there are ten, called *antanaclaſis*, *ploce*, *epizeuxis*, *climax*, *anaphora*, *epiſtrophe*, *ſymploce*, *epanalepſis*, *anadiploſis*, and *epanodos*. The two firſt of theſe agree in ſound, but differ in ſenſe; the eight following agree in both.

When the ſame word in ſound but not in ſenſe is repeated, it is called *antanaclaſis*. This figure ſometimes carries a poignancy in it; and when it appears natural and eaſy, diſcovers a ready turn of thought. As when a ſon, to clear himſelf of ſuſpicion, aſſured his father *he did not wait for his death*; his father replied, *But I deſire you would wait for it.* Here the word *wait* is taken in two different ſenſes. It is likewiſe uſed on ſerious occaſions, as in grave and moral precepts, which are apt to affect the mind with greater pleaſure when delivered in an agreeable dreſs. As this; *Care for thoſe things in your youth, which in old age may free you from care*: Where the word *care* in the former place ſignifies to *provide*, and in the latter *anxiety of mind*. And even our Saviour himſelf once uſes this figure, when he ſays to one of his diſciples, who deſired to be diſmiſſed from attending him that he might go and bury his father; *Follow me, and let the dead bury their dead:* Where *dead* in one place denotes a *natural death*, and in the other a *moral* or *ſpiritual death*.

Sometimes the name of ſome perſon or thing is repeated again, to denote ſome particular character or property deſigned to be expreſſed by it; and then it is called *ploce*. Thus Cicero ſays, *Young Cato wants experience, but yet he is Cato*; meaning he had the ſteady temper of the family. And ſo in the proverbial expreſſion, *An ape is an ape dreſs him ever ſo fine.*

When a word is repeated again with vehemence in the ſame ſenſe, it is called *epizruxis*. This figure ſhows the earneſtneſs of the ſpeaker, and his great concern of mind about what he ſays; and therefore has a natural tendency to excite the attention of the audience. It is ſuited to expreſs anger, ſurpriſe, ſorrow, and ſeveral other paſſions. As when Cicero would expreſs his indignation againſt Antony for having been the chief inſtrument in bringing on the civil war, he ſays to him. *You, you, Antony, puſhed Cæſar upon the civil war.* And thus he tells Catiline in his firſt invective againſt him: *You live; and live, not to lay aſide, but to purſue your wicked deſign.* And when our Saviour would expreſs his great concern and ſorrow for the wickedneſs of the Jews, he does it in this pathetic manner: *O Jeruſalem, Jeruſalem, who killeſt the prophets!*

Climax is a beautiful kind of repetition, when the word, which ends the firſt member of a period, begins the ſecond, and ſo through each member, till the whole is finiſhed. There is a great deal of ſtrength as well as beauty in this figure, where the ſeveral ſteps riſe naturally, and are cloſely connected with each other. As in this example: *There is no enjoyment of property without government, no government without a magiſtrate, no magiſtrate without obedience, and no obedience where every one acts as he pleaſes.* But, as Quintilian obſerves, this figure lies ſo open, that it is apt to look too much like art; for which reaſon he adviſes not to uſe it often. To prevent this, therefore, orators ſometimes diſguiſe it, by not repeating the ſame word which ſtood in the former member, but ſome other equivalent to it. As in the following inſtance of Cicero for Milo: "Nor did he commit himſelf only to the people, but alſo to the ſenate; nor to the ſenate only, but likewiſe to the public forces; nor to theſe only, but alſo to his power with whom the ſenate had entruſted the whole common wealth."

When ſeveral ſentences, or members of a ſentence, begin with the ſame word, it is called *anaphora*. This is a lively and elegant figure, and ſerves very much to engage the attention. For by the frequent return of the ſame word the mind of the hearer is held in an agreeable ſuſpenſe, till the whole is finiſhed. "You do nothing (ſays Cicero to Catiline), you attempt nothing, you think nothing, but what I not only hear, but alſo ſee, and plainly perceive." It is frequently uſed by way of queſtion; which renders it not only beautiful, but likewiſe ſtrong and nervous. As at the beginning of the ſame ſpeech: "Does neither the night-guard of the palace, nor the city-watch, nor the peoples fear, nor the agreement of all good men, nor the meeting of the ſenate in this fortified place, nor the countenances and looks of this aſſembly, at all move you?" And in another of his orations: "What is ſo popular as peace, which ſeems to afford a pleaſure, not only to beings endowed with ſenſe, but even to inanimate nature? What is ſo popular as liberty, which even beaſts as well as men ſeem to covet and prefer above all things? What is ſo popular as eaſe and leiſure, for the enjoyment of which you and your anceſtors have undergone the greateſt labours."

Epiſtrophe is contrary to the former, and makes the repetition at the end of each member or ſentence. As thus: *Since concord was loſt; friendſhip was loſt, fidelity was loſt, liberty was loſt; all was loſt.* And Cicero, in the charge which he brings againſt Mark Antony before the ſenate, makes uſe of this figure, when he ſays, "Do you lament the deſtruction of three Roman armies? The author of that deſtruction was Antony. Do you bewail the loſs of moſt eminent citizens? They have been taken from you by Antony. Is the authority of this order weakened? It is weakened by Antony."

Symploce takes in both theſe laſt figures. As in that of Cicero: "You would pardon and acquit him, whom the ſenate hath condemned, whom the people of Rome have condemned, whom all mankind have condemned." Here the ſeveral members both begin and end with the ſame word. We have a beautiful inſtance of it in St. Paul, when he ſays, "Are they Hebrews? ſo am I. Are they Iſraelites? ſo am I. Are they the ſeed of Abraham? ſo am I."

When a ſentence concludes with the word with which it began, it is called *epanalepſis*. As in that expreſſion of Plautus, "Virtue contains all things, he wants no good thing who has virtue." The figure is the ſame, but the principle not ſo honeſt, in the advice which we find given by the miſer in Horace, when he ſays, "Get money, if you can, honeſtly; but however, get money." This figure adds a force to an expreſſion, when the principal thing deſigned to be conveyed is thus repeated, by leaving it laſt upon the mind. And it heightens the beauty of it, when the ſentence has an agreeable turn ariſing from two oppoſite parts. As in Cicero's compliment to Cæſar: "We have ſeen your victory terminated by the war; your drawn ſword in the city we have not ſeen." Hermogenes calls this a *circle*, becauſe the ſentence returns again to the ſame word, as that geometrical figure is formed by the orbicular motion of a line to the ſame point.

When the following ſentence begins with the ſame word with which the former concluded, it is termed *anadiploſis*. As in the following inſtance: *Let us think no price too great for truth; truth cannot be bought too dear.* So in that paſſage of St. John: *He came to his own, and his own received him not.* This figure generally ſuits beſt with grave and ſolemn diſcourſes.

Epanodos is the inverſion of a ſentence, or repeating it backwards, ſo that it takes in the two laſt figures; for it both begins and ends with the ſame word, and the ſame word is likewiſe repeated in the middle. This turn of expreſſion has a beauty in it, and ſhows a readineſs of thought. We have the following example of it in Minutius Felix, where he is expoſing the folly of the Egyptian ſuperſtition. "Iſis (ſays he), with Cynocephalus and her prieſts, laments, bemoans, and ſeeks her loſt ſon; her attendants beat their breaſts, and imitate the grief of the unhappy mother; in a little time the ſon is found, upon which they all rejoice. Nor do they ceaſe every year to loſe what they find, or to find what they loſe. And is it not ridiculous to lament what you worſhip, or to worſhip what you lament?" It ſerves likewiſe to illuſtrate and enforce the ſenſe, by ſetting it in two oppoſite views. As in that expreſſion of the prophet: "Wo unto them who call good evil, and evil good; who put darkneſs for light, and light for darkneſs!"

Thoſe figures which conſiſt in a repetition of words of a like ſound or ſignification, or both, are four; *paronomaſia*, *homoioptoton*, *ſynonymia*, and *derivatio*; the two firſt of which reſpect words that are ſimilar in ſound only, the third in ſenſe, and the laſt in both.

When two words very near in ſound, but different in ſenſe, reſpect each other in the ſame ſentence, it is called *paronomaſia*. As when we ſay, *After a feaſt comes a faſt*; and, *A friend in need is a friend indeed*. We uſually call it a *pun*, which when new, and appoſitely uſed, paſſes for wit, and ſerves to enliven converſation. Nor is it wholly to be excluded from grave and ſerious diſcourſes; for a witty jeſt has many times had a better effect than a ſolid argument, and prevailed with thoſe who could not be moved by cloſe reaſoning. And therefore Cicero and the beſt ſpeakers have ſometimes recourſe to it upon weighty and ſolemn occaſions, as will be ſhown hereafter in its proper place.

When the ſeveral parts of a ſentence end with the ſame caſe, or tenſe of a like ſound, this alſo is conſidered as a figure, and named *homoioptoton*. As thus: *No marvel though wiſdom complain that ſhe is either wilfully deſpiſed, or careleſly neglected; either openly ſcorned, or ſecretly abhorred.* This figure is eſteemed moſt beautiful when the parts are all of the ſame length, or pretty near it; as it adds to the harmony of the period, and renders the cadency of the ſeveral members more muſical from the juſt proportion between them. The Greek rhetoricians were much addicted to this figure, and Iſocrates is particularly celebrated for it. But ſome of the beſt orators ſeem to have induſtriouſly avoided it, as carrying in it too much the appearance of art. And it is remarkable, that this figure appears nowhere ſo much in all the works of Demoſthenes, as in an oration which he did not ſpeak himſelf, but wrote for his friend Diodorus, a man of that taſte, who was to pronounce it as his own.

The next figure above-mentioned is *ſynonymia*. Now ſtrictly ſpeaking, ſynonymous words are thoſe which have exactly the ſame ſenſe. But there being few ſuch, the uſe of the term is ſo far extended as to comprehend words of a near affinity in their ſignification, which in diſcourſe are frequently put for one another. So, *to deſire*, and *intreat*, are ſometimes uſed as equivalent terms; whereas *to deſire* is no more than to wiſh for a thing, and *to intreat* is to expreſs that inclination in words. In like manner, *eſteem* and *honour* are often taken for ſynonymous words, though they have not preciſely the ſame ſenſe, but one is the uſual conſequence of the other; for eſteem is the good opinion we entertain of a perſon in our mind, and honour the outward expreſſion of that opinion. When two or more ſuch words come together, they conſtitute this figure. As when Cicero, ſpeaking of Piſo, ſays, "His whole countenance, which is the tacit language of the mind, has drawn men into a miſtake, and deceived, cheated, impoſed on thoſe who did not know him." This figure ſometimes adds force to an expreſſion, by enlivening the idea; and it often promotes the harmony and juſt cadency of a ſentence, which otherwiſe would drop too ſoon, and diſappoint the ear.

When ſuch words as ſpring from the ſame root, as *juſtice*, *juſt*, *injuſtice*, *unjuſt*, and the like, come together in the ſame ſentence, they make the figure called *derivatio*. Cicero obſerving the vanity of the philoſophers who affected praiſe at the ſame time that they decried it, uſes this figure, when he ſays of them, "The philoſophers ſet their names to thoſe very books which they write for the contempt of glory; and are deſirous to be honoured and applauded even for what they ſay in contempt of honour and applauſe." This figure receives an additional beauty when repeated, eſpecially in two oppoſite members; as, *He wiſhed rather to die a preſent death, than to live a miſerable life.*

Art. II. Figures *of* Sentences.

Of theſe, ſome are principally adapted for reaſoning, and others to move the paſſions.

I. *Thoſe ſuited for proof.* Which are ſix: *Prolepſis*, *hypobole*, *anacoinoſis*, *epitrope*, *parabole*, and *antithecſis*.

Prolepſis, or *anticipation*, is ſo called, when the orator firſt ſtarts an objection, which he foreſees may be made either againſt his conduct or cauſe, and then anſwers it. Its uſe is to foreſtal an adverſary, and prevent his exceptions, which cannot afterwards be introduced with ſo good a grace. Though it has likewiſe a farther advantage, as it ſerves to conciliate the audience, while the ſpeaker appears deſirous to repreſent matters fairly, and not to conceal any objection which may be made againſt him. The occaſions of this figure are various; and the manner of introducing it very different. Sometimes the orator thinks it neceſſary to begin with it, in order to juſtify his conduct, and remove any exceptions which may be made againſt his deſign. Cicero, for ſeveral years together, after he firſt began to plead, had always been for the defendent in criminal caſes. And therefore, when he was prevailed with to undertake the accuſation of Verres, he begins his oration with this apology for himſelf: "If any one preſent ſhould wonder, that when for ſeveral years paſt I have ſo conducted myſelf as to defend many and accuſe none, I now on a ſudden alter my cuſtom, and undertake an accuſation: when he ſhall have heard the occaſion and reaſon of my deſign, he will both

approve of it, and think no perſon ſo proper to manage this affair as myſelf." And then he proceeds to give an account of the reaſons which moved him to engage in it. At other times the objection is admitted as an exception to what has been ſaid, but not ſo as to effect it in general. Thus, when Cicero has repreſented the advantages of literature and the polite arts, he ſtarts this objection to what himſelf had ſaid, "But ſome one will aſk, whether thoſe great men, the memory of whoſe glorious actions is delivered down to poſterity, were acquainted with that ſort of learning I ſo applaud?" To which he replies, "Indeed this can ſcarce be ſaid of them all. However, the anſwer is eaſy. I have known ſeveral perſons of excellent abilities, who, without learning, by the force of an extraordinary genius have been men of great virtue and ſolidity. Nay I will add, that nature without learning, has oftener produced theſe qualifications, than learning without a genius. But yet it muſt ſtill be owned, that where both theſe meet, they form ſomething very excellent and ſingular." Again, at other times, the orator artfully repreſents the objection as ſomething conſiderable and important, to give the greater weight to his anſwer when he has confuted it. Cicero, in his celebrated oration for the Manilian law, could not omit to take notice, that Lucullus had already gained ſeveral very conſiderable advantages over Mithridates. And therefore, having before deſcribed the war as very great and dangerous, apprehending theſe two accounts might appear ſomewhat inconſiſtent, and be liable to an objection, he puts it thus artfully himſelf: "But now, after what I have ſaid of Lucullus, it may probably be aſked, How then can the war be ſo great? Be pleaſed to hear, for there ſeems to be very juſt reaſon for this queſtion." And then he proceeds to ſhow, from the power of king Mithridates at that time, his great abilities, long experience in military affairs, and freſh alliances, that the war was yet very great and dangerous. But ſometimes, when the orator is ſenſible that what he has advanced lies open to an objection, he omits to make it in expreſs terms; and yet proceeds to vindicate what he had ſaid, as if it had been made. Thus, when Cicero had charged Verres with having plundered the inhabitants of Sicily of all their plate, jewels, and other valuable moveables, which he thought worth while to carry away; as the audience might imagine this to be ſcarce creditable, he takes it for granted they thought ſo, and therefore immediately adds, "As ſtrange as this is, I affirm it poſitively, without any intention to aggravate the crime." And ſo he goes on to the proof of his aſſertion. But this figure is likewiſe made uſe of to guard againſt ſome objection, which the ſpeaker apprehends may be made againſt what he deſigns to ſay. And thus Cicero uſes it in his oration for Sextus. "My province (ſays he), as I ſpeak laſt, ſeems to call for affection to my friend, rather than his defence; complaint, rather than eloquence; expreſſions of grief, rather than art. And therefore, if I ſhall expreſs myſelf with more warmth, or greater freedom, than thoſe who have ſpoke before me, I hope you will grant me all that liberty of ſpeech which you judge reaſonable to be allowed to an affectionate ſorrow and juſt reſentment." This figure requires great prudence and diſcretion in the management of it. The ſpeaker muſt conſider well the temper, bias, and other circumſtances of his hearers, in order to form a right judgment what parts of his diſcourſe may be moſt liable to exception. For to object ſuch things, which the hearers would never have thought of themſelves, is to give himſelf a needleſs trouble; and to ſtart ſuch difficulties, which he cannot afterwards fairly remove, will expoſe both himſelf and his cauſe. But as nothing gives an audience greater pleaſure and ſatisfaction, than to have their ſcruples fully anſwered as they riſe in their thoughts; ſo on the contrary, be a diſcourſe otherwiſe ever ſo entertaining and agreeable, if there be any doubt left upon the minds of the hearers, it gives them a pain that continues with them till it be removed.

The figure *hypobole* or *ſubjection*, is not much unlike the former; and is, when ſeveral things are mentioned that ſeem to make for the contrary ſide, and each of them refuted in order. It conſiſts of three parts, when complete; a propoſition, an enumeration of particulars with their anſwers, and a concluſion.—Thus Cicero, upon his return from baniſhment, vindicates his conduct in withdrawing ſo quietly and not oppoſing the faction that ejected him. "My departure (ſays he) is objected to me, which charge I cannot anſwer without commending myſelf. For what muſt I ſay? That I fled from a conſciouſneſs of guilt? But what is charged upon me as a crime, was ſo far from being a fault, that it is the moſt glorious action ſince the memory of man, (he means his puniſhing the aſſociates of Catiline.) That I feared being called to an account by the people? That was never talked of; and if it had been done, I ſhould have come off with double honour. That I wanted the ſupport of good and honeſt men? That is falſe. That I was afraid of death? That is a calumny. I muſt therefore ſay, what I would not, unleſs compelled to it, that I withdrew to preſerve the city." When the objections are put by way of queſtion, as in the example here given, they add a briſkneſs and poignancy to the figure. All the parts of it are not conſtantly expreſſed. For thus Cicero in his defence of Plancius introduces his adverſary objecting, and himſelf anſwering, "The people judged ill, but they did judge; they ſhould not have done it, but they had a power; I cannot ſubmit to it, but many very great and wiſe men have."—Both the propoſition and concluſion are here omitted.

The next figure in order is *anacoinoſis*, or *communication*; by which the ſpeaker deliberates either with the judges, the hearers, or the adverſary himſelf. Thus Cicero addreſſes the judges in his accuſation of Verres: "Now I deſire your opinion what you think I ought to do. And I know your advice will be, though you do not declare it, what appears to me neceſſary to be done." In another place we find him reaſoning in this manner with the adverſe party: "What could you have done in ſuch a caſe, and at ſuch a time; when to have ſat ſtill, or withdrawn, would have been cowardice? When the wickedneſs and fury of Saturninus the tribune had called you into the capitol; and the conſuls, to defend the ſafety and liberty of your country; whoſe authority, whoſe voice, which party would you have followed, and whoſe command would you have choſen to obey?" This figure carries in it an air of modeſty and condeſcenſion, when the ſpeaker ſeems unwilling to determine in his own cauſe, but refers it to the opinion of others. It likewiſe ſhows a perſuaſion of the equity of his cauſe, that he can leave it to their arbitration; and ſerves very much to conciliate their minds, while he joins them, as it were, with himſelf, and makes them of his party. And when the appeal is made to the adverſe party, it is of conſiderable advantage, either to extort a confeſſion, or at leaſt to ſilence him. And therefore the ſacred writers ſometimes very beautifully introduce God himſelf thus expoſtulating with mankind; as the prophet Malachi, *A ſon honoureth his father, and a ſervant his maſter. If then I be a father, where is mine honour? and if I be a maſter, where is my fear?*

Another figure that comes under this head, is *epitrope* or *conceſſion;* which grants one thing to obtain another more advantageous. It is either real or feigned; and either the whole of a thing, or a part only, is granted. We ſhall conſider each of theſe ſparately, and illuſtrate them with proper examples. Nothing more confounds an adverſary, than to grant him his whole argument; and at the ſame time either to ſhow that it is nothing to the purpoſe, or to offer ſomething elſe which may invalidate it. *I allow*, ſays the claimant by will againſt the heir at

law, *that no body was more nearly related to the deceaſed than you; that he was under ſome obligations to you; that you were in the army together: but what is all this to the will?* And thus Cicero in his defence of Ligarius, who was accuſed by Tubero for having joined with Pompey in the civil war between him and Cæſar: "You have, Tubero, what an accuſer would moſt deſire, the accuſed perſon confeſſing the charge; but ſo as to affirm, that he was of the ſame party with you and your excellent father. Therefore own firſt, that it was a crime in yourſelf, before you charge it as ſuch upon Ligarius." Sometimes the orator gives up ſome particular point that would well admit of a diſpute, to gain ſomething more conſiderable, which he thinks cannot fairly be denied him. In the affair of Roſcius, where the proof depended upon circumſtances, Cicero, who defended him, inquires what reaſon could be alleged for his committing ſo black a crime, as to kill his father. And after he has ſhown there was no probable reaſon to be aſſigned for it, he adds, "Well, ſince you can offer no reaſon, although this might be ſufficient for me, yet I will recede from my right; and upon the aſſurance I have of his innocence, I will grant you in this cauſe what I would not in another. I do not therefore inſiſt upon your telling me why he killed his father, but aſk how he did it?" This appearance of candour and ingenuity in ſuch conceſſions removes the ſuſpicion of art, and gives greater credit to what is denied. We have an example of a feigned or ironical conceſſion, in Cicero's defence of Flaccus; where, interceding for him on the account of his former good ſervices in the time of Catiline's conſpiracy, he ſays in a way of irony, If ſuch things are to be overlooked, "let us appeaſe the ghoſts of Lentullus and Cethegus; let us recal thoſe who are in exile; and let us be puniſhed for our too great affection and love for our country." By this artful inſinuation, the orator, after he has uſed all his arguments to perſuade his hearers, does as it were ſet them at liberty, and leave them to their own election; it being the nature of man to adhere more ſtedfaſtly to what is not violently impoſed, but referred to his own free and deliberative choice. And to theſe feigned conceſſions may be referred ſuch ways of reaſoning, by which the orator both juſtifies a charge brought againſt him upon the ſuppoſition of its being true and alſo proves that the charge itſelf is falſe. Thus Cicero, in his defence of Milo, repreſents the taking off Clodius, with which Milo was accuſed, as a glorious action; after he has ſhown that Milo's ſervants did it without the knowledge of their maſter.

Parabole, or *ſimilitude*, illuſtrates a thing by comparing it with ſome other, to which it bears a reſemblance. Similitudes are indeed generally but weak arguments, though often beautiful and fine ornaments. And where the deſign of them is not ſo much to prove what is doubtful, as to ſet things in a clear and agreeable light, they come properly under the notion of figures. They are of two ſorts; ſimple and compound. Thoſe are called *ſimple*, in which one thing only is likened or compared to another, in this manner: *As ſwallows appear in ſummer, but in winter retreat; ſo falſe friends ſhow themſelves in proſperity, but all fly away when adverſity approaches.* Compound ſimilitudes are ſuch, wherein one thing is likened or compared to ſeveral others, as thus: *What light is to the world, phyſic to the ſick, water to the thirſty, and reſt to the weary; that is knowledge to the mind.* The more exact the agreement is, between the things thus compared, they give the greater beauty and grace to the figure.

Antitheſis, or *oppoſition*, by which things contrary or different are compared, to render them more evident. Thus Cicero ſays, "The Roman people hate private luxury, but love public grandeur." This is a very florid figure; and ſuited no leſs for amplification than proof. As in the following inſtance of Cicero, where, ſpeaking of Pompey, he ſays, "He waged more wars than others had read; conquered more provinces than others had governed; and had been trained up from his youth to the art of war, not by the precepts of others, but by his own commands; not by miſcarriages in the field, but by victories; not by campaigns, but triumphs." It is eſteemed a beauty in this figure when any of the members are inverted, which ſome call *antimetatheſis*. As where Cicero oppoſing the conduct of Verres when governor of Sicily, to that of Marcellus, who took Syracuſe the capital city of that iſland, ſays, "Compare this peace with that war, the arrival of this governor with the victory of that general, his profligate troops with the invincible army of the other, the luxury of the former with the temperance of the latter; you will ſay, that Syracuſe was founded by him who took it, and taken by him who held it when founded." To this figure may alſo be referred *oxymoron*, or *ſeeming contradiction*; that is, when the parts of a ſentence diſagree in ſound, but are conſiſtent in ſenſe. As when Ovid ſays of Althea, that *ſhe was impiouſly pious*. And ſo Cato uſed to ſay of Scipio Africanus, that "he was never leſs at leiſure, than when he was at leiſure; nor leſs alone than when alone:" By which he meant, as Cicero tells us, that "Scipio was wont to think of buſineſs in his retirement, and in his ſolitude to converſe with himſelf." This is a ſtrong and bold figure, which awakens the mind, and affords it an agreeable pleaſure to find upon reflection, that what at firſt ſeemed contradictory, is not only conſiſtent with good ſenſe, but very beautiful.—The celebrated Dr. Blair, whom we have more than once quoted in this article, has theſe obſervations on antitheſis, or the contraſt of two objects. "Contraſt has always this effect, to make each of the contraſted objects appear in the ſtronger light. White, for inſtance, never appears ſo bright as when it is oppoſed to black, and when both are viewed together. Antitheſis, therefore, may, on many occaſions, be employed to advantage, in order to ſtrengthen the impreſſion which we intend that any object ſhould make. In order to render an antitheſis more complete, it is always of advantage, that the words and members of the ſentence, expreſſing the contraſted objects, be ſimilarly conſtructed, and made to correſpond to each other. This leads us to remark the contraſt more, by ſetting the things which we oppoſe more clearly over againſt each other; in the ſame manner as when we contraſt a black and a white object, in order to perceive the full difference of their colour, we would chooſe to have both objects of the ſame bulk, and placed in the ſame light. Their reſemblance to each other, in certain circumſtances, makes their diſagreement in others more palpable. At the ſame time, I muſt obſerve, that the frequent uſe of antitheſis, eſpecially where the oppoſition in the words is nice and quaint, is apt to render the ſtyle diſagreeable. A maxim, or moral ſaying, properly enough receives this form; both becauſe it is ſuppoſed to be the fruit of meditation, and becauſe it is deſigned to be engraven on the memory, which recals it more eaſily by the help of ſuch contraſted expreſſions. But where a ſtring of ſuch ſentences ſucceed each other, where this becomes an author's favourite and prevailing manner of expreſſing himſelf, his ſtyle is faulty, and it is upon this account Seneca has been often and juſtly cenſured. Such a ſtyle appears too ſtudied and laboured; it gives us the impreſſion of an author attending more to his manner of ſaying things, than to the things themſelves which he ſays." There is ſtill another kind of antitheſis, which conſiſts in ſurpriſing us by the unexpected contraſts of things which it brings together; but it is ſuch as is wholly beneath the dignity of an orator, or of grave compoſitions of any ſort, and is fit only for pieces of profeſſed wit and humour, calculated only to excite laughter, or create ridicule.

II. *Thoſe ſuited to move the paſſions.* Which are 13; namely, *epanorthoſis, paralepſis, parrheſia, aparithmeſis, exergaſia, hypotypoſis, aporia, poſiopeſis, eroteſis, ecphoneſis, epiphonema, apoſtrophe*, and *proſopopœia*.

Epanorthoſis, or *correction*, is a figure, by which the ſpeaker either recals or amends what he had laſt ſaid. It is uſed different ways. For ſometimes one or more words are recalled by him, and others ſubjoined in their room; at other times, with-

out recalling what has been ſaid, ſomething elſe is ſubſtituted as more ſuitable. This is a very extenſive figure, and made uſe of in addreſſing to different paſſions. We have an inſtance of it in Terence's *Self-tormentor*, where the old man, whoſe extraordinary concern for the abſence of his ſon gave occaſion to the name of the play, thus bewails his condition to his neighbour, "I have an only ſon, Chremes. Alas! did I ſay that I have; I had indeed; but it is now uncertain whether I have or not." Here, to aggravate his misfortunes, he recals a pleaſing word, and ſubſtitutes another more affecting in its place. And Cicero, in his defence of Milo, ſpeaking to the judges concerning Clodius, ſays, "Are you only ignorant what laws, if they may be called laws, and not rather torches and plagues of the ſtate, he was about to impoſe and force upon us?" Again, in his defence of Plancius, he ſays, "What greater blow could thoſe judges, if they are to be called judges, and not parricides of their country, have given to the ſtate, than when they baniſhed him, who when prætor freed the republic from a neighbouring war, and when conſul from a civil one?" He is ſpeaking there of Opimius. But in commending the moderation of Lucius Mummius, who did not enrich himſelf, but his country, by demoliſhing the wealthy city of Corinth, he thus recals his whole expreſſion, and by giving it a new turn heightens the compliment he deſigned him: "He choſe rather (ſays he) to adorn Italy than his own houſe; though by adorning Italy his houſe ſeems to have received the greateſt ornament." And ſometimes the correction is made by ſubſtituting ſomething contrary to what had been ſaid before; as in the following paſſage of Cicero: "Cæſar (meaning Auguſtus), though but a youth, by an incredible and ſurpriſing reſolution and courage, when Antony was moſt enraged, and we dreaded his cruel and pernicious return from Brunduſium, at a time when we neither aſked, nor expected, nor deſired it (becauſe it was thought impoſſible), raiſed a very powerful army of invincible veterans; to effect which he threw away his whole eſtate: Though I have uſed an improper word; for he did not throw it away, but employed it for the ſafety of the government." At other times, as has been ſaid, the correction is made by adding a more ſuitable word, without any repetition of the former. Thus Cicero, after he has inveighed againſt the crimes of Verres, breaks out into this pathetic exclamation: *O the clemency, or rather wonderful and ſingular patience, of the Roman people!* He did not think the word *clemency* ſtrong enough, and therefore adds *patience*, as better anſwering his deſign. The ſudden and unexpected turn of this figure gives a ſurpriſe to the mind, and by that means renders it the more pathetic.

Paralepſis, or omiſſion, is another of theſe figures, when the ſpeaker pretends to omit, or paſs by, what at the ſame time he declares. It is uſed either in praiſe or diſpraiſe. Thus Cicero, in his defence of Sextus, introduces his character in this manner, with a deſign to recommend him to the favour of the court: "I might ſay many things of his liberality, kindneſs to his domeſtics, his command in the army, and moderation during his office in the province: but the honour of the ſtate preſents itſelf to my view; and calling me to it, adviſes me to omit theſe leſſer matters." But in his oration to the ſenate againſt Rullus the tribune, who had propoſed a law to ſell the public lands, he makes uſe of this figure to repreſent the pernicious effects of ſuch a law, particularly with reſpect to the lands in Italy. "I do not complain (ſays he) of the diminution of our revenues, and the woful effects of this loſs and damage. I omit what may give every one occaſion for a very grievous and juſt complaint, that we could not preſerve the principal eſtate of the public, the fineſt poſſeſſion of the Roman people, the fund of our proviſions, the granary of our wants, a revenue entruſted with the ſtate; but that we muſt give up thoſe lands to Rullus, which, after the power of Sylla, and the largeſſes of the Gracchi, are yet left us. I do not ſay, this is now the only revenue of the ſtate, which continues when others ceaſe, is an ornament in peace, fails us not in war, ſupports the army, and does not fear an enemy. I paſs over all theſe things, and reſerve them for my diſcourſe to the people, and only ſpeak at preſent of the danger of our peace and liberties." His view here was to raiſe the indignation of the ſenate againſt Rullus, and excite them to oppoſe the law. There is a beautiful inſtance of this figure in St. Paul's epiſtle to Philemon, where, after he has earneſtly intreated him to receive again Oneſimus his ſervant, who had run from him, and promiſed that if he had wronged him, or owed him any thing, he would repay it, he adds, *That I may not ſay, you owe even yourſelf to me.* Nothing could be a ſtronger motive to ſoften his diſpleaſure againſt his ſervant, from a ſenſe of gratitude to the apoſtle. Hermogenes has obſerved, that the deſign of this figure is to poſſeſs the minds of the audience with more than the words expreſs, and that it is principally made uſe of on three occaſions: either when things are ſmall, but yet neceſſary to be mentioned; or well known, and need not be enlarged on; or ungrateful, and therefore ſhould be introduced with caution, and not ſet in too ſtrong a light.

The next figure above-mentioned was *Parrheſia*, or reprehenſion: Not that whenever a perſon admoniſhes or reproves another it is to be eſteemed a figure; but when it is done with art and addreſs, and in ſuch circumſtances as render it difficult not to diſpleaſe.—The orator therefore ſometimes prepares his hearers for this by commending them firſt, urging the neceſſity of it, repreſenting his great concern for them as his motive, or joining himſelf with them. Thus Cicero charges the ſenate with the death of Servius Sulpicius, for ſending him to Mark Antony under a very ill ſtate of health. And his deſign in it was to bring them more readily into a motion he was about to make, that both a ſtatue and a ſepulchral monument might be erected to his memory at the public expence. "You (ſays he), it is a very ſevere expreſſion, but I cannot help ſaying it; you, I ſay, have deprived Servius Sulpicius of his life. It was not from cruelty indeed, (for what is there with which this aſſembly is leſs chargeable?) but when his diſtemper pleaded his excuſe more than his words, from the hopes you conceived that there was nothing which his authority and wiſdom might not be able to effect, you vehemently oppoſed his excuſe, and obliged him, who always had the greateſt regard for your commands, to recede from his reſolution." Sometimes, indeed, the orator aſſumes an air of reproof, with a view only to paſs a compliment with a better grace. As Cicero in his addreſs to Cæſar, when he ſays, "I hear that excellent and wiſe ſaying from you with concern, That you have lived long enough, either for the purpoſes of nature, or glory: for nature perhaps, if you think ſo; and, if you pleaſe, for glory; but what is principally to be regarded, not for your country." It adds both a beauty and force to this figure, when it is expreſſed in a way of compariſon. As in the following inſtance of Cicero: "But ſince my diſcourſe leads me to this, conſider how you ought to be affected for the dignity and glory of your empire. Your anceſtors often engaged in war to redreſs the injuries of their merchants or ſailors: how ought you then to reſent it, that ſo many thouſand Roman citizens were murdered by one meſſage, and at one time? Your forefathers deſtroyed Corinth, the principal city in Greece, for the haughty treatment of their ambaſſadors; and will you ſuffer that king to go unpuniſhed, who has put to death a Roman legate, of conſular dignity, in the moſt ignominious as well as moſt cruel manner? See, leſt, as it was their honour to leave you the glory of ſo great an empire, it ſhould prove your diſgrace not to be able to maintain and defend what you have received from them." By this figure an addreſs is made to the more tender paſſions, modeſty, ſhame, and emulation, the attendants of an ingenuous temper, which is ſooneſt touched, and moſt affected, by a juſt reproof.

Another of these pathetic figures is *Aparithmesis*, or *enumeration*, when that which might be expressed in general by a few words, is branched out into several particulars, to enlarge the idea, and render it the more affecting. Cicero, in pleading for the Manilian law, where his design is to conciliate the love and esteem of the people to Pompey, thus enlarges upon his character: "Now, what language can equal the virtue of Cneius Pompey? What can be said either worthy of him, or new to you, or which every one has not heard? For those are not the only virtues of a general which are commonly thought so; labour in affairs, courage in dangers, industry in acting, dispatch in performing, design in contriving; which are greater in him than in all other generals we have ever seen or heard of." And so likewise, when he endeavours to dispossess Pompey of the apprehension that Milo designed to assassinate him: "If (says he) you fear Milo; if you imagine that either formerly, or at present, any ill design has been formed by him against your life; if the soldiers raised through Italy (as some of your officers give out), if these arms, if these cohorts in the Capitol, if the centries, if the watch, if the guards which defend your person and house, are armed to prevent any attempt of Milo, and all of them appointed, prepared, and stationed on his account; he must be thought a person of great power, and incredible resolution, above the reach and capacity of a single man, that the most consummate general, and the whole republic are in arms against him only." But who does not perceive, that all the disordered and sinking parts of the state are committed to you, to rectify and support them by these forces?" This might have been said in a few words, that such vast preparations could never be intended for so low a purpose. But the orator's view was to expose that groundless report, and shame it out of countenance. And soon after he endeavours to raise compassion for Milo under those prejudices by the same figure: "See how various and changeable is the state of human life, how unsteady and voluble is fortune, what infidelity in friends, what disguises suited to the times, what slights, what fears, even of the nearest acquaintance, at the approach of dangers." Had no address to the passions been designed here, fewer of these reflections might have been sufficient. The use of this figure in amplification is very evident from the nature of it, which consists in unfolding of things, and by that means enlarging the conception of them.

Exergasia, or *exposition*, has an affinity with the former figure: but it differs from it in this, that it consists of several equivalent expressions, or nearly such, in order to represent the same thing in a stronger manner; whereas the other enlarges the idea by an enumeration of different particulars. So that this figure has a near relation to synonymia, of which we have treated before under *Verbal figures*. We have an instance of it in Cicero's defence of Sextus, where he says, "Those who at any time have incited the populace to sedition, or blinded the minds of the ignorant by corruption, or traduced brave and excellent men, and such as deserved well of the public, have with us always been esteemed vain, bold, bad, and pernicious citizens. But those who repressed the attempts and endeavours of such as, by their authority, integrity, constancy, resolution and prudence, withstood their insolence, have been always accounted men of solidity, the chiefs, the leaders, and supporters of our dignity and government." Nothing more is intended by this passage, but to set the opposite characters of factious persons and true patriots in the strongest light, with a view to recommend the one, and create a just hatred and detestation of the other. So elsewhere he represents the justice of self-defence in no less different terms: "If reason (says he) prescribes this to the learned, and necessity to barbarians, custom to nations, and nature itself to brutes, always to ward off all manner of violence, by all possible ways, from their body, from their head, from their life; you can-

not judge this to be a criminal and wicked action, without judging at the same time, that all persons who fall among robbers and assassins must either perish by their weapons or your sentence." He is addressing here to the judges in favour of Milo. The warmth and vehemence of the speaker often runs him into this figure, when he is affected with his subject, and thinks no words, no expressions, forcible enough to convey his sentiments; and therefore repeats one after another, as his fancy suggests them. This flow of expression, under the conduct of a good judgment, is often attended with advantage: as it warms the hearers, and impresses their minds, excites their passions, and helps them to see things in a stronger light.

Hypotyposis, or *imagery*, is a description of things painted in such strong and bright colours, as may help the imagination of the hearers to conceive of them rather as present to their view, than described in words. It is peculiarly suited for drawing characters; and often affords the finest ornaments in poetry and history, as well as oratory. Nor is it less moving, but suited to strike different passions, according to the nature of the subject, and artful management of the speaker. Cicero has thus drawn the picture of Catiline, consisting of an unaccountable mixture of contrary qualities. "He had (says he) the appearance of the greatest virtues: he made use of many ill men to carry on his designs, and pretended to be in the interest of the best men; he had a very engaging behaviour, and did not want industry nor application; he gave into the greatest looseness, but was a good soldier. Nor do I believe there was ever the like monster in the world, made of such jarring and repugnant qualities and inclinations. Who at one time was more acceptable to the best men, and who more intimate with the worst? Who was once a better patriot, and who a greater enemy to this state? Who more devoted to pleasures, who more patient in labours? Who more rapacious, and yet more profuse? He suited himself to the humours of all he conversed with; was serious with the reserved, and pleasant with the jocose; grave with the aged, and facetious with the young; bold with the daring, and extravagant with the profligate." Such a character of a man, when accompanied with power and interest, must render him no less the object of fear than detestation, which was the design of Cicero in this description. And elsewhere, in order to prevail with the senate to direct the execution of those conspirators with Catiline who were then in prison, he paints the most dismal scene of that horrid design in the strongest colours. "Methinks, (says he) I see this city, the light of the world, and citadel of all nations, suddenly falling into one fire; I perceive heaps of miserable citizens buried in their ruined country; the countenance and fury of Cethegus raging in your slaughter, presents itself to my view." This figure is very serviceable in amplification, as we have formerly shown in treating upon that subject. But no small judgment is required in the management of descriptions. Lesser circumstances should either be wholly omitted, or but slightly touched; and those which are more material drawn in their due proportion. Nature is as much the rule of the orator as of the painter, and what they both propose to imitate. And therefore, let a thought be ever so pleasing and beautiful in itself, it must not be introduced when foreign to the purpose, or out of its place, any more than a painter should attempt to alter nature, when he proposes to copy it. This figure requires likewise a vigorous and lively genius. For the images in description can rise no higher than the conception of the speaker, since the idea must first be formed in his own mind, before he can convey it to others, and agreeably to the clearness with which he conceives it himself, he will be able to express it in words.

Aporia, or *doubt*, expresses the debate of the mind with itself upon a pressing difficulty. A person in such a state is apt to hesitate, or start several things successively, without coming to

any fixed reſolution. The uneaſineſs ariſing from ſuch a diſorder of thought is naturally very moving. Of this kind is that of Cicero for Cluentius, when he ſays, "I know not which way to turn myſelf. Shall I deny the ſcandal thrown upon him of bribing the judges? Can I ſay the people were not told of it? that it was not talked of in the court? mentioned in the ſenate? Can I remove an opinion ſo deeply and long rooted in the minds of men? It is not in my power. You, judges, muſt ſupport his innocence, and reſcue him from this calamity." Orators ſometimes chooſe to begin their diſcourſe with this figure. A diffidence of mind at firſt is not unbecoming, but graceful. It carries in it an air of modeſty, and tends very much to conciliate the affections of the hearers. Livy gives us a very elegant example of this in a ſpeech of Scipio Africanus to his ſoldiers, when, calling them together after a ſedition, he thus beſpeaks them: "I never thought I ſhould have been at a loſs in what manner to addreſs my army. Not that I have applied myſelf more to words than things; but becauſe I have been accuſtomed to the genius of ſoldiers, having been trained up in the camp almoſt from my childhood. But I am in doubt what or how to ſpeak to you, not knowing what name to give you. Shall I call you *citizens*, who have revolted from your country? *Soldiers*, who have diſowned the authority of your general, and broke your military oath? *Enemies?* I perceive the mien, the aſpect, and habit of citizens; but diſcern the actions, words, deſigns, and diſpoſitions of enemies."

Sometimes a paſſion has that effect, not ſo much to render a perſon doubtful what to ſay, as to ſtop him in the midſt of a ſentence, and prevent his expreſſing the whole of what he deſigned; and then it is called *Apoſiopeſis*, or *concealment*. It denotes different paſſions; as anger, which, by reaſon of its heat and vehemence, cauſes perſons to break off abruptly in their diſcourſe. So the old man in Terence, when he was jealous that his ſervant obſtructed his deſigns, uſes this imperfect, but threatening expreſſion, *Whom, if I find.* And Neptune, when deſcribed by Virgil as very angry that the winds ſhould preſume to diſturb the ſea without his permiſſion, after he has called them to him to know the reaſon of it, threatens them in this abrupt manner: "*Whom I—but firſt I'll lay the ſtorm.*" But Cicero, in writing to Atticus, applies it to expreſs grief, where he ſays, "I know nothing of Pompey, and believe he muſt be taken, if he is not got on ſhipboard. O incredible ſwiftneſs! But of our friend—Though I cannot accuſe him without grief, for whom I am in ſo much concern and trouble." And in a letter to Caſſius he uſes it to expreſs fear, when he ſays to him, "Brutus could ſcarce ſupport himſelf at Mutina; if he is ſafe, we have carried the day. But if—heaven avert the omen! all muſt have recourſe to you." His meaning is, "If Brutus ſhould be defeated."

The next figure is *eroteſis* or *interrogation*. But every interrogation or queſtion is not figurative. When we enquire about a thing that is doubtful, in order to be informed, this is no figure, but the natural form of ſuch expreſſions. As if I aſk a perſon, *Where he is going?* or *What he is doing?* But then it becomes figurative when the ſame thing may be expreſſed in a direct manner; but the putting it by way of queſtion gives it a much greater life and ſpirit. As when Cicero ſays, "Catiline, how long will you abuſe our patience? do not you perceive your deſigns are diſcovered?" He might indeed have ſaid, *You abuſe our patience a long while. You muſt be ſenſible your deſigns are diſcovered.* But it is eaſy to perceive how much this latter way of expreſſion falls ſhort of the force and vehemence of the former. And ſo when Medea ſays, *I could ſave; and do you aſk if I can deſtroy?* Had ſhe ſaid, *I could ſave, and I can deſtroy*, the ſentence had been flat, and very unfit to expreſs the rage and fury in which the poet there repreſents her. This figure is ſuited to expreſs moſt paſſions and emotions of the mind, as anger, diſdain, fear, deſire, and others. It ſerves alſo to preſs and bear down an adverſary. Cicero frequently makes this uſe of it. As in his defence of Plancius: "I will make you this offer (ſays he), chooſe any tribe you pleaſe, and ſhow, as you ought, by whom it was bribed; and if you cannot, as I believe you will not undertake it, I will prove how he gained it. Is this a fair conteſt? Will you engage on this foot? I cannot give you fairer play. Why are you ſilent? Why do you diſſemble? Why do you heſitate? I inſiſt upon it, urge you to it, preſs it, require, and even demand it of you." Such a way of puſhing an antagoniſt ſhows the ſpeaker has great confidence in his cauſe; otherwiſe he would never lay himſelf ſo open, if he was not aſſured the other party had nothing to reply. This figure likewiſe diverſifies a diſcourſe, and gives it a beautiful variety, by altering the form of expreſſion, provided it be neither too frequent, nor continued too long at once. And beſides, the warmth and eager manner in which it is expreſſed, enlivens the hearers, and quickens their attention.

Ecphoneſis, or *exclamation*, is a vehement extenſion of the voice, occaſioned by a commotion of mind, naturally venting itſelf by this figure, which is uſed by Cicero to expreſs a variety of paſſions. It often denotes reſentment or indignation. Thus, after his return from baniſhment, reflecting on thoſe who had occaſioned it, he breaks out into this moving exclamation: "O mournful day to the ſenate, and all good men, calamitous to the ſtate, afflictive to me and my family, but glorious in the view of poſterity!" His deſign was to excite an odium againſt the authors of his exile, when recalled in ſo honourable a manner. And again, in his defence of Cælius: "O the great force of truth; which eaſily ſupports itſelf againſt the wit, craft, ſubtilty, and artful deſigns of men!" He had been juſt ſhowing the abſurdity of the charge againſt Cælius, and now endeavours to expoſe his accuſers to the indignation of the court. At other times it is uſed to expreſs diſdain or contempt. As when ſpeaking of Pompey's houſe, which was bought by Mark Antony, he ſays: "O conſummate impudence! dare you go within that houſe! dare you enter that venerable threſhold, and ſhow your audacious countenance to the tutelar deities which reſide there?" Nor is it leſs ſuited to indicate grief, as when he ſays of Milo: "O that happy country, which ſhall receive this man! ungrateful this, if it baniſh him! miſerable, if it loſe him!" And ſometimes it ſerves to expreſs admiration; as when, in compliment to Cæſar, he ſays, "O admirable clemency! worthy of the greateſt praiſe, the higheſt encomiums, and moſt laſting monuments!" It has its uſe alſo in ridicule and irony. As in his oration for Balbus, where he derides his accuſer, by ſaying "O excellent interpreter of the law! maſter of antiquity! corrector and amender of our conſtitution!" The ſacred writers ſometimes uſe it by way of intreaty or wiſh. As the royal Pſalmiſt: "O that I had the wings of a dove, that I might flee away, and be at reſt!" And at other times in triumph and exultation, as in that of St. Paul: O death, where is thy ſting! O grave, where is thy victory!" It is frequently joined with the preceding figure *interrogation*; as appears in ſome of the inſtances here brought from Cicero. And it generally follows the repreſentation of the thing which occaſions it. Though ſometimes it is made uſe of to introduce it, and then it ſerves to prepare the mind by exciting its attention. Thus Cicero in his defence of Cælius, to render the character of Clodia more odious, at whoſe inſtigation he was accuſed, inſinuates that ſhe had before poiſoned her huſband; and to heighten the barbarity of the fact, and make it appear the more ſhocking, he introduces the account of it, with this moving exclamation: "O heavens, why do you ſometimes wink at the greateſt crimes of mankind, or delay the puniſhment of them to futurity!"

Epiphonema, or *acclamation*, has a great affinity with the former figure. And it is ſo called, when the ſpeaker, at the concluſion of his argument, makes ſome lively and juſt remark

upon what he has been ſaying, to give it the greater force, and render it the more affecting to his hearers. It is not ſo vehement and impetuous as exclamation, being uſually expreſſive of the milder and more gentle paſſions. And the reflection ought not only to contain ſome plain and obvious truth, but likewiſe to ariſe naturally from the diſcourſe which occaſioned it, otherwiſe it loſes its end. When Cicero has ſhown, that recourſe is never to be had to force and violence, but in caſes of the utmoſt neceſſity, he concludes with the following remark: "Thus to think, is prudence; to act, fortitude; both to think and act, perfect and conſummate virtue." And elſewhere, after he has deſcribed a ſingular inſtance of cruelty and breach of friendſhip: "Hence (ſays he) we may learn, that no duties are ſo ſacred and ſolemn, which covetouſneſs will not violate." This figure is frequently expreſſed in a way of admiration. As when Cicero has obſerved, that all men are deſirous to live to an advanced age, but uneaſy under it when attained, he makes this juſt reflection upon ſuch a conduct: "So great is their inconſtancy, folly, and perverſeneſs!"

The next figure in order is *apoſtrophe*, or *addreſs*, when the ſpeaker breaks off from the ſeries of his diſcourſe, and addreſſes himſelf to ſome particular perſon preſent or abſent, living or dead; or to inanimate nature, as endowed with ſenſe and reaſon. By this means he has an opportunity of ſaying many things with greater freedom than perhaps would be conſiſtent with decency if immediately directed to the perſons themſelves. He can admoniſh, chide, or cenſure, without giving offence. Nor is there any paſſion, but may be very advantageouſly expreſſed by this figure. When an orator has been ſpeaking of any particular perſon, on a ſudden to turn upon him, and apply the diſcourſe to that perſon himſelf, is very moving; it is like attacking an adverſary by ſurpriſe, when he is off his guard, and where he leaſt expects it. Thus Cicero: "I deſire, ſenators, to be merciful, but not to appear negligent in ſo great dangers of the ſtate; though at preſent I cannot but condemn myſelf of remiſſneſs. There is a camp formed in Italy, at the entrance of Etruria, againſt the ſtate; our enemies increaſe daily; but we ſee the commander of the camp, and general of the enemies, within our walls, in the very ſenate, contriving ſome inteſtine ruin to the ſtate. If now, Catiline, I ſhould order you to be ſeized and put to death, I have reaſon to fear, that all good men would rather think I had deferred it too long, than charge me with cruelty. But I am prevailed with for a certain reaſon not to do that yet, which ought to have been done long ſince;" This ſudden turn of the diſcourſe to Catiline himſelf, and the addreſs to him in that unexpected manner muſt have touched him very ſenſibly. So, in his defence of Milo, expreſſing his concern if he ſhould not ſucceed in it, he ſays, "And how ſhall I anſwer it to you, my brother Quintus, the partner of my miſfortunes, who art now abſent." And elſewhere addreſſing to the ſoldiers of the Martian legion, who had been killed in an engagement with Mark Antony, he thus beſpeaks them:" O happy death, which due to nature, was paid to your country! I may eſteem you truly born for your country! who likewiſe received your name from Mars; ſo that the ſame deity ſeems to have produced this city for the world, and you for this city." And in his oration for Balbus he thus calls upon dumb nature to witneſs to Pompey's virtues: "I invoke you, mute regions; you, moſt diſtant countries; you ſeas, havens, iſlands, and ſhores. For what coaſt, what land, what place is there, in which the marks of his courage, humanity, wiſdom, and prudence, are not extant?" An appeal to heaven, or any part of inanimate nature, has ſomething very ſublime and ſolemn in it, which we often meet with in ſacred writ. So the divine prophet: "Hear, O heavens, and give ear, O earth! for the Lord hath ſpoken." And in like manner, the prophet Jeremy: "Be aſtoniſhed, O ye heavens, at this." See APOSTROPHE.

Proſopopeia, or *the fiction of a perſon*: by which, either an abſent perſon is introduced ſpeaking; or one who is dead, as if he was alive and preſent; or ſpeech is attributed to ſome inanimate being. There is no figure, perhaps, which ſerves more or better purpoſes to an orator than this. For by this means he is enabled to call in all nature to his aſſiſtance, and can aſſign to every thing ſuch parts as he thinks convenient. There is ſcarce any thing fit to be ſaid, but may be introduced this way. When he thinks his own character is not of ſufficient weight to affect his audience in the manner he deſires, he ſubſtitutes a perſon of greater authority than himſelf to engage their attention. When he has ſevere things to ſay, and which may give offence as coming from himſelf; he avoids this, by putting them into the mouth of ſome other perſon from whom they will be better taken; or makes inanimate nature bring a charge, or expreſs a reſentment to render it the more affecting. And by the ſame method he ſometimes chooſes to ſecure himſelf from a ſuſpicion of flattery, in carrying a compliment too high. We meet with ſeveral very beautiful inſtances of this figure in Cicero; but an example of each ſort may here ſuffice, beginning with that of an abſent perſon, from his defence of Milo, whom he thus introduces as ſpeaking to the citizens of Rome: "Should he, holding the bloody ſword, cry out, Attend, I pray, hearken, O citizens, I have killed Publius Clodius by this ſword, and by this right hand, I have kept off his rage from your necks, which no laws, no courts of judicature, could reſtrain; it is by my means, that juſtice, equity, laws, liberty, ſhame, and modeſty, remain in the city. Is it to be feared how the city would bear this action? Is there any one now, who would not approve and commend it." And in his oration for Balbus, he introduces Marius, who was then dead, to plead in his defence: "Can Balbus (ſays he) be condemned, without condemning Marius for a like fact? Let him be preſent a little to your thoughts, ſince he cannot be ſo in perſon; that you may view him in your minds, though you cannot with your eyes. Let him tell you, he was not unacquainted with leagues, void of examples, or ignorant of war." And again, in his firſt invective againſt Catiline, he repreſents his country, as thus expoſtulating with himſelf, and upbraiding him for ſuffering ſuch a criminal as Catiline to live. "Should my country (ſays he), which is much dearer to me than my life, ſhould all Italy, all the ſtate, thus addreſs me, Mark Tully what do you do? Do you ſuffer him, whom you have found to be an enemy, who you ſee is to be at the head of the war, whom you perceive your enemies wait for in their camp as their general, who has been the contriver of this wickedneſs, the chief of the conſpiracy, the exciter of ſlaves and profligate citizens, to leave the city, which is rather to bring him in, than let him out? Will you not order him to be impriſoned, condemned, and executed? What prevents you? The cuſtom of our anceſtors? But private perſons have often puniſhed pernicious citizens in this ſtate. The laws relating to the puniſhment of Roman citizens? But traitors never had the rights of citizens. Do you fear the cenſure of poſterity? Truly you make a very handſome return to the people of Rome, who have advanced you from an obſcure condition ſo early to the higheſt dignity; if you neglect their ſafety to avoid envy, or from the apprehenſion of any danger. And if you fear cenſure; which is moſt to be dreaded, that which may ariſe from juſtice and fortitude, or from cowardice and treachery? When Italy ſhall be waſted by a war, cities plundered, and houſes burnt, do you think then to eſcape the ſevereſt cenſure?" In the management of this figure, care ſhould be taken that what is ſaid be always conſiſtent with the character introduced, in which both the force and beauty of it conſiſt.

In treating upon figures, we have hitherto conſidered them ſeparately; but it may not be amiſs to obſerve, that ſome expreſſions conſiſt of a complication of them, and may come under the

denomination of ſeveral figures, a well verbal as thoſe of ſentences, differently conſidered. Thus when Cicero ſays, "What, Tubero, did your drawn ſword do in the Pharſalian battle? at whoſe ſide was its point directed? What was the intention of your arms? As he ſpeaks to Tubero, it is an apoſtrophe; as the expreſſions have much the ſame import, and are deſigned to heighten and aggravate the fact, it is *exergaſia*; and as they are put by queſtion, it is *interrogation*. So likewiſe, in his ſecond Phillipic, where he ſays, "What can I think? that I am contemned? I ſee nothing in my life, intereſt, actions, or abilities, as moderate as they are, which Antony can deſpiſe. Did he think he could eaſily leſſen me in the ſenate? But they, who have commended many famous citizens for their good government of the ſtate, never thanked any but me for preſerving it. Would he contend with me for eloquence. This would be a favour indeed. For what could be a larger and more copious ſubject, than for me to ſpeak for myſelf againſt Antony? His deſign was really this: he thought he could not convince his aſſociates, that he was truly an enemy to his country, unleſs he was ſo firſt to me." There are three figures in this paſſage; *doubt*, *interrogation* and *ſubjecti n*. And again, when he introduces Sicily thus addreſſing Verres in a way of complaint; "Whatever gold, whatever ſilver, whatever ornaments in my cities, dwellings, temples, whatever right of any kind I poſſeſſed by the favour of the ſenate and people of Rome; you, Verres, have plundered and taken from me." Here is a *proſopopcia*, joined with the verbal figure *anaphora*, as ſeveral members of the ſentence begin with the ſame word. The like inſtances of complex figures frequently occur, and therefore we need not multiply examples of them here.

Chap IV. *Of Style and its different Characters.*

The word *ſtyle*, properly ſignifies the inſtrument which the ancients uſed in writing. For as they commonly wrote upon thin boards covered over with wax, and ſometimes upon the barks of trees, they made uſe of a long inſtrument like a bodkin, pointed at one end, with which they cut their letters; and broad at the other, to eraze any thing they choſe to alter. And this the Latins called *ſtylus*. But though this be the firſt ſenſe of the word, yet afterwards it came to denote the manner of expreſſion. In which ſenſe we likewiſe uſe it, by the ſame kind of trope that we call any one's writing his *hand*. Style, then, in the common acceptation of the word at preſent, is the peculiar manner in which a man expreſſes his conceptions by means of language. It is a picture of the ideas which riſe in his mind, and of the order in which they are there produced. As to the reaſons which occaſion a variety of ſtyle they are principally theſe.

Since both ſpeech and writing are only ſenſible expreſſions of our thoughts, by which we communicate them to others; as all men think more or leſs differently, ſo conſequently they in ſome meaſure differ in their ſtyle. No two perſons, who were to write upon one ſubject, would make uſe of all the ſame words. And were this poſſible, yet they would as certainly differ in their order and connection, as two painters, who uſed the ſame colours in painting the ſame picture, would neceſſarily vary their mixtures and diſpoſition of them, in the ſeveral gradations of lights and ſhades. As every painter therefore has ſomething peculiar in his manner, ſo has every writer in his ſtyle. It is from theſe internal characters, in a good meaſure, that critics undertake to diſcover the true authors of anonymous writings; and to ſhow that others are ſpurious, and not the genuine productions of thoſe whoſe names they bear; as they judge of the age of ſuch writings from the words and manner of expreſſion which have been in uſe at different times. And we may often obſerve in perſons a fondneſs for ſome particular words or phraſes; and a peculiarity in the turn or connection of their ſentences, or in their tranſitions from one thing to another; by which their ſtyle may be known, even when they deſign to conceal it. For theſe things, through cuſtom and habit, will ſometimes drop from them, notwithſtanding the greateſt caution to prevent it.

There is likewiſe very often a conſiderable difference in the ſtyle of the ſame perſon, in ſeveral parts of his life. Young perſons, whoſe invention is quick and lively, commonly run into a pompous and luxuriant ſtyle. Their fancy repreſents the images of things to their mind in a gay and ſprightly manner, clothed with a variety of circumſtances; and while they endeavour to ſet off each of theſe in the brighteſt and moſt glittering colours, this renders their ſtyle verboſe and florid, but weakens the force and ſtrength of it. And therefore, as their imagination gradually cools, and comes under the conduct of a more mature judgment, they find it proper to cut off many ſuperfluities; ſo that by omitting unneceſſary words and circumſtances, and by a cloſer connection of things placed in a ſtronger light, if their ſtyle becomes leſs ſwelling and pompous, it is, however, more correct and nervous. But as old age ſinks the powers of the mind, chills the imagination, and weakens the judgment; the ſtyle too, in proportion uſually grows dry and languid. Critics have obſerved ſomething of this difference in the writings even of Cicero himſelf. To be maſter of a good ſtyle, therefore, it ſeems neceſſary that a perſon ſhould be endowed with a vigorous mind and lively fancy, a ſtrong memory, and a good judgment. It is by the imagination that the mind conceives the images of things. If the impreſſions of thoſe images be clear and diſtinct, the ſtyle will be ſo too: ſince language is nothing but a copy of thoſe images firſt conceived by the mind. But if the images are faint and imperfect, the ſtyle will accordingly be flat and languid. This is evident from the difference between ſuch objects as are repreſented to our ſight, and things of which we have only read or heard. For as the former generally make a deeper impreſſion upon our minds, ſo we can deſcribe them in a more ſtrong and lively manner. And we commonly find, that, according as perſons are affected themſelves when they ſpeak, they are able to affect others with what they ſay. Now perſons are more or leſs affected with things in proportion to the impreſſions which the images of thoſe things make upon the mind. For the ſame reaſon alſo, if the imagination be dull, and indiſpoſed to receive the ideas of things, the ſtyle will be ſtiff and heavy; or if the images are irregular and diſordered, the ſtyle will likewiſe be perplexed and confuſed. When things lie ſtraight (as we ſay) in the mind, we expreſs them with eaſe, and in their juſt connection and dependence; but when they are warpt and crooked, we deliver them with pain and difficulty, as well as diſorder. A good fancy ſhould likewiſe be accompanied with a happy memory. This helps us to retain the names of thoſe things the ideas whereof are preſented to the mind by the imagination, together with proper and ſuitable phraſes to expreſs them in their ſeveral connections and relations to each other. When the images of things offer themſelves to the mind, unleſs the names of them preſent themſelves at the ſame time, we are at a loſs to expreſs them, or at leaſt are in danger of doing it by wrong and improper terms. Beſides, variety is neceſſary in diſcourſe to render it agreeable; and therefore, without a large furniture of words and phraſes, the ſtyle will neceſſarily become inſipid and jejune, by the frequent return of the ſame terms and manner of expreſſion. But to both theſe a ſolid judgment is highly requiſite to form a juſt and accurate ſtyle. A fruitful imagination will furniſh the mind with plenty of ideas, and a good memory will help to clothe them in proper language; but unleſs they are both under the conduct of reaſon, they are apt to hurry perſons into many inconveniences. Such are generally great talkers, but far from good orators. Freſh images continually crowd in upon them, faſter than the tongue

can well expreſs them. This runs them into long and tedious diſcourſes, abounding with words, but void of ſenſe. Many impertinencies, if not improprieties, neceſſarily mix themſelves with what they ſay; and they are frequently carried off from their point, by not having their fancies under a proper regulation. So that ſuch diſcourſes, though compoſed perhaps of pretty expreſſions, rhetorical flowers, and ſprightly ſallies of wit, yet fall very much ſhort of a ſtrong and manly eloquence. But where reaſon preſides and holds the reins, every thing is weighed before it is ſpoken. The propereſt words are made choice of, which beſt ſuit the ideas they are deſigned to convey; rather than the moſt gay and pompous. All things are not ſaid which offer themſelves to the mind, and fancy dictates; but ſuch only as are fit and proper, and the reſt are dropped. Some things are but ſlightly mentioned, and others diſcourſed on more largely and fully, according to their different importance. And every thing is placed in that order, and clothed in ſuch a dreſs, as may repreſent it to the greateſt advantage. So that, in a word, the foundation of a good ſtyle is chiefly good ſenſe. Where theſe qualities all meet in a conſiderable degree, ſuch perſons have the happineſs to excel, either in ſpeaking or writing. But this is not generally the caſe. Many perſons of a vigorous and ſprightly imagination, have but a weak judgment; and others much more judicious can think but ſlowly. And it is this, in a great meaſure, which makes the difference between ſpeaking and writing well, as one or the other of theſe qualities is predominant. A perſon of a lively fancy, ready wit, and voluble tongue, will deliver himſelf off hand much better and more acceptably, than one who is capable upon due premeditation, to diſcern farther into the ſubject, but cannot command his thoughts with the ſame eaſe and freedom. And this latter would have the ſame advantage of the other, were they both coolly to offer their ſentiments in writing. Many things appear well in ſpeaking, which will not bear a ſtrict ſcrutiny. While the hearer's attention is obliged to keep pace with the ſpeaker, he is not at leiſure to obſerve every impropriety or incoherence, but many ſlips eaſily eſcape him, which in reading are preſently diſcovered. Hence it is often found, that diſcourſes, which were thought very fine when heard, appear to have much leſs beauty, as well as ſtrength, when they come to be read. And therefore it is not without reaſon, that Cicero recommends to all thoſe who are candidates for eloquence, and deſirous to become maſters of a good ſtyle, to write much. This affords them an opportunity to digeſt their thoughts, weigh their words and expreſſions, and give every thing its proper force and evidence; as likewiſe, by reviewing a diſcourſe when compoſed, to correct its errors, or ſupply its defects; till by practice they gain a readineſs both to think juſtly, and to ſpeak with propriety and eloquence. But it is time to proceed to ſome other cauſes of the diverſity of ſtyle.

Different countries have not only a different language, but likewiſe a peculiarity of ſtyle ſuited to their temper and genius. The eaſtern nations had a lofty and majeſtic way of ſpeaking. Their words are full and ſonorous, their expreſſions ſtrong and forcible, and warmed with the moſt lively and moving figures. This is very evident from the Jewiſh writings in the Old Teſtament, in which we find a moſt agreeable mixture of ſimplicity and dignity. On the contrary, the ſtyle of the more northern languages generally partakes of the chilneſs of their climate. "There is (ſays Mr. Addiſon) a certain coldneſs and indifference in the phraſes of our European languages, when they are compared with the oriental forms of ſpeech. And it happens very luckily, that the Hebrew idioms run into the Engliſh tongue with a peculiar grace and beauty. Our language has received innumerable elegancies and improvements from that infuſion of Hebraiſms, which are derived to it out of the poetical paſſages in holy writ. They give a force and energy to our expreſſions, warm and animate our language, and convey our thoughts in more ardent and intenſe phraſes than any that are to be met with in our own tongue. There is ſomething ſo pathetic in this kind of diction, that it often ſets the mind in a flame, and makes our hearts burn within us."

Again, people of different nations vary in their cuſtoms and manners, which occaſions a diverſity in their ſtyle. This was very remarkable in the Attics, Aſiatics, and Rhodians, and is often taken notice of by ancient writers. The Athenians, while they continued a free ſtate, were an active, induſtrious, and frugal people; very polite indeed, and cultivated arts and ſciences beyond any other nation: but as they had powerful enemies, and were exceedingly jealous of their liberties, this preſerved them from wantonneſs and luxury. And their way of ſpeaking was agreeable to their conduct; accurate and cloſe, but very full and expreſſive. The Aſiatics, on the other hand, were more gay, and looſe in their manners, devoted to luxury and pleaſure; and accordingly they affected a florid and ſwelling ſtyle, filled with redundancies and ſuperfluities of expreſſion. Indeed, ſome of the ancients have attributed this looſeneſs of ſtyle to their way of purſuing eloquence at firſt. For as they were put upon it by converſing with the Greek colonies who ſettled among them, they ſuppoſe that, in imitating them, before they were maſters of the language, they were often obliged to make uſe of circumlocutions, which afterwards became habitual, and very much weakened the force of their expreſſions, as it naturally would do. But one would think, if they were put to this neceſſity at firſt, when they found its ill effect, they might eaſily have amended it afterwards, as they grew better acquainted with the Greek language, had they been inclined ſo to do. The Rhodian ſtyle was a medium between the other two; not ſo conciſe and expreſſive as the Attic, nor yet ſo looſe and redundant as the Aſiatic. Quintilian ſays, it had a mixture of its author, and the humour of the people; and, like plants ſet in a foreign ſoil, degenerated from the Attic purity, but not ſo wholly as to loſe it. They firſt received it from Æſchines, who being worſted in his famous conteſt with Demoſthenes, retired thither, and taught rhetoric, which put them upon the ſtudy of eloquence.

The ſtyle of the ſame country likewiſe very much alters in different ages. Cicero tells us, that the firſt Latin hiſtorians aimed at nothing more than barely to make themſelves intelligible, and that with as much brevity as they could. Thoſe who ſucceeded them advanced a ſtep further; and gave ſomewhat a better turn and cadency to their ſentences, though ſtill without any dreſs or ornament. But afterwards, when the Greek language became faſhionable at Rome, by copying after their writers, ſuch as Herodotus, Thucydides, Xenophon, and others, they endeavoured to introduce all their beauties into their own tongue, which in Cicero's time was brought to its higheſt perfection. But it did not long continue in that ſtate. A degeneracy of manners ſoon altered their taſte, and corrupted their language, which Quintilian very much complains of in his time. The caſe was the ſame with reſpect to the Greek tongue; though that had the good fortune to continue its purity much longer than the Latin. Nor can any language be exempt from the common fate of all human productions; which have their beginning, perfection, and decay. Beſides, there is a ſort of faſhion in language, as well as other things; and the generality of people are always fond of running into the mode. Perhaps ſome one, or a few perſons, fall into a manner which happens to pleaſe. This gives them a reputation; and others immediately copy after them, till it generally prevail. Cicero tells us, that the moſt ancient Greek orators whoſe writings were extant in his time, ſuch as Pericles, Alcibiades, and others, were ſubtle, acute, conciſe, and abounded in ſenſe rather than words. But another ſet that

ſet that followed them, of which were Critias, Theramenes, and Lyſias, retained the good ſenſe of the former, and at the ſame time took more care of their ſtyle; not leaving it ſo bare as the former had done, but furniſhing it with a better dreſs. After theſe came Iſocrates, who added all the flowers and beauties of eloquence. And as he had abundance of followers, they applied theſe ornaments and decorations acording to their different genius; ſome for pomp and ſplendor; and others to invigorate their ſtyle, and give it the greater force and energy. And in this latter way Demoſthenes principally excelled. Now as each of theſe manners had its peculiar beauties, and generally prevailed in different ages, Cicero thinks this could not have happened otherwiſe than from imitation. And he attributes it to the ſame cauſe, that afterwards they ſunk into a ſofter and ſmoother manner, not leſs exact and florid, but more cold and lifeleſs. If we take a view of our own tongue, Chaucer ſeems to have been the firſt who made any conſiderable attempts to cultivate it. And whoever looks into his writings, will perceive the difference to be ſo great from what it is at preſent, that it ſcarce appears to be the ſame language. The gradual improvements it has ſince received, are very evident in the writers almoſt of every ſucceeding age ſince that time; and how much farther it may ſtill be carried, time only can diſcover. See LANGUAGE.

Another cauſe of the variety of ſtyle ariſes from the different nature and properties of language. A difference in the letters, the make of the words, and the order of them, do all affect the ſtyle. So Quintilian obſerves, that the Latin tongue cannot equal the Greek in pronunciation, becauſe it is harſher. The Latins want two of the ſofteſt Greek letters, υ and ζ; and uſe others of a very hard ſound, which the Greeks have not, as *f* and *q*. Again, many Latin words end in *m*; a letter of a broad and hollow ſound, which never terminates any Greek word; but ν does frequently, whoſe ſound is much ſofter and ſweeter. Beſides, in the combination of ſyllables, the letters *b* and *d* are often ſo ſituated, as to require too ſtrong and unequal a force to be laid upon them, as in the words *obverſus* and *adjungo*. Another advantage of the Greek Tongue ariſes from the variety and different ſeat of the accents: For the Greeks often accent the laſt ſyllable, which both enlivens the pronunciation and renders it more muſical; whereas the Latins never do this. But the greateſt advantage of the Greeks lies in their plenty and variety of words; for which reaſon they have leſs occaſion for tropes or circumlocutions, which, when uſed from neceſſity, have generally leſs force, and weaken the ſtyle But under theſe diſadvantages, Quintilian ſeems to give his countrymen the beſt advice the caſe will admit of: That what they cannot do in words, they ſhould make up in ſenſe. If their expreſſions are not ſo ſoft and tender, they ſhould exceed in ſtrength; if they are leſs ſubtile, they ſhould be more ſublime; and if they have fewer proper words, they ſhould excel in the beauty as well as number of their figures. If this account of Quintilian be juſt, that the Greek tongue does ſurpaſs the Latin in all theſe inſtances, it is certain that both of them have much greater advantages over ſome modern languages. The varying all their declinable words, both nouns and verbs, by terminations, and not by ſigns, contributes very much to the ſmoothneſs and harmony of their periods. Whereas in the modern languages, thoſe ſmall particles and pronouns which diſtinguiſh the caſes of nouns and the tenſes and perſons of verbs, hinder the run of a period, and render the ſound much more rough and uneven. Beſides, the ancient languages ſeem to have a better and more equal mixture of vowels and conſonants, which makes their pronunciation more eaſy and muſical.

But the chief diſtinction of ſtyle ariſes from the different ſubjects or matter of diſcourſe. The ſame way of ſpeaking no more ſuits all ſubjects, than the ſame garment would all perſons. A prince and a peaſant ought not to have the ſame dreſs; and another different from both becomes thoſe of a middle ſtation in life. The ſtyle therefore ſhould always be adapted to the nature of the ſubject, which rhetoricians have reduced to three ranks or degrees; the *low* or *plain* ſtyle, the *middle* or *temperate*, and the *lofty* or *ſublime:* Which are likewiſe called *characters*, becauſe they denote the quality of the ſubject upon which they treat. This diviſion of ſtyle into three characters, was taken notice of very early by ancient writers. Some have obſerved it even in Homer, who ſeems to aſſign the *ſublime* or magnificent to Ulyſſes, when he repreſents him ſo copious and vehement an orator, that his words came from him *like winter ſnow*. On the contrary, he deſcribes Menelaus as a *polite* ſpeaker, but *conciſe* and *moderate*. And when he mentions Neſtor, he repreſents his manner as between theſe two, not ſo high and lofty as the one, nor yet ſo low and depreſſed as the other; but ſmooth, even, and pleaſant, or, as he expreſſes it, *more ſweet than honey*. Quintilian obſerves, that although accuracy and politeneſs were general characters of the Attic writers; yet among their orators, Lyſias excelled in the *low and familiar* way; Iſocrates for his *elegancy, ſmoothneſs*, and the *fine turn of his periods*: and Demoſthenes for his *flame and rapidity*, by which he carried all before him. And Gellius tells us, that the like difference was found in the three philoſophers who were ſent from the Athenians to Rome (before the Romans had any reliſh for the polite arts) to ſolicit the remittance of a fine laid upon them for an injury done to a neighbouring ſtate. Carneades, one of thoſe ambaſſadors, was *vehement and rapid* in his harangues; Critolaus, *neat and ſmooth*; and Diogenes, *modeſt and ſober*. The eloquence of theſe orators, and the agreeable variety of their different manner, ſo captivated the Roman youth, and inflamed them with a love of the Grecian arts, that old Cato, who did all he could to check it by hurrying away the ambaſſadors could not prevent their vigorous purſuit of them, till the ſtudy became in a manner univerſal. And the old gentleman afterward learned the Greek language himſelf, when it became more faſhionable. Which *Lord Bacon* repreſents as *a puniſhment upon him for his former crime*. It ſeldom happens that the ſame perſon excels in each of theſe characters. They ſeem to require a different genius, and moſt people are naturally led to one of them more than another; though all of them are requiſite for an orator upon different occaſions. See the article STYLE.

CHAP. VI. *Of the Style of an Orator*

THE ſtyle of an orator comprehends the characters of *low, middle*, and *ſublime*, as they are applied by him in the different parts of his province. For that the language muſt be ſuited to the nature of the ſubject, we have had occaſion often to obſerve already; and the different view of the ſpeaker or writer neceſſarily occaſions a variety in the manner of expreſſion. Now an orator has three things in his view; to prove what he aſſerts, to repreſent it in an agreeable light, and to move the paſſions. Theſe are all neceſſary, we do not mean in the order wherein we have now mentioned them, but that the diſcourſe may upon the whole have its deſired effect upon the audience. For unleſs the mind be convinced of the truth of what is offered by ſolid and cogent arguments, neither will the moſt eloquent diſcourſe afford a laſting pleaſure, nor the moſt pathetic long influence the affections. Though, on the other hand, the hearers expect to be entertained at the ſame time they are informed; and therefore, unleſs the language be agreeable to their taſte, they will ſoon call off their attention, and think but meanly of the ſpeaker. And unleſs both theſe are warmed and animated by a becoming pathos, the ſpeaker may very probably miſs of his end in bringing his audience over to his ſentiments. For

bare conviction is not ſufficient with many perſons to excite them to action. They will acquieſce in the truth of a thing which they cannot contradict, or will not give themſelves the trouble to examine; and at the ſame time remain unconcerned to proſecute it. And the pleaſure of a florid diſcourſe will of itſelf ſoon vaniſh, like the harmony of muſic, or the charms of a fine poem. And therefore to captivate his audience, ſecure them in his intereſt, and puſh them upon action, it is neceſſary for the orator to engage their affections; theſe are, as it were, the ſprings of the ſoul, which, managed by a ſkilful hand, move and direct it at pleaſure. Now each of theſe parts of an orator's province requires a different ſtyle. The *low ſtyle* is moſt proper for proof and information; becauſe he has no other view here but to repreſent things to the mind in the plaineſt light, as they really are in themſelves, without colouring or ornament. The *middle ſtyle* is moſt ſuited for pleaſure and entertainment, becauſe it conſiſts of ſmooth and well turned periods, harmonious numbers, with florid and bright figures. But the *ſublime* is neceſſary in order to ſway and influence the paſſions. Here the orator calls in all the aſſiſtance both of nature and art; the moſt raiſed and lofty thoughts, clothed with the brighteſt and ſtrongeſt colouring, enter into this character.

But as an orator has frequently each of theſe views in the ſame diſcourſe, we ſhall firſt give a ſummary deſcription of the ſeveral characters of ſtyle, that, by placing them together in one view, the difference between them may be more plain and obvious; and then we ſhall proceed to ſhow to what particular parts of a diſcourſe each of them is more eſpecially to be applied.

I. Firſt, then, as ſhorter periods are proper in the *low ſtyle*, ſo leſs care is neceſſary in their turn and cadency. If a ſentence now and then drop unexpectedly, and diſappoint the ear, or has ſomething rough and harſh in its compoſition, it is no blemiſh in this character. For as it is ſuited to the manner of common diſcourſe, an appearance of regard to the ſubject, rather than the form of expreſſion, is more becoming than any beauties of art. But the words ſhould be well choſen and proper, ſuited to the ideas they are deſigned to convey; the expreſſions plain and clear, and the artificial ornaments few and modeſt. By *artificial ornaments* are here meant *tropes* and *figures*; and they are called *artificial*, becauſe they vary from the natural dreſs of language, either in the words or manner of expreſſion: though they are often uſed by thoſe who are wholly unacquainted with the rules of art; and particularly metaphors, which perſons who have the leaſt command of language frequently run into through mere neceſſity, for want of a ſufficient ſtock of proper words to convey their ideas. The low ſtyle therefore admits of theſe: but care ſhould be taken to chooſe ſuch as have been rendered familiar by uſe, or at leaſt where the ſimilitude is very plain and evident. Bold or lofty metaphors, or where the alluſion is dark and remote, ought to be avoided. Nor is the moderate uſe of the other tropes wholly diſagreeable to this ſtyle. And the ſame thing is to be ſaid with reſpect to verbal figures, or ſuch as conſiſt in the particular diſpoſition of the ſentence, ſo that if the form of it be changed, the figure is loſt. Of theſe, ſuch as come neareſt to the natural way of expreſſion, are moſt proper for this ſtyle; and therefore thoſe which conſiſt in a jingle of words, ariſing from the ſame or a like ſound, are to be avoided, as carrying in them too much the appearance of art. Thoſe likewiſe which conſiſt in a repetition of the ſame word have often too great a force and vehemence for this mild and gentle character. And as to figures of ſentences, which do not depend on the conſtruction of words, but lie in the ſenſe, many of them are too gay and ſprightly, and others too rapid and impetuous, for the ſimplicity of the low ſtyle; ſo that only the more moderate and ſedate ones are to be allowed a place here. It is therefore no wonder if perſons are often miſtaken in their notions of this character; the beauty of which conſiſting in a certain plainneſs and ſimplicity, without any thing in it but what ſeems natural and common, every one is apt to imagine he can readily be maſter of it, till by experience he finds the contrary. For the caſe is much the ſame here, as in perſons of faſhion and good breeding, whoſe behaviour and addreſs is attended with that agreeable freedom and ſeeming negligence, which in appearance is very eaſy to expreſs, but in reality is ſcarce imitable by others.

As the *middle ſtyle* is more adapted for pleaſure and delight, it admits of all thoſe beauties and ornaments which ſoothe and entertain the mind. It has more force and energy than the low ſtyle, but leſs than the ſublime. Smooth and harmonious numbers, well turned periods, of a juſt length, delightful cadency, and accurate diſpoſition of the words, are ſuited to this ſtyle. The moſt beautiful and ſhining tropes, which ſtrike the fancy, and all thoſe verbal figures which, by a repetition, ſimilitude, or proportion of ſounds, pleaſe and gratify the ear, help to form this character. The like is to be ſaid as to figures of ſentences: The moſt florid and beautiful, ſuch as enumeration, deſcription, ſimilitude, and the like, are here the moſt proper.

But it is the *ſublime ſtyle* which perfects the orator. This requires the moſt forcible and emphatical words, the boldeſt metaphors, and ſtrongeſt figures. In verbal figures, repetitions, ſynonyms, gradations, contraries, with others of a like force and energy, are chiefly employed here. But figures of ſentences are the moſt conſiderable, and principally contribute to make up this character. Among theſe are ſimilies taken from lofty ſubjects, profopopœia, apoſtrophe, exclamation, epiphonema, apoſiopeſis, and others of a like nature. But due care muſt likewiſe be taken of the form, conſtruction, and harmony of the periods; which ſeem beſt diſpoſed, when long and ſhort ones are intermixed. For though round and ſwelling periods carry in them ſomething grand and majeſtic, yet many times they move too ſlow to ſtrike the paſſions; whereas ſhort ones are more acute and pungent, and by returning quick, awaken the mind, and raiſe the paſſions. But to render it complete, it muſt be ſupported with ſtrong reaſon, grandeur of thought, and ſentiments every way equal to the expreſſion; without which it will be very liable to ſwell into bombaſt, and end barely in amuſement.

II. Having given a ſhort ſketch of this part of the orator's furniture, we ſhall now go on to ſhow where, and in what manner, he is to make uſe of it. This will beſt appear by conſidering his principal view in each part of his diſcourſe. Now the parts of a juſt oration (as we have formerly ſhown) are ſix; *Introduction*, *Narration*, *Propoſition*, *Confirmation*, *Confutation*, and *Concluſion*. Not that all theſe are neceſſary in every diſcourſe, but it is proper they ſhould all be mentioned, that we may conſider what ſtyle is fitteſt for them when they are neceſſary.

In the *Introduction*, the orator has three things before him; to gain the eſteem of his hearers, to ſecure their attention, and to give them ſome general notion of his ſubject. To ſet out modeſtly is undoubtedly the moſt likely way to recommend himſelf. For to attempt to inflame an audience, before they are prepared for it, or ſee the reaſon of much warmth, is highly improper. A prudent ſpeaker will, like Demoſthenes, begin with temper, and riſe gradually, till he has inſenſibly warmed his hearers, and in ſome degree engaged their affections in his favour. So that this part ſcarce riſes above the middle ſtyle. And if it carry in it an air of pleaſantry and good-humour, it is generally the more apt to engage the attention.

The introduction is uſually followed by the *narration*, or a recital of ſuch things as either preceded, accompanied, or followed upon the ſubject under conſideration. Now, as the qualities that recommend a narration are clearneſs, brevity, and pro-

bability; theſe ſufficiently point out the ſtyle. Perſpicuity ariſes from the choice of proper words, and ſuch tropes as have been rendered moſt familiar by uſe; brevity requires moderate periods, whoſe parts are but little tranſpoſed; and a plain and ſimple dreſs; without ornament or colouring, is beſt ſuited to repreſent things probable: all which are the properties of the low ſtyle. And therefore Cicero ſays, *narrations come pretty near to our ordinary diſcourſe*. Indeed, ſometimes it is neceſſary not only to relate the facts themſelves, but likewiſe to deſcribe the manner in which they were performed. And then a further degree of art may be requiſite to repreſent them with all their circumſtances, and paint them to the mind in their proper colours.

The next part in order is the *Propoſition*, or ſubject of the diſcourſe, in which there can be no room for ornament. But as it is the baſis and foundation of the orator's whole deſign, it ought to be laid down in the plaineſt and cleareſt terms, ſo as to leave no room for doubt or uncertainty what it is which he intends to diſcourſe upon.

The next thing is *Confirmation*, wherein the orator endeavours to maintain and defend his own cauſe, and to convince his hearers of the truth of it by reaſon and argument. Now the low ſtyle is certainly fitteſt for cool reaſoning and debate. But the orator's method of reaſoning often very much differs from that of the philoſopher. The latter contents himſelf with the moſt plain and familiar manner of repreſenting the truth, and thinks it ſufficient if what he ſays be clearly underſtood. But the former, at the ſame time that he convinces the judgment, endeavours likewiſe to affect the paſſions, and that in a great variety of ways. So that in this part of the diſcourſe the ſtyle is very different, according to the nature and circumſtances of the caſe. Sometimes, while he is dwelling upon the proof of a thing, he talks coolly, and reaſons with the ſedateneſs of a philoſopher; and where any part of his argument appears doubtful or obſcure, he endeavours with the ſame even temper to explain and clear it up. But frequently he intermixes with his proofs all the arts of perſuaſion, and embelliſhes his reaſons with the greateſt ornaments and beauties of eloquence.

Confirmation is uſually followed by *confutation*, in which the orator endeavours to enervate and overthrow all that has been advanced in favour of the oppoſite ſide of the queſtion. But as the ſtyle is much the ſame here as in the former part, what has been ſaid upon that may be ſufficient for this likewiſe.

The laſt part above-mentioned is the *concluſion*. This conſiſts of two branches, *recapitulation* and *addreſs*. Recapitulation is a ſhort recital of the ſeveral arguments, or at leaſt the chief of them, which were before advanced in ſupport of the cauſe; that, being brought together into a narrow compaſs, they may appear in a ſtronger light. Wherefore the language here ought rather to be forcible and ſtrong than florid, becauſe brevity and conciſeneſs is a neceſſary quality. The other branch of the concluſion conſiſts in an addreſs to the paſſions, and is wholly perſuaſive; for which the ſpeaker is now entirely at leiſure. Indeed, this is often done occaſionally in other parts of the diſcourſe, particularly in the introduction and confirmation: But as in the former of theſe, his view is principally to ſecure the good opinion of the hearers, and excite their attention; and in the latter to defend his own ſide of the queſtion by reaſon and argument; when theſe two points are gained, he has nothing left but to prevail with them to fall in with his deſign, and declare for him. And the beſt way to attain this is, by engaging their paſſions in his intereſt. Hence, then, to uſe Quintilian's words, "All the ſprings of eloquence are to be opened. Now we are paſt the rocks and ſhallows, all the ſails may be hoiſted. And as the greateſt part of the concluſion conſiſts in illuſtration, the moſt pompous language and ſtrongeſt figures have place here."

All the variety above mentioned, however, is not always neceſſary. Regard muſt be had to the nature of the ſubject, the time, place, perſons, and other circumſtances; by all which the ſtyle is to be regulated. To diſcourſe in a lofty and grand way upon a common topic, or in a low and flat manner upon a ſublime argument, are both equally injudicious. Cicero refers us to ſome diſcourſes of his own, as inſtances of each kind. His oration for Cæcina, he ſays, is written in the low ſtyle, that for the Manilian law in the middle ſtyle, and that for Rabirius in the ſublime; and his Actions againſt Verres, with ſome others, are patterns of the variety here mentioned. And he gives us a very comprehenſive deſcription of a perfect orator in very few words, when he ſays: "He is one who can ſpeak upon a low ſubject acutely, upon a lofty ſubject with ſublimity, and upon a moderate ſubject temperately." By which he means no more, than one who is maſter of the three characters here deſcribed, and knows when and how to uſe them. But although he mentions ſeveral among the Greeks, and ſome few among the Romans, who excelled in one or other of theſe different kinds; yet one who excelled in them all, he ſuppoſes never to have exiſted, except in the imagination. The reaſon perhaps may be, becauſe each of them ſeems to require a very different genius, ſo that it is ſcarce poſſible for the ſame perſon to ſucceed in them all. Since therefore it is ſo rare and difficult a matter to gain the command of each in any good degree, it is better perhaps for every one to purſue that which nature ſeems moſt inclined to, and to excel in it, than to ſtrive againſt their genius. For every kind has its perfections; and it is more commendable to be maſter of one thing, than to do ſeveral but indifferently.

PART IV. OF PRONUNCIATION.

CHAP. I. *Of Pronunciation in general, and of the Management of the Voice.*

PRONUNCIATION is alſo called *Action* by ſome of the ancients. Though, if we attend to the proper ſignification of each of theſe words, the former reſpects the voice, and the latter the geſtures and motions of the body. But if we conſider them as ſynonymous terms, in this large ſenſe pronunciation or action may be ſaid to be *a ſuitable conformity of the voice, and the ſeveral motions of the body, in ſpeaking, to the ſubject matter of the diſcourſe.*

The beſt judges among the ancients have repreſented this as the principal part of an orator's province, from whence he is chiefly to expect ſucceſs in the art of perſuaſion. When Cicero, in the perſon of Craſſus, has largely and elegantly diſcourſed upon all the other parts of oratory, coming at laſt to ſpeak of this, he ſays: "All the former have their effect as they are pronounced. It is the action alone that governs in ſpeaking; without which the beſt orator is of no value, and is often defeated by one in other reſpects much his inferior." And he lets us know, that Demoſthenes was of the ſame opinion, who, when he was aſked what was the principal thing in oratory, replied, Action; and being aſked again a ſecond and a third time, what was next conſiderable, he ſtill made the ſame anſwer. By which he ſeemed to intimate, that he thought the whole art did in a manner conſiſt in it. And indeed, if he had not judged this highly neceſſary for an orator, he would ſcarce have taken ſo much pains in correcting thoſe natural defects, under which he laboured at firſt, in order to acquire it. For he had both a weak voice, and likewiſe an impediment in his ſpeech, ſo that

he could not pronounce diſtinctly ſome particular letters. The former of which defects he conquered, partly by ſpeaking as loud as he could upon the ſhore, when the ſea roared and was boiſterous; and partly, by pronouncing long periods as he walked up hill; both of which methods contributed to the ſtrengthening of his voice. And he found means to render his pronunciation more clear and articulate, by the help of ſome littl ſtones put under his tongue. Nor was he leſs careful in endeavouring to gain the habit of a becoming and decent geſture; for which purpoſe he uſed to pronounce his diſcourſes alone before a large glaſs.

Voice is one kind of ſounds. Now the influence of ſounds, either to raiſe or allay our paſſions, is evident from muſic. And certainly the harmony of a fine diſcourſe, well and gracefully pronounced, is as capable to move us, if not in a way ſo violent and ecſtatic, yet not leſs powerful, and more agreeable to our rational faculties. As the buſineſs of this chapter is to offer ſome conſiderations for the juſt and decent management of the voice, it may not be improper in the firſt place to obſerve in general what nature does when free and unconſtrained. As perſons are differently affected when they ſpeak; ſo they naturally alter the tone of their voice, though they do not attend to it. It riſes, ſinks, and has various inflections given it, according to the preſent ſtate and diſpoſition of the mind. When the mind is calm and ſedate, the voice is moderate and even; when the former is dejected with ſorrow, the latter is languid; and when that is inflamed by paſſion, this is raiſed and elevated. It is the orator's buſineſs, therefore, to follow nature, and to endeavour that the tone of his voice appear natural and unaffected. And for this end, he muſt take care to ſuit it to the nature of the ſubject; but ſtill ſo as to be always grave and decent. Some perſons continue a diſcourſe in ſuch a low and drawling manner, that they can ſcarce be heard by their audience. Others again hurry on in ſo loud and boiſterous a manner as if they imagined their hearers were deaf. But all the muſic and harmony of ſpeech lies in the proper temperament of the voice between theſe extremes. In order to ſet this matter in a juſt light, it will be neceſſary to conſider the principal affections or properties of the voice, and how they are to be regulated by an orator. Now theſe may all be referred either to *quantity* or *quality*.

The *quantity* of the voice conſiſts in its *highneſs* or *lowneſs*, *ſwiftneſs* or *ſlowneſs*, and the intermediate degrees between them.

Every perſon who ſpeaks in public, ſhould endeavour, if he can, to fill the place where he ſpeaks. But ſtill he ought to be careful not to exceed the natural key of his voice. If he does, it will neither be ſoft nor agreeable; but either harſh and rough, or too ſhrill and ſqueaking. Beſides, he will not be able to give every ſyllable its full and diſtinct ſound; which will render what he ſays obſcure, and difficult to be underſtood. He ſhould therefore take care to keep his voice within reach, ſo as to have it under management, that he may raiſe or ſink it, or give it any inflection he thinks proper: Which it will not be in his power to do, if he put a force upon it, and ſtrain it beyond its natural tone.

The like caution is to be uſed againſt the contrary extreme, that the voice be not dropped, and ſuffered to ſink too low. This will give the ſpeaker pain in raiſing it again to its proper pitch, and be no leſs offenſive to the hearers. For though the muſic of ſpeech conſiſts in the variations of the voice, yet they muſt be gradual to render them pleaſant. Such ſudden and great changes at once are rather to be eſteemed chaſms in ſpeaking, than variations. Beſides, as they often prevent the hearers from taking in the ſenſe of what is ſaid, it gives them no ſmall uneaſineſs that they are obliged to ſtretch their attention. Many perſons are too apt to be guilty of this, eſpecially at the end of a ſentence, by dropping the laſt word; which ought in a particular manner to be expreſſed diſtinctly, becauſe the meaning of the whole ſentence often depends upon it.

The medium between theſe two is a moderate and even voice. But this is not the ſame in all; that which is moderate in one would be high in another. Every perſon therefore muſt regulate it by the natural key of his own voice. A calm and ſedate voice is generally beſt; as a moderate ſound is moſt pleaſing to the ear, if it be clear and diſtinct. But this equality of the voice muſt alſo be accompanied with a variety, otherwiſe there can be no harmony; ſince all harmony conſiſts in variety. Nothing is leſs pleaſing than a diſcourſe pronounced throughout in one continued tone of the voice, without any change or alteration. Beſides, a variation of the voice is an eaſe to the ſpeaker; as the body is relieved by ſhifting its poſture. The equality therefore we are here ſpeaking of admits a variety of inflections and changes within the ſame pitch. And when that is altered, the gradations, whether higher or lower, ſhould be ſo gentle and regular as to preſerve a due proportion of the parts and harmony of the whole; which cannot be done, when the voice is ſuddenly varied with too great a diſtinction. And therefore it ſhould move from one key to another, ſo as rather to glide like a gentle ſtream, than pour down like a rapid torrent, as an ingenious writer has well expreſſed it. An even voice is beſt fitted to keep the mind to cloſe attention. And therefore, in ſubjects deſigned only for inſtruction, without any addreſs to the paſſions, there is little room for a variety of voice. For the voice ought to agree with the ſtyle; and as upon ſuch ſubjects this ſhould be equal, moderate, and ſmooth, ſo ſhould the other. Every thing, as we ſay, is beautiful in its ſeaſon; and there is a certain propriety in things which ought always to be regarded. And therefore, an affected variety, ill placed, is as diſagreeable to a judicious audience, as the want of it, where the ſubject requires it. We may find ſome perſons, in pronouncing a grave and plain diſcourſe, affect as many different tones, changes, and variations of their voice, as if they were acting a comedy; which is doubtleſs a very great impropriety. But the orator's province is not barely to apply to the mind, but likewiſe to the paſſions; which require a great variety of the voice, high or low, vehement or languid, according to the nature of the paſſions he deſigns to affect. So that for an orator always to uſe the ſame tone or degree of his voice, and expect to anſwer all his views by it, would be much the ſame thing as if a phyſician ſhould propoſe to cure all diſtempers by one medicine. From hence it is evident, that although various inflections and tones of the voice are requiſite to make it harmonious and pleaſing to the ear; yet the degree of it ſhould differ according to the nature of the ſubject and deſign of the ſpeaker. And, as a perfect monotony is always unpleaſant, ſo it can never be neceſſary in any diſcourſe.

The next property of the voice above-mentioned was *ſwiftneſs*. That ſome expreſſions ought to be pronounced faſter and ſwifter than others, is very manifeſt. Gay and ſprightly ideas ſhould not only be expreſſed louder, but alſo faſter, than ſuch as are ſad and melancholy. And when we preſs an adverſary, the voice ſhould be briſk and quick. But to hurry on in a precipitant manner without pauſing, till ſtopt for want of breath, is certainly a very great fault. This deſtroys not only the neceſſary diſtinction between ſentence and ſentence, but likewiſe between the ſeveral words of the ſame ſentence; nay, and often occaſions us to expreſs our words by halves, while one is thrown ſo faſt upon another, that we are not able to give each its full and juſt ſound. By this means all the grace of ſpeaking is loſt, and in a great meaſure the advantage of hearing. For when the ears of the hearers cannot keep pace with the ve-

lubility of the ſpeaker's tongue, they will be little the better for what he ſays. Beſides, by not commanding his voice, and eaſing his breath at the proper pauſes and points of diſtinction, he is often obliged to ſtop in the middle of a ſentence; and ſo divides what ſhould be continued, and joins what ſhould be ſeparated; which muſt neceſſarily deſtroy the ſenſe, and confound his diſcourſe. Young perſons are very liable to this, eſpecially at firſt ſetting out. And it often ariſes from diffidence. They are jealous of their performances, and the ſucceſs they may have in ſpeaking, which gives them a pain till it is over; and this puts them into a hurry of mind, which incapacitates them from governing their voice, and keeping it under that due regulation which perhaps they propoſed to themſelves before they began to ſpeak. And the greater degree ſuch perſons have of a native and ingenuous modeſty, accompanied with a laudable ambition to excel, they are commonly more expoſed to this. For while on the one hand they are fired with an ardent deſire to recommend themſelves, and on the other are fearful of the event, this dubious ſtate of mind is very apt to throw them off their guard, and run them into this exceſs. From which we may ſee the great advantage of having the voice well formed betimes; for when once it is become habitual to ſpeak with juſtneſs and propriety, perſons readily practiſe it without much attention or concern.

And as a precipitant and haſty pronunciation is culpable, ſo likewiſe on the other hand, it is a fault to ſpeak too ſlow. This ſeems to argue a heavineſs in the ſpeaker. And as he appears cool himſelf, he can never expect to warm his hearers, and excite their affections. When not only every word, but every ſyllable is drawn out to too great a length, the ideas do not come faſt enough to keep up the attention without much uneaſineſs. For, till the ſenſe is completed, the mind is in ſuſpenſe; and, if it be held long in that ſituation, it will of courſe flag and grow tired. Indeed, in ſome caſes, it is requiſite the pronunciation ſhould be ſlower than in others; as in repreſenting things great and difficult; or in expreſſing ſome particular paſſions, as admiration or grief. But the extreme we are now ſpeaking of, is a flowneſs equally continued through a whole diſcourſe, which muſt neceſſarily render it flat and lifeleſs.

Now, to avoid either of the two extremes laſt mentioned, the voice ought to be ſedate and diſtinct. And in order to render it diſtinct, it is neceſſary, not only that each word and ſyllable ſhould have its juſt and full ſound, both as to time and accent; but likewiſe that every ſentence, and part of a ſentence, ſhould be ſeparated by its proper pauſe and interval. This is more eaſy to be done in reading, from the aſſiſtance of the points; but it is no leſs to be attended to in ſpeaking, if we would pronounce in a diſtinct and graceful manner. For every one ſhould ſpeak in the ſame manner as he ought to read, if he could arrive at that exactneſs. Now the common rule given in pauſing is, that we ſtop our voice at a comma till we can tell one, at a ſemicolon two, at a colon three, and at a full period four. And as theſe points are either accommodated to the ſeveral parts of the ſame ſentence, as the firſt three; or different ſentences, as the laſt; this occaſions the different length of the pauſe, by which either the dependence of what precedes upon that which follows, or its diſtinction from it, is repreſented. And therefore, in the firſt three ſtops, the voice is rather to be ſuſpended in different degrees or meaſures of time, than entirely dropt, to ſhow that the ſenſe is not yet completed. But between ſentence and ſentence we reſpire, and begin anew. So that in long periods, the voice ſhould be favoured by beginning low and ſedately, that it may hold to the end without reſpiration; or if it will not, the breath ought to be recovered without ſinking the voice. For if once the voice drop for want of breath before the period be finiſhed, not only the beauty, but likewiſe the ſenſe of it will be loſt. Quintilian lays a great ſtreſs upon a due attention to theſe pauſes; and ſays, "Though it may appear not ſo conſiderable in itſelf, yet all the other virtues of a good pronunciation are deficient without it."

Hitherto we have conſidered ſuch properties of the voice as reſpect *quantity*, we come now to ſpeak of its *qualities*. And the chief of theſe are *ſtrength* or *weakneſs*, *clearneſs* or *obſcureneſs*, *fullneſs or ſmallneſs*, *ſmoothneſs* or *roughneſs*. Now, one half of theſe is what every one would willingly chooſe, as he would wiſh to be free from the others. But it is not in our power to give ourſelves what qualities of the voice we pleaſe; but only to make the beſt uſe we can of what nature has beſtowed upon us. However, ſeveral defects of the voice are capable of being helped by care and proper means; as, on the other hand, the beſt voice may be greatly hurt by ill management and indiſcretion. Temperance is a great preſervative of the voice, and all exceſs is highly prejudicial to it. The voice muſt neceſſarily ſuffer, if the organs of ſpeech have not their proper tone. And in order to their having this, they muſt be kept in a due temperature; that is, they muſt neither be too moiſt nor too dry. If they abound with fluids, theſe will obſtruct the clearneſs of the voice, and render it obſcure and confuſed; and if they are parched with drought, the voice will be harſh and rough. Now all exceſſes, as well as ſome bodily indiſpoſitions, are apt to affect the organs one or other of theſe ways.

A ſtrong voice is very ſerviceable to an orator, becauſe, if it want ſome other advantages, he is, however, capable to make himſelf heard. And if at any time he is forced to ſtrain it, he is in leſs danger of its failing him before he has finiſhed his diſcourſe. But he who has a weak voice, ſhould be very careful not to ſtrain it, eſpecially at firſt. He ought to begin low, and riſe gradually to ſuch a pitch as the key of his voice will well carry him, without being obliged to ſink again afterwards. Frequent inflections of the voice will likewiſe be ſome aſſiſtance to him. But eſpecially he ſhould take care to ſpeak deliberately, and eaſe his voice, by allowing due time for reſpiration at all the proper pauſes. It is an extreme much leſs inconvenient for ſuch a perſon rather to ſpeak too ſlow, than too faſt. But this defect of a weak voice is ſometimes capable of being helped by the uſe of proper methods; as is evident from the inſtance of Demoſthenes, before mentioned.

A voice is ſaid to be *clear*, when the organs of ſpeech are ſuited to give every ſingle letter, and all the combinations of them in ſyllables and words, their proper and diſtinct ſound. Such a voice is very pleaſing and agreeable to the hearers; and no leſs an happineſs to the ſpeaker, as it ſaves him a great expence of ſpirits. For a moderate voice, if clear, will be as diſtinctly heard, as one much louder, if thick and obſcure. Which is a great advantage to the ſpeaker, becauſe he can better keep his voice under command, and modulate it at pleaſure, as the ſeveral parts and circumſtances of his diſcourſe may require. On the contrary, an obſcure and confuſed voice is not always occaſioned from a deficiency in the organ; but many times is the effect of cuſtom and a bad habit. Some perſons, either from want of due care in their education at firſt, or from inadvertency and negligence afterwards, run into a very irregular and confuſed manner of expreſſing their words; either by miſplacing the accent, confounding the ſound of the letters, or huddling the ſyllables one upon another, ſo as to render what they ſay often unintelligible. Indeed, ſometimes this ariſes from a natural defect, as in the caſe of Demoſthenes; who found a method to rectify that, as well as the weakneſs of his voice. But in faults of this kind, which proceed from habit, doubtleſs the moſt likely way to mend them is to ſpeak deliberately.

A full voice is not the ſame as a ſtrong or a loud voice. It

fills the ear, but it is often not pleaſant. And therefore to render it ſo, as well as audible, it ſhould be frequently varied. However, this ſeems better ſuited to the character of an orator, than a ſmall and ſhrill voice; becauſe it has ſomething in it more grave and manly. And thoſe who have the misfortune of a very ſmall voice, ſhould be cautious of raiſing it to too high a pitch, eſpecially at once; becauſe the ſudden compreſſure of the organ is apt to occaſion a ſqueaking and very diſagreeable ſound.

A ſoft and ſmooth voice is of all the moſt muſical, eſpecially if it be flexible. And on the contrary, nothing is leſs harmonious than a voice that is harſh and rough. For the one grates as diſagreeably upon the ear, as the other gives it pleaſure and delight.

From the conſideration of theſe ſeveral properties of the voice, we may conclude that to be the beſt, and fitteſt for an orator, which is moderate, diſtinct, firm, clear, and ſmooth, and withal eaſily flexible to the ſeveral degrees and variations of ſound which every part of the diſcourſe may require.

Chap. II. *Of Geſture.*

By this is meant, a ſuitable conformity of the motions of the countenance, and ſeveral parts of the body in ſpeaking, to the ſubject matter of the diſcourſe. The word *geſture* is here uſed in a larger ſenſe than is ordinarily done in common language. For we rarely make uſe of that word to denote the motions of the countenance, or any parts of it; but as theſe make a conſiderable part of our preſent ſubject, they muſt here be comprehended under this term.

It is not agreed among the learned, whether voice or geſture has the greater influence upon us. But as the latter affects us by the eye, as the former does by the ear, geſture in the nature of it ſeems to have this advantage, that it conveys the impreſſion more ſpeedily to the mind; for the ſight is the quickeſt of all our ſenſes. Nor is its influence leſs upon our paſſions; nay, in ſome inſtances it appears to act more powerfully. A caſt of the eye ſhall expreſs deſire in as moving a manner as the ſofteſt language; and a different motion of it, reſentment. To wring the hands, tear the hair, or ſtrike the breaſt, are all ſtrong indications of ſorrow. And he who claps his hand to his ſword, throws us into a greater panic than one who only threatens to kill us. Nor is it in ſome reſpects leſs various and extenſive than language. Cicero tells us, he often diverted himſelf by trying this with Roſcius the comedian; who could expreſs a ſentence as many ways by his geſtures, as he himſelf by words. And ſome dramas, called *pantomimes*, have been carried on wholly by mutes, who have performed every part by geſtures only, without words, in a way very intelligent, as well as entertaining to the ſpectators. Well therefore might Cicero call *action* (or geſture) *the language of the body*, ſince it is capable in ſo lively a manner to convey both our ideas and paſſions. But with reſpect to oratory, geſture may very properly be called the *ſecond part of pronunciation*; in which, as the voice ſhould be ſuited to the impreſſions it receives from the mind, ſo the ſeveral motions of the body ought to be accomodated to the various tones and inflections of the voice. When the voice is even and moderate, little geſture is required; and nothing is more unnatural than violent motion, in diſcourſing upon ordinary and familiar ſubjects. The motions of the body ſhould riſe therefore in proportion to the vehemence and energy of the expreſſion, as the natural and genuine effect of it.

But as geſture is very different and various as to the manner of it, which depends upon the decent conduct of ſeveral parts of the body; it will not be amiſs to conſider more particularly the proper management of each of thoſe parts. Now all geſture is either natural, or from imitation. By natural geſture we mean ſuch actions and motions of the body, as naturally accompany our words, as theſe do the impreſſions of our minds. And theſe either reſpect the whole body, or ſome particular part of it. But before we enter upon this, give us leave juſt to obſerve, that it has been cuſtomary in all ages and countries, in making a ſet diſcourſe before an aſſembly, to do it ſtanding. Thus we read, that *Abraham ſtood up, and ſpake unto the children of Heth.* And it ſeems as if he ſat down, when he had ended his ſpeech? becauſe, immediately after the account of their anſwer, it is ſaid again, that *Abraham ſtood up and bowed himſelf to the people of the land, the children of Heth.* In like manner Homer repreſents the Grecian princes, as ſtanding up, when they made a ſpeech, either to the army, or in their councils. So when Achilles has aſſembled the army, to inquire into the reaſon of the great plague which at that time raged among them, he riſes up before he begins to ſpeak, and ſits down again when he has done. After him the prophet Calchas riſes, and charges it upon Agamemnon; who riſing up in a paſſion, does not refuſe to comply with what Calchas propoſed, but expreſſes his reſentment at him for ſaying it. And upon another occaſion, both Agamemnon and Neſtor do the ſame in council. And Cicero acquaints us, that when Lentulus had been charged in the ſenate as an aſſociate with Catiline, he ſtood up to make his defence. Nor does the advantage of being better heard, ſeem to have been the only reaſon for ſo general an agreement in this poſture; but it appears likewiſe to have been choſen, as the moſt decent and reſpectful. Sitting carries in it an air of authority, and is therefore a poſture ſcarce uſed upon ſuch occaſions, unleſs perhaps where that is deſigned to be expreſſed by it. Wherefore it was a thing very much reſented, that when Cæſar, after he had got the power into his hands, once addreſſed the ſenate, either refuſed to riſe, as ſome ſay, or as others, one of his friends held him down by his gown.

But though ſtanding appears to be the moſt proper poſture for ſpeaking in public, yet it is very unbecoming for the body to be entirely without any motion like a ſtatue. It ſhould not long continue in the ſame poſition, but be conſtantly changing, though the motion be very moderate. There ought to be no appearance of ſtiffneſs, but a certain eaſe and pliableneſs, naturally ſuiting itſelf to every expreſſion; by which means, when a greater degree of motion is neceſſary, it will appear leſs ſudden and vehement: for as the raiſing, ſinking, and various inflections of the voice muſt be gradual; ſo likewiſe ſhould the motions of the body. It is only on ſome particular occaſions that an haſty vehemence and impetuoſity is proper in either caſe.

As to the ſeveral parts of the body, the head is the moſt conſiderable. To lift it up too high has the air of arrogance and pride; to ſtretch it out too far, or throw it back, looks clowniſh and unmannerly; to hang it downwards on the breaſt, ſhows an unmanly baſhfulneſs and want of ſpirit; and to ſuffer it to lean on either ſhoulder, argues both ſloth and indolence. Wherefore in calm and ſedate diſcourſe it ought to keep its natural ſtate, an upright poſture. However, it ſhould not be long without motion, nor yet always moving; but gently turn ſometimes on one ſide, and ſometimes on the other, as occaſion requires, that the voice may be heard by all who are preſent; and then return again to its natural poſition. It ſhould always accompany the other actions of the body, and turn on the ſame ſide with them; except when averſion to any thing is expreſſed, which is done by ſtretching out the right hand, and turning the head to the left. The ancients erected a ſtatue of Venus in this poſture, who was called by the Greeks *αποστροφια*, and by the Latins *Verticordia*, and in Engliſh may be termed the *forbidding Venus*. But nothing is more indecent than violent motions and agitations of the head. And therefore, when a

witty writer, who is well known among us, would convey the moſt ridiculous idea of a pretender to knowledge, he expreſſes it thus:

For having three times ſhook his head
To ſtir his wit up, thus he ſaid. HUDIB.

But it is the countenance, that chiefly repreſents both the paſſions and diſpoſitions of the mind. By this we expreſs love, hatred, joy, ſorrow, modeſty, and confidence: by this we ſupplicate, threaten, ſooth, invite, forbid, conſent, or refuſe; and all this without ſpeaking. Nay, from hence we form a judgment not only of a perſon's preſent temper, but of his capacity and natural diſpoſition. And therefore it is common to ſay, *ſuch an one has a promiſing countenance*, or *that he promiſes little by his countenance*. It is true, this is no certain rule of judging; nor is it in the power of any one to alter the natural make of his countenance: however, it may put us upon endeavouring to gain the moſt pleaſing aſpect we can; ſince it is ſo natural for mankind to draw ſuch concluſions from it; and ſome perſons are ſo unhappy, as to render their countenance more diſagreeable, than otherwiſe it would be, by ill habits.

But the ſeveral parts of the face bear their part, and contribute to the proper and decent motion of the whole. In a calm and ſedate diſcourſe, all the features retain their natural ſtate and ſituation. In ſorrow, the forehead and eyebrows lour, and the cheeks hang down. But in expreſſions of joy and cheerfulneſs, the forehead and eyebrows are expanded, the cheeks contracted, and the corners of the mouth drawn upwards. Anger and reſentment contract the forehead, draw the brows together, and thruſt out the lips. And terror elevates both the brows and forehead. As theſe are the natural ſigns of ſuch paſſions, the orator ſhould endeavour to conform to them.

But as the eyes are moſt active and ſignificant, it is the advice of Cicero that the greateſt care ſhould be taken in their management. And he gives this reaſon for it, "Becauſe other parts of the countenance have but few motions; whereas all the paſſions of the ſoul are expreſſed in the eyes, by ſo many different actions, which cannot poſſibly be repreſented by any geſtures of the body, if the eyes are kept in a fixed poſture." Common experience does in a great meaſure confirm the truth of this obſervation. We readily gueſs at a perſon's intention, or how he is affected to us, by his eyes. And any ſudden change or emotion of the mind is preſently followed by an alteration in the look. In ſpeaking therefore upon pleaſant and delightful ſubjects, the eyes are briſk and cheerful; as, on the contrary, they ſink and are languid in delivering any thing melancholy and ſorrowful. This is ſo agreeable to nature, that before a perſon ſpeaks, we are prepared with the expectation of one or the other from his different aſpect. So likewiſe in anger, a certain vehemence and intenſeneſs appears in the eyes, which, for want of proper words to expreſs it by, we endeavour to repreſent by metaphors taken from fire, the moſt violent and rapid element, and ſay in ſuch caſes, the *eyes ſparkle, burn*, or are *inflamed*. In expreſſions of hatred or deteſtation, it is natural to alter the look, either by turning the eyes aſide, or downwards. Virgil has very juſtly obſerved this: for when he deſcribes Æneas meeting with Dido in the Elyſian ſhades, and addreſſing her, he repreſents her diſregard of him, by ſaying,

Diſdainfully ſhe look'd; then turning round,
Still fix'd her eyes unmov'd upon the ground.

She ſhowed her reſentment for his former treatment of her, by not vouchſafing to look on him. Indeed, the eyes are ſometimes turned downwards upon other occaſions, as to expreſs modeſty. And if at any time a particular object be addreſſed to, whatever it be, the eyes ſhould be turned that way. And therefore Philoſtratus very deſervedly ridicules a certain rhetorician as guilty of a ſoleciſm in geſture, who, upon ſaying, *O Jupiter!* turned his eyes downward; and when he ſaid, *O earth!* looked upward. A ſtaring look has the appearance of giddineſs and want of thought; and to contract the eyes, gives ſuſpicion of craft and deſign. A fixed look may be occaſioned from intenſeneſs of thought, but at the ſame time ſhows a diſregard to the audience; and a too quick and wandering motion of the eyes denotes levity and wantonneſs. A gentle and moderate motion of the eyes is therefore in common moſt ſuitable, always directed to ſome of the audience, and gradually turning from ſide to ſide with an air of reſpect and modeſty, and looking them decently in the face, as in common diſcourſe: ſuch a behaviour will of courſe draw an attention. As in converſation, when a perſon addreſſes us in an handſome and becoming manner, we preſently put ourſelves in a poſture to give what he ſays a proper reception. But as all the paſſions are in the moſt lively manner expreſſed in the eyes, their motions ought to vary according to the different nature of thoſe paſſions they are ſuited both to diſcover in the ſpeaker, and convey to his hearers; ſince, as the quickeſt acceſs to the mind is by the ſight, a proper well-timed look will ſometimes ſooner effect this than it can be done by words; as in diſcharging a cannon, we are ſtruck with the light before we hear the ſound.

As to the other parts of the body diſtinct from the head, the ſhoulders ought not to be elevated; for this is not only in itſelf indecent, but it likewiſe contracts the neck, and hinders the proper motion of the head. Nor, on the other hand, ſhould they be drawn down, and depreſſed; becauſe this occaſions a ſtiffneſs both to the neck and the whole body. Their natural poſture therefore is beſt, as being moſt eaſy and graceful. To ſhrug the ſhoulders has an abject and ſervile air; and frequently to heave them upwards and downwards is a very diſagreeable ſight.

A continued motion of the arms any way, is by all means to be avoided. Their action ſhould generally be very moderate, and follow that of the hands, unleſs in very pathetic expreſſions, where it may be proper to give them a more lively ſpring.

The hands need never be idle. Quintilian ſeems to think them as neceſſary and powerful in action, as Cicero does the eyes. "The hands (ſays he), without which all geſture is lame and weak, have a greater variety of motions than can well be expreſſed; for they are almoſt equal to our words. Do not we deſire with them, promiſe, call, diſmiſs, threaten, beſeech, deteſt, fear, inquire, deny? Do not they expreſs joy, ſorrow, doubt, confeſſion, penitence, meaſure, plenty, number, and time? Do not they excite, reſtrain, prove, admire, and ſhame? That in ſo great a variety of ſpeech among all nations and countries, this ſeems to me the common language of all mankind." Thus far Quintilian. Now, all bodily motion, is either upward or downward, to the right or left, forward or backward, or elſe circular. The hands are employed by the orator in all theſe, except the laſt. And as they ought to correſpond with our expreſſions, ſo they ought to begin and end with them. In admiration, and addreſſes to heaven they muſt be elevated, but never raiſed above the eyes; and in ſpeaking of things below us, they are directed downwards. Side motion ſhould generally begin from the left, and terminate gently on the right. In demonſtrating, addreſſing, and on ſeveral other occaſions, they are moved forward; and in threatening ſometimes thrown back. But when the orator ſpeaks of himſelf, his right-hand ſhould be gently laid on his breaſt. When no other motion is neceſſary, the hands ſhould be kept about as high as the breaſt, ſo as to make near a right angle with the arm. This is not only graceful, but likewiſe the moſt eaſy poſture, and gives the leaſt ſtrain to the muſcles. They ſhould never be ſuffered to hang down, nor to loll upon the cuſhion or bar. The left hand ſhould never move alone, but

accommodate itſelf to the motions of the right. In motions to the left ſide, the right hand ſhould not be carried beyond the left ſhoulder. In promiſes, and expreſſions of compliment, the motion of the hands ſhould be gentle and ſlow; but in exhortations and applauſe more ſwift. The hands ſhould generally be open: but in expreſſions of compunction and anger they may be cloſed. All finical and trifling actions of the fingers ought to be avoided; nor ſhould they be ſtretched out and expanded in a ſtiff and rigid poſture, but kept eaſy and pliable.

Neither the breaſt nor the belly ſhould be thruſt out; which in itſelf looks ungainly, and hinders the free motion of the trunk; which ought not to be kept too ſtiff and upright, but eaſy and flexible, always ſuiting itſelf to the motions of the head and hands. The feet ſhould continue ſteady, and not give the body a wavering and giddy motion, by frequently ſhifting; though ſome perſons fall into that habit, without moving their feet. Curio, a Roman orator, as Cicero tells us, was addicted to this; which occaſioned a friend of his once to paſs a joke upon him, by aſking, *Who that was talking out of a boat?* The jeſt is too plain to need explication; for every one knows the waving of a boat will give the body ſuch a motion.

The geſtures we have hitherto diſcourſed of, are ſuch as naturally accompany our expreſſions. And we believe thoſe we have mentioned, if duly attended to, will be found ſufficient to anſwer all the purpoſes of our modern pronunciation. The ancients, indeed, uſed ſeveral more vehement actions and geſtures than we are accuſtomed to; as we have formerly ſhown. Philip the Roman orator, as Cicero informs us, did not uſe to prepare his diſcourſes; but ſpoke, as we ſay, *off hand*. And he was wont to tell his friends, "he was never fit to talk till he had warmed his arm." He doubtleſs, therefore, uſed a more violent motion with his arms and hands than is common with us. And Cicero calls the arm projected, *the orator's weapon*. Indeed, to extend or brandiſh the arm, carries in it an air of command and authority, which was not unbecoming the character of Philip, who was a perſon of the higheſt rank and quality. And therefore young orators, both among the Greeks and Romans, for a time uſed no motion of the arm, but kept it confined in their garment, as an argument of modeſty, till age and experience allowed them to uſe greater freedom. Nor was it uncommon for the ancient orators to expreſs the exceſs of their paſſions by tears. They thought nothing unbecoming that was natural; and judged it agreeable to the characters even of the braveſt men, to be touched with a ſenſe of humanity in great calamities: And therefore we find both Homer and Virgil make their greateſt heroes ſhed tears on ſome occaſions.

The other ſort of geſtures above mentioned are ſuch as ariſe from imitation: as where the orator deſcribes ſome action, or perſonates another ſpeaking. But here great care is to be taken not to over act his part, by running into any ludicrous or theatrical mimicry. It is ſufficient for him ſo to repreſent things of this nature, as may beſt convey the image of them in a lively manner to the minds of the hearers; without any ſuch change either of his actions or voice as are not ſuitable to his own character.

Chap. III. *Some particular Rules for the Voice and Geſture.*

The ſubject of pronunciation is of ſo great importance to an orator, than it can neither be too clearly laid down, nor too ſtrongly inculcated. If we enquire into the cauſes of that ſurpriſing power it has over us, and by what means it ſo ſtrongly affects us, this may in ſome meaſure appear by reflecting on the frame and conſtitution of human nature. For our infinitely great and wiſe Maker has ſo formed us, that not only the actions of the body are ſubject to the direction of the mind, but we are likewiſe endowed with various paſſions and affections, that excite us to purſue thoſe things which make for our happineſs, and avoid others which are hurtful to us. And as we are made for ſociety, we are alſo furniſhed with ſpeech, which enables us to converſe one with another. And ſuch is the contrivance of our make, and influence of our minds upon the mechaniſm of our bodies, that we can not only communicate our thoughts to each other, but likewiſe our paſſions. For, as Cicero well obſerves, "Every motion of the mind has naturally its peculiar countenance, voice, and geſture; and the whole body, every poſition of the face, and ſound of the voice, like the ſtrings of an inſtrument, act agreeably to the impreſſion they receive from the mind." Nor is this all: but as every one is differently affected himſelf, he is capable to make the like impreſſions upon others, and excite them to the ſame motions which he feels in himſelf. As when two inſtruments are ſet to the ſame pitch, the ſtrings of the one being touched, produce in the other the like ſound. This common ſympathy in the human frame ſhows how neceſſary it is that an orator ſhould not only in general be well acquainted with the rules of pronunciation, but likewiſe know how to uſe them as occaſion requires. For a general knowledge of the rules of art is not of itſelf ſufficient to perfect an artiſt, without a further acquaintance with the particular application of them to their ſeveral caſes and circumſtances. Thus, for inſtance, it is not enough for an orator to underſtand all the beauties and ornaments of language, and which of them are ſuited to form the ſeveral kinds of ſtyle, unleſs he can likewiſe accomodate each of thoſe characters to their proper ſubject. And ſo likewiſe in pronunciation, he ought not only to know the ſeveral qualities of the voice, and proper geſtures of the body, but alſo when and where to make uſe of them. For not only different ſubjects, but alſo different parts of the ſame diſcourſe, and even particular expreſſions, often require a difference in the manner of pronunciation, both as to the voice and geſture. Having therefore treated on both theſe parts of pronunciation in general, it may not be amiſs now to conſider how they are to be applied in each of the two reſpects laſt mentioned.

We ſhall begin with the parts of a diſcourſe, and treat of them in their natural order. And here the view and deſign of the ſpeaker in each of them will eaſily help us to ſee the proper manner of pronunciation.

Let us ſuppoſe then a perſon preſenting himſelf before an aſſembly, in order to make a diſcourſe to them. It cannot be decent immediately to begin to ſpeak ſo ſoon as ever he makes his appearance. He will firſt ſettle himſelf, compoſe his countenance, and take a reſpectful view of his audience. This prepares them for ſilence and attention. To begin preſently, and hurry on, without firſt allowing either himſelf or his hearers time to compoſe themſelves, looks as if he was rather performing a taſk than had any deſign to pleaſe them; which will be very apt to make them as uneaſy till he has done, as he ſeems to be himſelf. Perſons commonly form ſome opinion of a ſpeaker from their firſt view of him, which prejudices them either in his favour, or otherwiſe, as to what he ſays afterwards. A grave and ſedate aſpect inclines them to think him ſerious; that he has conſidered his ſubject, and may have ſomething to offer worth their attention. A haughty and forbidding air occaſions diſtaſte, as it looks like diſreſpect. A wandering giddy countenance argues levity. A dejected drooping appearance is apt to raiſe contempt, unleſs where the ſubject is melancholy. And a cheerful aſpect is a proper prelude to a pleaſant and agreeable argument.

To ſpeak low at firſt has the appearance of modeſty, and is beſt for the voice; which, by riſing gradually, will with more eaſe be carried to any pitch that may be afterwards neceſſary, without ſtraining it. However ſome variation of the voice is always proper to give it an harmony. Nay, and ſometimes it is not improper for an orator to ſet out with a conſiderable degree of warmth, expreſſed by ſuch an elevation of the voice, and geſ-

tures of the body, as are ſuited to repreſent the emotions of his mind. But this is not ordinarily the caſe. We have ſome few inſtances of this in Cicero; as in his oration for Roſcius Amerinus, where the heinouſneſs of the charge could not but excite his indignation againſt the accuſers. And ſo likewiſe in that againſt Piſo, and the two firſt againſt Catiline, which begin in the ſame manner, from the reſentment he had conceived againſt their perſons and conduct.

In the narration, the voice ought to be raiſed to ſomewhat an higher pitch. Matters of fact ſhould be related in a very plain and diſtinct manner, with a proper ſtreſs and emphaſis laid upon each circumſtance, accompanied with ſuitable addreſs and motions of the body, to engage the attention of the hearers. For there is a certain grace in telling a ſtory, by which thoſe who are maſters of it, ſeldom fail to recommend themſelves in converſation. The beauty of it conſiſts in an eaſy and familiar manner of expreſſion, attended with ſuch actions and geſtures as are ſuited to the nature of the things related, and help to enliven each particular circumſtance and part of the diſcourſe.

The propoſition, or ſubject of the diſcourſe, ſhould be delivered with a very clear and audible voice. For if this be not plainly heard, all that follows in proof of it cannot well be underſtood. And for the ſame reaſon, if it be divided into ſeveral parts or branches, they ſhould each be expreſſed very deliberately and diſtinctly. But as the deſign here is only information, there can be little room for geſture.

The confirmation admits of great variety both of the voice and geſtures. In reaſoning, the voice is quick and pungent, and ſhould be enforced with ſuitable actions. And as deſcriptions likewiſe have often a place here, in painting out the images of things, the orator ſhould ſo endeavour to adapt both his voice, and the motions of his body, particularly the turn of his eyes, and action of his hands, as may beſt help the imagination of his hearers. Where he introduces another perſon ſpeaking, or addreſſes to an abſent perſon, it ſhould be with ſome degree of imitation. And in dialogue the voice ſhould alter with the parts. When he diverts from his ſubject by any digreſſion, his voice ſhould be lively and chearful; ſince that is rather deſigned for entertainment than inſtruction.

In confutation, the arguments of the adverſe party ought firſt to be repeated in a plain and diſtinct manner, that the ſpeaker may not ſeem to conceal or avoid the force of them. Unleſs they appear trifling, and unworthy of a ſerious anſwer; and then a facetious manner, both of expreſſion and geſture, may be the propereſt way to confute them. For to attempt to anſwer in a grave and ſerious manner, what is in itſelf empty and ludicrous, is apt to create a ſuſpicion of its having more in it than it really has. So when Tubero, in his accuſation of Ligarius before Cæſar, had made it part of his charge, that Ligarius was in Africa during ſome part of the civil war between Cæſar and Pompey; Cicero in his anſwer, not thinking it deſerved a ſerious reply, contents himſelf with barely mentioning it ironically. For thus he begins his defence of Ligarius: "Cæſar, my kinſman Tubero has laid before you a new crime, and till this day unheard of, that Q. Ligarius was in Africa." Every one muſt eaſily perceive, by the manner in which theſe words were pronounced, that the deſign of them was to make the charge appear ridiculous. But caution ſhould be uſed not to repreſent any argument of weight in a ludicrous way, leſt by ſo doing the ſpeaker ſhould more expoſe himſelf than his adverſary.

In the concluſion, both the voice and geſture ſhould be briſk and ſprightly, which may ſeem to ariſe from a ſenſe of the ſpeaker's opinion of the goodneſs of his cauſe, and that he has offered nothing but what is agreeable to reaſon and truth; as likewiſe from his aſſurance that the audience agree with him in the ſame ſentiments. In every undertaking that requires care and thought, perſons are apt at firſt to be ſedate and moderate; but when it is drawn to an end, and is near finiſhed, it is very natural to appear more gay. If an enumeration of the principal arguments of the diſcourſe be convenient, as it ſometimes is, where they are pretty numerous, or the diſcourſe is long, they ought to be expreſſed in the moſt clear and forcible manner. And if there be an addreſs to the paſſions, both the voice and geſture muſt be ſuited to the nature of them, of which more will be ſaid preſently.

We proceed now to the conſideration of particular expreſſions. And what we ſhall offer here, will be firſt in relation to ſingle words, then ſentences, and laſtly the paſſions.

I. Even in thoſe ſentences which are expreſſed in the moſt even and ſedate manner, there is often one or words which require an emphaſis and diſtinction of the voice. Pronouns are often of this kind; as, *This is the man.* And ſuch are many words that denote the circumſtances and qualities of things. Such as heighten or magnify the idea of the thing to which they are joined, elevate the voice; as *noble, admirable, majeſtic, greatly,* and the like. On the contrary, thoſe which leſſen the idea, or debaſe it, depreſs the voice, or at leaſt protract the tone; of which ſort are the words *little, mean, poorly, contemptible,* with many others. Some tropes likewiſe, as metaphors and verbal figures, which conſiſt in the repetition of a ſingle word, ſhould have a particular emphaſis. As when Virgil ſays of the river Araxes, *It diſdained a bridge.* And Niſus of himſelf, in the ſame poet, *I, I am the man*: where the repeated word is loudeſt. This diſtinction of words, and giving them their proper emphaſis, does not only render the expreſſion more clear and intelligible, but very much contributes to the variation of the voice, and the preventing a monotony. And the different pronunciation of theſe words will alſo require a peculiar geſture.

II. In ſentences, regard ſhould be had to their length, and the number of their parts, in order to diſtinguiſh them by proper pauſes. The frame and ſtructure of the period ought likewiſe to be conſidered, that the voice may be ſo managed as to give it the moſt muſical accent. Unleſs there be ſome ſpecial reaſon for the contrary, it ſhould end louder than it begins. And this difference of tone between the end of the former ſentence and the beginning of the next, not only helps to diſtinguiſh the ſenſe, but adds to the harmony of the voice. And that the laſt ſyllables of a ſentence might become more audible and diſtinct, was doubtleſs one reaſon why the ancient rhetoricians diſlike ſhort feet at the end of a period. In an antitheſis, or a ſentence conſiſting of oppoſite parts, one contrary muſt be louder than the other. As, "*He is gone, but by a gainful remove, from* painful labour *to* quiet reſt; *from* unquiet deſires *to happy* contentment: *from* ſorrow *to* joy; *and from* tranſitory time *to* immortality." In a climax or gradation, the voice ſhould riſe with it. So, "*There is no enjoyment of* property *without* government; *no* government *without a* magiſtrate; *no* magiſtrate *without* obedience; *no* obedience *where every one acts as he* pleaſes." And ſo in other gradations of a different form. As, "*Since* concord *was loſt,* friendſhip *was loſt,* fidelity *was loſt,* liberty *was loſt,* all *was loſt.*" And again, "*You would pardon him whom the* ſenate *hath condemned, whom* the people of Rome *have condemned, whom* all mankind *have condemned.*" We might mention ſeveral other figurative expreſſions, which require a particular conformation and management of the voice; but theſe, we preſume, with ſome others we ſhall have occaſion to name preſently when we come to the paſſions, may be ſufficient to guide us in the reſt. But that it may appear more evidently how neceſſary a different inflection and variation of the voice is in moſt ſentences, give us leave to ſhow how Quintilian illuſtrates it, by a paſſage which he takes from Cicero. The place is the beginning of Cicero's defence for Milo, and the words are theſe: "*Although I. am apprehenſive it may ſeem baſe to diſcover fear when I enter upon the defence of* a

moſt courageous man, *and it may appear very indecent*, when Milo diſcovers more concern for the public ſafety than for his own, *not to ſhow a greatneſs of mind equal to his cauſe, yet this new form of the court terrifies my eyes*, which cannot diſcern the ancient manner of the forum, and former cuſtom of trials, *whatever way they look:* your bench is not ſurrounded with its uſual attendants." This ſentence conſiſts of four members. And Quintilian ſuppoſes, that though theſe words are the beginning of a ſpeech, and were accordingly expreſſed in a calm and ſubmiſſive manner, yet that the orator uſed a great deal of variety in the pronunciation of their ſeveral parts. In the firſt member (as he imagines) his voice was more elevated in expreſſing the words, *a moſt courageous man*, than in thoſe other parts of it, *I am apprehenſive it may ſeem baſe*, and, *to diſcover fear*. In the ſecond member he roſe higher, in ſaying *when Milo diſcovers more concern for the public ſafety than for his own*; and then again, as it were, checked himſelf in what follows, *not to ſhow a greatneſs of mind equal to his cauſe*. The beginning of the third member, carrying a reflection in it, was ſpoke with a different tone of the voice, *this new form of the court terrifies my eyes*; and the other part of it more loud and diſtinctly, *which cannot diſcern the ancient manner of the forum, and former cuſtom of trials*. And the laſt member was ſtill more raiſed and audible, *your bench is not ſurrounded with its uſual attendants*. And it muſt be ſuppoſed, that while he was ſaying this, he caſt his eyes round the aſſembly, and viewed the ſoldiers whom Pompey had placed there, which renders the expreſſion ſtill more grave and ſolemn. If this was the manner of the ancient orators, and they were ſo exact and accurate in expreſſing their periods, and the ſeveral parts of them, as we have reaſon to believe they were, it muſt have given a very great force, as well as beauty, to their pronunciation.

III. That the paſſions have each of them both a different voice and action, is evident from hence; that we know in what manner a perſon is affected, by the tone of his voice, though we do not underſtand the ſenſe of what he ſays, or many times ſo much as ſee him; and we can often make the ſame judgment from his countenance and geſtures. Love and eſteem are expreſſed in a ſmooth and cheerful tone; but anger and reſentment, with a rough, harſh, and interrupted voice; for when the ſpirits are diſturbed and ruffled, the organs are moved unequally. Joy raiſes and dilates the voice, as ſorrow ſinks and contracts it. Cicero takes notice of a paſſage in an oration of Gracchus, wherein he bewails the death of his brother, who was killed by Scipio, which in his time was thought very moving: "*Unhappy man* (ſays he), *whither ſhall I betake myſelf? where ſhall I go?* Into the capitol? *that flows with my brother's blood.* Shall I go home? *and behold my unhappy mother all in tears and deſpair?*" Though Gracchus had a very ill deſign in that ſpeech, and his view was to excite the populace againſt their governors, yet (as Cicero tells us) when he came to this paſſage, he expreſſed himſelf in ſuch moving accents and geſtures, that he extorted tears even from his enemies. Fear occaſions a tremor and heſitation of the voice, and aſſurance gives it ſtrength and firmneſs. Admiration elevates the voice, and ſhould be expreſſed with pomp and magnificence: *O ſurpriſing clemency, worthy of the higheſt praiſe and greateſt encomiums, and fit to be perpetuated in laſting monuments!* This is Cicero's compliment to Cæſar, when he thought it for his purpoſe. And oftentimes this paſſion is accompanied with an elevation both of the eyes and hands. On the contrary, contempt ſinks and protracts the voice. In the diſpute between Cicero and Cecilius, which of them ſhould accuſe Verres, Cicero puts this contemptuous queſtion to him: "How are you qualified, Cecilius, for ſuch an undertaking? I will not aſk, when you ever gave a proof of it; but when you ſo much as attempted it? Do you conſider the difficulty of managing a public cauſe?" with much more to the ſame purpoſe. Though ſuch kind of expreſſions require little geſture, yet ſometimes a motion of the hand may not be improper, to ſignify diſdain or averſion. We may ſuppoſe Cicero to have acted thus in his defence of Rabirius. For to ſhow his aſſurance of his client's cauſe, having uſed this expreſſion in a very audible manner, "I wiſh I had it to ſay, that Rabirius had with his own hand killed Saturninus, who was an enemy to the Roman ſtate," ſome perſons in the crowd began to raiſe a clamour, juſt as of later times hiſſing has been practiſed on the like occaſions. Upon which Cicero immediately replies, "This noiſe does not diſturb me but pleaſe me, ſince it ſhows, though there are ſome weak perſons, yet they are but few." Then preſently after follows the expreſſion we refer to: "Why do not you ceaſe your clamour, ſince it only diſcovers your folly, and the ſmallneſs of your number?" All exclamations ſhould be violent. When we addreſs to inanimate things, the voice ſhould be higher than when to animated beings; and appeals to heaven muſt be made in a loftier tone than thoſe to men.

Theſe few hints for expreſſing the principal paſſions may, if duly attended to, ſuffice to direct our practice in others. Though, after all, it is impoſſible to gain a juſt and decent pronunciation of voice and geſture merely from rules, without practice and an imitation of the beſt examples. Which ſhows the wiſdom of the ancients in training up their youth to it, by the aſſiſtance of maſters, to form both their ſpeech and actions.

But there is one thing which ought always to be attended to; namely, that perſons ſhould well conſider their own make and genius, eſpecially with reſpect to the paſſions. We ſeldom find, that any actor can excel in all characters; but if he performs one well, he is deficient in another: And therefore they are commonly ſo prudent as to confine themſelves to ſuch as beſt ſuit them. The caſe is the ſame in an orator; who ſhould therefore keep within thoſe bounds which nature ſeems to have preſcribed for him. Some are better fitted for action than others; and moſt for ſome particular actions rather than others; and what ſits well upon one would appear very aukward in another. Every one, therefore, ſhould firſt endeavour to know himſelf, and manage accordingly. Though in moſt caſes, nature may be much aſſiſted and improved by art and exerciſe. See Profeſſor Ward's *Syſtem of Oratory*.

ORB

ORB

Oratory, among the Romaniſts, a cloſet or like apartment near a bed-chamber, furniſhed with an altar, crucifix, &c. for private devotions.

Orb, in aſtronomy, denotes an hollow globe or ſphere.

Orb, in tactics, is the diſpoſing of a number of ſoldiers in circular form of defence. The orb has been thought of conſequence enough to employ the attention of the famous marſhal de Puyſegur in his art of war, who prefers this poſition to throw a body of infantry in an open country, to reſiſt cavalry, or even a ſuperior force of infantry; becauſe it is regular and equally ſtrong, and gives an enemy no reaſon to expect better ſucceſs by attacking one place than another. Cæſar drew his whole army in this form, when he fought againſt Labienus. The whole army of the Gauls were formed into an orb, under the command of Sabinus and Cotta, when fighting againſt the Romans. The orb was generally formed ſix deep.

Orbit, in aſtronomy, the path of a planet or comet, or the curve that it deſcribes in its revolution round its central

body; thus the earth's orbit is the curve which it deſcribes in its annual courſe round the ſun, and uſually called the *ecliptic*. See ASTRONOMY.

ORCADES, *the Orkney Iſlands*. See ORKNEY.

ORCHARD, a garden-department, conſigned entirely to the growth of ſtandard fruit-trees, for furniſhing a large ſupply of the moſt uſeful kinds of fruit. In the orchard you may have, as ſtandards, all ſorts of apple trees, moſt ſorts of pears and plums, and all ſorts of cherries: which four ſpecies are the capital orchard fruits; each of them compriſing numerous valuable varieties. But to have a complete orchard, you may alſo have quinces, medlars, mulberries, ſervice-trees, filberts, Spaniſh nuts, berberries; likewiſe walnuts and cheſnuts; which two latter are particularly applicable for the boundaries of orchards, to ſcreen the other trees from the inſults of impetuous winds and cold blaſts. All the trees ought to be arranged in rows from 20 to 30 feet diſtance, as hereafter directed. But ſometimes orchards conſiſt entirely of apple-trees, particularly in the cyder-making counties, where they are cultivated in very great quantities in large fields, and in hedge-rows, for the fruit to make cyder for public ſupply. And ſometimes whole orchards of very conſiderable extent are entirely of cherry-trees. But in this caſe, it is when the fruit is deſigned for ſale in ſome great city, as London, &c. for the ſupply of which city, great numbers of large cherry-orchards are in ſome of the adjacent counties, but more particularly in Kent, which is famous for very extenſive cherry-orchards; many of which are entirely of that ſort called *Kentiſh cherry*, as being generally a great bearer; others are ſtored with all the principal ſorts of cultivated cherries, from the earlieſt to the lateſt kinds. See PRUNUS *Ceraſus*.

A general orchard, however, compoſed of all the beforementioned fruit-trees, ſhould conſiſt of a double portion of apple-trees or more, becauſe they are conſiderably the moſt uſeful fruit, and may be continued for uſe the year round.

The utility of a general orchard, both for private uſe and profit, ſtored with the various ſorts of fruit-trees, muſt be very great, as well as afford infinite pleaſure from the delightful appearance it makes from early ſpring till late in autumn: In ſpring the various trees in bloſſom are highly ornamental; in ſummer, the pleaſure is heightened by obſerving the various fruits advancing to perfection; and as the ſeaſon advances, the mature growth of the different ſpecies ariving to perfection, in regular ſucceſſion, from May or June, until the end of October, muſt afford exceeding delight, as well as great profit.

Of the proper Extent, Situation, and Soil for this Department.] As to the proper extent of ground for an orchard, this muſt be proportioned, in ſome meaſure, to the extent of land you have to work on, and the quantity of fruit required either for private uſe or for public ſupply: ſo that an orchard may be from half an acre to 20 or more in extent.

With reſpect to the ſituation and aſpect for an orchard, we may obſerve very thriving orchards both in low and high ſituations, and on declivities and plains, in various aſpects or expoſures, provided the natural ſoil is good: we ſhould, however, avoid very low damp ſituations as much as the nature of the place will admit; for in very wet ſoils no fruit trees will proſper, nor the fruit be fine: but a moderately low ſituation, free from copious wet, may be more elegible than an elevated ground, as being leſs expoſed to tempeſtuous winds; though a ſituation having a ſmall declivity is very deſirable, eſpecially if its aſpect incline towards the eaſt, ſouth eaſt, or ſoutherly, which are rather more eligible than a weſterly aſpect; but a north aſpect is the worſt of all for an orchard, unleſs particularly compenſated by the peculiar temperament or good quality of the ſoil.

And as for ſoil, any common field or paſture that produces good crops of corn, graſs, or kitchen-garden vegetables, is ſuitable for an orchard; if it ſhould prove of a loamy nature, it will be a particular advantage: any ſoil, however, of a good quality, not too light and dry, or too heavy, ſtubborn, or wet, but of a medium nature, of a ſoft, pliant temperature, not leſs than one ſpade deep of good ſtaple, will be proper for this purpoſe.

Preparation of the Ground.] The preparation of the ground for the reception of trees, is by trenching; or, if for very conſiderable orchards, by deep ploughing; but trench-digging, one or two ſpades, as the ſoil will admit, is the moſt eligible, either wholly, or only for the preſent in the places where the lines of trees are to ſtand, a ſpace of ſix or eight feet wide, all the way in each row, eſpecially if it be graſs-ground, and intended to be kept in the ſward; or if any under-crops are deſigned to be raiſed, the ground may be wholly trenched at firſt: in either caſe trench the ground in the uſual way to the depth of the natural ſoil; and if in graſs, turn the ſward clean to the bottom of each trench, which, when rotted, will prove an excellent manure.

In planting orchards, however, on graſs-grounds, ſome only dig pits for each tree, capacious enough for the reception of the roots, looſening the bottom well, without the labour of digging any other part of the ground.

The ground muſt be fenced ſecurely againſt cattle, &c. either with a good ditch and hedge, or with a paling fence, as may be moſt convenient. See HEDGES.

Method of planting the Trees.] The beſt ſeaſon for planting all the ſorts of fruit-trees is autumn, ſoon after the fall of the leaf, from about the latter end of October until December; or indeed it might be performed any time in open weather from October until March.

Chooſe principally full ſtandards, with ſtraight clean ſtems, ſix feet high; each with a branchy well-formed head, or from two or three to four or five years growth; and let ſeveral varieties of each particular ſpecies be choſen, that ripen their fruit at different times, from the earlieſt to the lateſt, according to the nature of the different ſorts, that there may be a proper ſupply of every ſort regularly during their proper ſeaſon. Of apples and pears in particular, chooſe a much greater quantity of the autumnal and late-ripening kinds than of the early ſorts; but moſt of all of apples: for the ſummer-ripening fruit is but of ſhort duration, only proper for temporary ſervice; but the later ripening kinds keep ſound ſome conſiderable time for autumnal uſe; and the lateſt ſorts that ripen in October, continue in perfection for various uſes all winter, and ſeveral ſorts until the ſeaſon of apples come again.

Having made choice of the proper ſorts, and marked them, let them be taken up with the utmoſt care, ſo as to preſerve all their roots as entire as poſſible; and when taken up, prune off any broken or bruiſed parts of the roots, and juſt tip the ends of the principal roots, in general, with the knife on the under ſide, with a kind of ſlope outward.

If the trees have been already headed, or ſo trained as to have branched out into regular ſhoots to form each a proper head, they muſt be planted with the ſaid heads entire, only retrenching or ſhortening any irregular or ill-placed ſhoot that takes an aukward direction, or grows acroſs its neighbours, or ſuch as may run conſiderably longer than all the reſt, &c.

The arrangement of the trees in the orchard muſt be in rows, each kind ſeparate, at diſtances according to the nature of the growth of the different ſorts; but for the larger growing kinds, ſuch as apples, pears, plums, cherries, &c. they ſhould ſtand from 25 to 30 or 40 feet every way aſunder, though 25 or 30 feet at moſt is a reaſonable diſtance for all theſe kinds.

Each ſpecies and its varieties ſhould generally be in rows by themſelves, the better to ſuit their reſpective modes of growth;

though for variety there may be ſome rows of apples and pears arranged alternately, as alſo of plums and cherries; and towards the boundaries there may be ranges of leſſer growth, as quinces, medlars, filberts, &c. and the outer row of all may be walnut-trees, and ſome cheſtnuts, ſet pretty cloſe to defend the other trees from violent winds.

According to the above diſtances, proceed to ſtake out the ground for making the holes for the reception of the trees; which if made to range every way, will have a very agreeable effect, and admit the currency of air, and the ſun's influence more effectually.

But in planting very extenſive orchards, ſome divide the ground into large ſquares or quarters, of different dimenſions, with intervals of fifty feet wide between; ſerving both as walks, and for admitting a greater currency of air; in different quarters planting different ſorts of fruit, as apples in one, pears in another, and plums and cherries in others, &c. and thus it may be repeated to as many quarters for each ſpecies and its varieties as may be convenient.

As to the mode of planting the trees: a wide hole muſt be dug for each tree, capacious enough to receive all the roots freely every way without touching the ſides. When the holes are all ready, proceed to planting, one tree in each hole, a perſon holding the ſtem erect, whilſt another trims in the earth, previouſly breaking it ſmall, and caſting it in equally all about the roots, frequently ſhaking the tree to cauſe the mould to ſettle in cloſe about all the ſmaller roots and fibres, and ſo as to raiſe the tree gradually up, that the crown of the roots may be but two or three inches below the general ſurface; and when the hole is filled up, tread it gently, firſt round the outſide, then near the ſtem of the tree, forming the ſurface a little hollow; and then if on the top of all is laid ſome inverted turf to the width of the hole, forming it with a ſort of circular bank, three or four inches high, it will ſupport the tree, and guard the roots from drying winds and the ſummer's drought: obſerving that each tree ſtand perfectly upright, and that they range exactly in their proper rows.

ORCHESTON St. Mary's, on Saliſbury plain in Wiltſhire, about nine miles from Saliſbury. There is a curious ſpecies of graſs found at this place in a meadow belonging to Lord Rivers, at preſent in the poſſeſſion of a farmer. The meadow is ſituated on a ſmall brook, is frequently overflowed, and ſometimes continues ſo a great part of the winter. It bears the greateſt burden in a wet ſeaſon.

We have the following account of this peculiar ſpecies of graſs in Letters and Papers on Agriculture, &c. The farmer in whoſe poſſeſſion the meadow is, informs us, "That it generally grows to the height of about 18 inches, and then falls and runs along the ground in knots to the length of 16 or 18 feet, but that he has known inſtances of its running to the length of 25 feet.

"The meadow contains about two acres and a half. It is mowed twice in a ſeaſon, and the average quantity is generally about twelve loads (tons) of hay the firſt mowing, and ſix the ſecond; though ſometimes conſiderably more. The tithe of the meadow has been compounded for at 9l. a year. The graſs is of a very ſweet nature; all cattle, and even pigs, eat it very eagerly. When made into hay, it is excellent, and improves beaſts greatly. The farmer ſays, his horſes will eat it in preference to corn mixed with chaff, when both are ſet before them together."

"This account appeared to us ſo ſingular, and the crop of graſs ſo very extraordinary, that our ſecretary went to Orcheſton to examine more particularly into it. The farmer, and divers other perſons in the village, confirmed the account contained in this letter, of its amazing produce in ſummers when the meadows had been overflowed in the preceding winter and ſpring; but when the winter had been dry, and the meadow not overflowed, the crop of graſs was not near ſo large. There did not appear to be any thing peculiar in the ſoil; nor were the other plants or weeds growing on it more luxuriant than in many other ſimilar ſituations. Some of this graſs was ſent to the ſociety at Norwich; ſome ingenious members of which inform us, that they think it is a ſpecies of the *agroſtis polymorpha*, mentioned by Hudſon in his *Flora anglica*, of which there are ſeveral varieties.

"Camden mentions, in his *Britannia*, a graſs growing near the place where this is found, which he calls *trailing Dog's graſs*, and ſays, that 'hogs were fed with it.'

"From all the inquiry made, we have not found this ſpecies of graſs growing in any other part of the kingdom; hence it is poſſible that there may be ſomething in the ſoil of this meadow peculiarly favourable to its growth. We ſhall not, however, determine on this point, but recommend trials to be made of propagating it, by ſowing the ſeed in other places ſubject to be overflowed in the ſame manner. If it can be propagated generally, it muſt turn out the moſt profitable to the farmer of any graſs yet diſcovered, and be of great benefit to the community."

ORCHESTRA, in the Grecian theatres, was that part of the *proſcenium* or ſtage where the chorus uſed to dance. In the middle of it was placed the Δογειον or *pulpit*. The orcheſtra was ſemicircular, and ſurrounded with ſeats. In the Roman theatres it made no part of the *ſcena*, but anſwered pretty nearly to the pit in our playhouſes, being taken up with ſeats for ſenators, magiſtrates, veſtals, and other perſons of diſtinction. The actors never went down into it. See Theatre.

ORCHIA lex, inſtituted by Orchius the tribune in the year of Rome 566. Its intention was to limit the number of gueſts that were to be admitted at an entertainment; and it alſo enforced, that during ſupper, which was the chief meal among the Romans, the doors of every houſe ſhould be left open.

ORCHIS, fool-stones: A genus of the diandria order, belonging to the gynandria claſs of plants; and in the natural method giving name to the ſeventh order, *Orchidæ*. Its characters are theſe: it has a ſingle ſtalk, with a vague ſheath, and no empalement; the flower hath five petals, three without and two within; the nectarium is of one leaf, fixed to the ſide of the receptacle, between the diviſion of the petals; the upper lip is ſhort and erect, the under large, broad, and ſpreading; the tube is pendulous, corniform, or like a horn, and prominent behind; it hath two ſhort ſlender ſtamina, ſitting upon the pointil, with oval erect ſummits, fixed to the upper lip of the nectarium; it hath an oblong contorted germen, under the flower, with a ſhort ſtyle, faſtened to the upper lip of the nectarium; the germen afterwards turns to an oblong capſule, with one cell, having three keel-ſhaped valves, opening on the three ſides, but jointed at top and bottom, filled with ſmall ſeeds like duſt. Miller enumerates 10, and Linnæus 33 ſpecies.

All thoſe ſorts of orchis deſcribed by Miller grow wild in ſeveral parts of England, but on account of the extreme oddneſs and beauty of their flowers, deſerve a place in every good garden; and the reaſon of their not being cultivated in gardens, proceeds from the difficulty of tranſplanting them: though this may be eaſily overcome, where a perſon has an opportunity of marking their roots, in their time of flowering, and letting them remain until their leaves are decayed, when they may be tranſplanted with ſafety; for it is the ſame with moſt ſorts of bulbous or fleſhy-rooted plants, which, if tranſplanted before their leaves decay, ſeldom live, notwithſtanding you preſerve a large ball of earth about them; for the extreme parts of their fibres extend to a great depth in the ground, from whence they receive their nouriſhment, which if broken or damaged by taking up their roots, ſeldom thrive after; for though they may

ſometimes remain alive a year or two, yet they grow weaker until they quite decay: which is alſo the caſe with tulips, fritillarias, and other bulbous roots. But if their ſoil and ſituation be adapted to their various ſorts, they will thrive and continue ſeveral years, and during their ſeaſon of flowering will afford as great varieties as any flowers which are at preſent cultivated. See pl. 2.

The moſt remarkable ſpecies are the following: 1. The *maſcula*, or male fool-ſtones, hath a root compoſed of two bulbs, crowned with oblong, broad, ſpotted leaves; upright-ſtalks, a foot high; garniſhed with one or two narrow amplexicaule leaves; and terminated by a long ſpike of reddiſh-purple flowers, having the petals reflexed backward; a quadrilobed crenated lip to the nectarium, and an obtuſe horn. The flowers of this ſpecies poſſeſs a very agreeable odour. The orchis maſcula, Lin. ſp. pl. is the moſt valuable; although the roots of ſome of the palmated ſorts, particularly of the orchis latifolia, are found to anſwer almoſt equally well. 2. The *morio*, or female orchis, hath a double bulbous root, crowned with oblong, ribbed, ſpreading leaves; erect flower-ſtalks, eight or ten inches high; garniſhed with a few amplexicaule leaves; and terminated by a ſhort looſe ſpike of flowers, having connivent petals, a quadrifid crenated lip to the nectarium, and an obtuſe horn. 3. The *militaris*, or man-orchis, hath a double bulbous root, crowned with oblong amplexicaule leaves; erect flower-ſtalks, eight or ten inches high; terminated by a looſe ſpike of aſh-coloured and reddiſh flowers, having confluent petals; a quinquefid, rough, ſpotted lip to the nectarium, and an obtuſe horn. The ſtructure of the flowers exhibit the figure of a naked man; and are often of different colours in the ſame flower, as aſh colour, red, brown, and dark ſtriped.

All the orchiſes are very hardy perennials, with bulbous fleſhy roots. The flowers appear in May, June, and July, but principally in June: their mode of flowering is univerſally in ſpikes, many flowers in each ſpike; and each flower is compoſed of five petals in two ſeries, and a nectarium. The ſeaſon for removing them is in ſummer, after they have done flowering, when their leaves and ſtalks decay: plant them three inches deep, and let them remain undiſturbed ſeveral years; for the leſs they are removed, the ſtronger they will flower.

The roots of all the ſpecies have a remarkable reſemblance to the ſcrotum of animals, whence the name. This plant flouriſhes in various parts of Europe and Aſia, and grows in our country ſpontaneouſly, and in great abundance. It is aſſiduouſly cultivated in the Eaſt; and the root of it forms a conſiderable part of the diet of the inhabitants of Turkey, Perſia, and Syria. From it is made the alimentary powder called SALEP; which, prepared from foreign roots, is ſold at five or ſix ſhillings per pound, though it might be furniſhed by ourſelves at the ſixth part of that price, if we choſe to pay any attention to the culture of this plant. The orchis maſcula is the moſt valued for this purpoſe. A dry and not very fertile ſoil is beſt adapted to its growth.

The propereſt time for gathering the roots, is when the ſeed is formed, and the ſtalk is ready to fall; becauſe the new bulb, of which the ſalep is made, is then arrived to its full maturity, and may be diſtinguiſhed from the old one, by a white bud riſing from the top of it, which is the germ of the orchis of the ſucceeding year. The culture of the orchis is an object highly deſerving of encouragement from all the lovers of agriculture. And as the root, if introduced into common uſe, would furniſh a cheap, wholeſome, and moſt nutritious article of diet, the growth of it would be ſufficiently profitable to the farmer. See SALEP.

ORCUS, god of the infernal regions, the ſame with Pluto, ſo called from the Greek word ὁρκος, ſignifying a "tomb or ſepulchre," or from ὁρκος "an oath by the river Styx." The ancients gave this name to all the divinities of the infernal regions, even to Cerberus. There was a river of the ſame name in Theſſaly, which took its riſe from the marſhes of the Styx, and the waters of which were ſo thick that they floated like oil upon the ſurface of the river Peneus, into which they diſcharged themſelves. This river probably ſuggeſted to the poets the idea of the infernal abodes, which they denominated *Orcus*. This deity has been confounded with Charon: he had a temple at Rome.

ORDEAL, an ancient form of trial. See TRIAL.—It was an appeal to the immediate interpoſition of divine power, and was peculiarly diſtinguiſhed by the appellation of *judicium Dei*; and ſometimes *vulgaris purgatio*, to diſtinguiſh it from the canonical purgation, which was by the oath of the party. There were two ſorts of it more common than the reſt, at leaſt in Europe, fire-ordeal, and water-ordeal. The former was confined to perſons of higher rank, the latter to the common people. Both theſe might be performed by deputy: but the principal was to anſwer for the ſucceſs of the trial; the deputy only venturing ſome corporal pain, for hire or perhaps for friendſhip.

That the purgation by ordeal, of ſome one kind or other, is very ancient, admits not of a doubt; and that it was very univerſal in the times of ſuperſtitious barbarity, is equally certain. It ſeems even to have been known to the ancient Greeks: for in the Antigone of Sophocles, a perſon ſuſpected by Creon of a miſdemeanour, declares himſelf ready "to handle hot iron and to walk over fire" in order to manifeſt his innocence; which the ſcholiaſt tells us was then a very uſual purgation. And Grotius gives us many inſtances of water-ordeal in Bithynia, Sardinia, and other places. It ſeems, however, to be carried to a greater height among the Hindoos, than ever it has been in any nation or among any people however rude or barbarous; for in a paper of the Aſiatic Reſearches communicated by the celebrated Warren Haſtings, Eſq; we find that the *trial by ordeal* among them is conducted in *nine* different ways: firſt, by the balance; ſecondly, by fire; thirdly, by water; fourthly, by poiſon; fifthly, by the Coſha, or water in which an idol has been waſhed; ſixthly, by rice; ſeventhly, by boiling oil; eighthly, by red hot iron; ninthly, by images.

I. Ordeal by the balance is thus performed. The beam having been previouſly adjuſted, the cord fixed, and both ſcales made perfectly even, the perſon accuſed and a Pandit faſt a whole day; then, after the accuſed has been bathed in ſacred water, the *homa*, or oblation, preſented to fire, and the deities worſhipped, he is carefully weighed; and, when he is taken out of the ſcale, the Pandits proſtrate themſelves before it, pronounce a certain *mantra* or incantation, agreeably to the Saſtras, and, having written the ſubſtance of the accuſation on a piece of paper, bind it on his head. Six minutes after, they place him again in the ſcale; and, if he weigh more than before, he is held guilty; if leſs, innocent; if exactly the ſame, he muſt be weighed a third time; when, as it is written in the *Mitacſhera*, there will certainly be a difference in his weight. Should the balance, though well fixed, break down, this would be conſidered as a proof of his guilt.

II. For the fire-ordeal, an excavation, nine hands long, two ſpans broad, and one ſpan deep, is made in the ground, and filled with a fire of pippal wood: into this the perſon accuſed muſt walk bare footed; and, if his foot be unhurt, they hold him blameleſs; if burned, guilty.

III. Water-ordeal is performed by cauſing the perſon accuſed to ſtand in a ſufficient depth of water, either flowing or ſtagnant, to reach his navel; but care ſhould be taken, that no ravenous animal be in it, and that it be not moved by much air: a brahman is then directed to go into the water, holding a ſtaff in his hand; and a ſoldier ſhoots three arrows on dry ground from a bow of cane: a man is next diſpatched to bring the arrow

which has been ſhot fartheſt; and, after he has taken it up, another is ordered to run from the edge of the water; at which inſtant the perſon accuſed is told to graſp the foot or the ſtaff of the brahman, who ſtands near him in the water, and immediately to dive into it. He muſt remain under water, till the two men, who went to fetch the arrows, are returned; for, if he raiſe his head or body above the ſurface, before the arrows are brought back, his guilt is conſidered as fully proved. In the villages near Benares, it is the practice for the perſon who is to be tried by this kind of ordeal, to ſtand in water up to his navel, and then, holding the foot of a brahman, to dive under it as long as a man can walk 50 paces very gently; if, before the man has walked thus far, the accuſed riſe above the water, he is condemned; if not, acquitted.

IV. There are two ſorts of trial by poiſon; firſt, the Pandits having performed their homa, and the perſon accuſed his ablution, two *rettis* and a half, or ſeven barley-corns, of *viſhanga*, a poiſonous root, or of *ſanchya* that is, white arſenic, are mixed in eight *maſhas*, or 64 *rettis*, of clarified butter, which the accuſed muſt eat from the hand of a brahman: if the poiſon produce no viſible effect, he is abſolved; otherwiſe, condemned. Secondly, the hooded ſnake, called *naga*, is thrown into a deep earthen pot, into which is dropped a ring, a ſeal, or a coin: this the perſon accuſed is ordered to take out with his hand; and, if the ſerpent bite him, he is pronounced guilty; if not, innocent.

V. Trial by the coſha is as follows: the accuſed is made to drink three draughts of the water, in which the images of the ſun, of devi, and other deities, have been waſhed for that purpoſe; and if, within 14 days, he has any ſickneſs or indiſpoſition, his crime is conſidered as proved.

VI. When ſeveral perſons are ſuſpected of theft, ſome dry rice is weighed with the ſacred ſtone called *ſalgram*, or certain *ſlocas* are read over it; after which the ſuſpected perſons are ſeverally ordered to chew a quantity of it: as ſoon as they have chewed it, they are to throw it on ſome leaves of *pippal*, or, if none be at hand, on ſome *bharja patra*, or bark of a tree from Nepal or Caſhmir. The man, from whoſe mouth the rice comes dry or ſtained with blood, is holden guilty; the reſt are acquitted.

VII. The ordeal by *hot oil* is very ſimple: when it is heated ſufficiently, the accuſed thruſts his hand into it; and, if he be not burned, is held innocent.

VIII. In the ſame manner, they make an *iron ball*, or the *head of a lance*, red hot, and place it in the hands of the perſon accuſed; who, if it burn him not, is judged guiltleſs.

IX. To perform the ordeal by *dharmaveh*, which is the name of the *ſloca* appropriated to this mode of trial, either an image, named *Dharma*, or the genius of juſtice, is made of ſilver, and another, called *Adharma*, of clay or iron, both of which are thrown into a large earthen jar; and the accuſed having thruſt his hand into it, is acquitted if he bring out the ſilver image, but condemned if he draw forth the iron: or, the figure of a deity is painted on white cloth, and another on black; the firſt of which they name *dharma*, and the ſecond *adharma*: theſe are ſeverallly rolled up in cow-dung, and thrown into a large jar without having ever been ſhown to the accuſed; who muſt put his hand into the jar, and is acquitted or convicted as he draws out the figure on white or on black cloth.

Though we have proceeded thus far, we have not exhauſted Mr. Haſting's communication. He goes on to ſhow (to greater extent than our limits permit us to follow him) the manner in which each ordeal abovementioned was executed, giving examples, and unfolding other particulars of ſome importance in developing the nature of theſe barbarous cuſtoms. For theſe particulars, however, we muſt refer to the book itſelf.

Beſides thoſe particular methods of trial which we have already mentioned, there were ſome few more common in European countries; as the judicial combat—the ordeal of the croſs—the ordeal of the corſned.

The judicial combat was well ſuited to the genius and ſpirit of fierce and warlike nations, and was, as we may reaſonably expect, one of the moſt ancient and univerſal modes of trial. We know that it was exceedingly common in Germany in very remote ages. It was alſo uſed in ſome countries on the continent at pretty early periods: it is not, however, mentioned in any of the Anglo-Saxon laws; and it does not appear to have been much uſed in England till after the Conqueſt. There are, however, two remarkable inſtances of it upon record, which we ſhall give in the words of Dr. Henry: "Henry de Eſſex, hereditary ſtandard-bearer of England, fled from a battle in Wales, A. D. 1158, threw from him the royal ſtandard, and cried out, with others, that the king was ſlain. Some time after, he was accuſed of having done this with a treaſonable intention, by Robert de Montfort, another great baron, who offered to prove the truth of his accuſation by combat. Henry de Eſſex denied the charge, and accepted the challenge. When all preliminaries were adjuſted, this combat was accordingly fought, in the preſence of Henry II. and all his court. Eſſex was defeated, and expected to be carried out to immediate execution. But the king, who was no friend to this kind of trial, ſpared his life, and contented himſelf with confiſcating his eſtate, and making him a monk in the abbey of Reading.

"The priory of Tinmouth, in Northumberland, was a cell of the abbey of St. Alban's. One Simon of Tinmouth claimed a right to two corrodies, or the maintenance of two perſons in the priory, which the prior and monks denied. This cauſe was brought before the abbot of St. Alban's, and his court-baron, who appointed it to be tried by combat on a certain day, before him and his barons. Ralf Gubion, prior of Tinmouth, appeared at the time and place appointed, attended by his champion, one William Pegun, a man of gigantic ſtature. The combat was fought, Pegun was defeated, and the prior loſt his cauſe; at which he was ſo much chagrined, that he immediately reſigned his office. This judicial combat is the more remarkable, that it was fought in the court of a ſpiritual baron, and that one of the parties was a prieſt."

We need ſcarcely add, that this deteſtable form of trial was the foundation of the no leſs deteſtable crime of duelling, which ſo much diſgraces our age and nation; which is defended only by ignorance, falſe honour, and injuſtice; which is a relick of barbarous ſuperſtition; and which was abſolutely unknown to thoſe brave and generous nations, the Greeks and Romans, which it is ſo much the faſhion to admire, and who in this particular ſo well merit our imitation. See DUEL.

It was ſo much the cuſtom in the middle ages of Chriſtianity, to reſpect the croſs even to ſuperſtition, that it would have been indeed wonderful if the ſame ignorant bigotry had not converted it into an ordeal: accordingly we find it uſed for this purpoſe, in ſo many different ways as almoſt to preclude deſcription. We ſhall however tranſcribe, for the ſatisfaction of our readers, Dr. Henry's account of it, and of the corſned: "In criminal trials, the judgment of the croſs was commonly thus conducted. When the priſoner had declared his innocence upon oath, and appealed to the judgment of the croſs, two ſticks were prepared exactly like one another; the figure of the croſs was cut on one of theſe ſticks, and nothing on the other: each of them was then wrapped up in a quantity of fine white wool, and laid on the altar, or on the relicks of the ſaints; after which a ſolemn prayer was put up to God, that he would be pleaſed to diſcover, by evident ſigns, whether the priſoner was innocent or guilty. Theſe ſolemnities being finiſhed, a prieſt approached the altar, and took up one of the ſticks, which was uncovered with much anxiety. If it was the ſtick marked with the croſs, the priſoner was pronounced innocent; if it was the other, he was declared

guilty. When the judgment of the croſs was appealed to in civil cauſes, the trial was conducted in this manner: The judges, parties, and all concerned, being aſſembled in a church, each of the parties choſe a prieſt, the youngeſt and ſtouteſt that he could find, to be his repreſentative in the trial. Theſe repreſentatives were then placed one on each ſide of ſome famous crucifix; and at a ſignal given, they both at once ſtretched their arms at full length, ſo as to form a croſs with their body. In this painful poſture they continued to ſtand while divine ſervice was performing: and the party whoſe repreſentative dropped his arms firſt loſt his cauſe.

"The conſned, or the conſecrated bread and cheeſe, was the ordeal to which the clergy commonly appealed when they were accuſed of any crimes; in which they acted a very prudent part, as it was attended with no danger or inconveniency. This ordeal was performed in this manner: A piece of barley-bread, and a piece of cheeſe, were laid upon the altar, over which a prieſt pronounced certain conjurations, and prayed with great fervency, that if the perſon accuſed was guilty, God would ſend his angel Gabriel to ſtop his throat, that he might not be able to ſwallow that bread and cheeſe. Theſe prayers being ended, the culprit approached the altar, took up the bread and cheeſe, and began to eat it. If he ſwallowed freely, he was declared innocent; but if it ſtuck in his throat, and he could not ſwallow, (which we may preſume ſeldom or never happened), he was pronounced guilty."

There were beſides theſe a variety of other ordeals practiſed in Chriſtian countries, many of which retain the ſame names as among Pagans, and differ only in the mode of execution. In all nations of Chriſtians where thoſe trials were uſed, we find the clergy engaged in them. Indeed, in England, ſo late as King John's time, we find grants to the biſhops and clergy to uſe the *judicium ferri, aquæ, et ignis*. And, both in England and Sweden, the clergy preſided at this trial, and it was only performed in the churches or in other conſecrated ground: for which Stiernhook gives the reaſon, *Non defuit illis operæ et laboris pretium; ſemper enim ab ejuſmodi judicio aliquid lucri ſacerdotibus obveniebat*. But, to give it its due praiſe, we find the canon law very early declaring againſt trial by ordeal, or *vulgaris purgatio*, as being the fabric of the devil, *cum ſit contra præceptum Domini, Non tentabis Dominum Deum tuum*. Upon this authority, though the canons themſelves were of no validity in England, it was thought proper (as had been done in Denmark above a century before) to diſuſe and aboliſh this trial entirely in our courts of juſtice, by an act of parliament in 3 Hen. III. according to Sir Edward Coke, or rather by an order of the king in council.

It may ſtill perhaps be a *poſtulatum* with ſome of our readers how the effects of theſe trials were evaded, and how it was poſſible to appear to do, what we know could not be really done, without material injury to the perſons concerned: and here we find the ſubject ſo well handled by the learned hiſtorian whom we have already quoted, as far as concerns the ordeals in ancient Britain, which *mutatis mutandis* will anſwer for others, that we ſhall finiſh the article, which has already extended we fear to too great a length, in his words: "If we ſuppoſe that few or none eſcaped conviction who expoſed themſelves to thoſe fiery trials, we ſhall be very much miſtaken. For the hiſtories of thoſe times contain innumerable examples of perſons plunging their naked arms into boiling water, handling red-hot balls of iron and walking upon burning ploughſhares, without receiving the leaſt injury. Many learned men have been much puzzled to account for this, and diſpoſed to think that Providence graciouſly interpoſed, in a miraculous manner, for the preſervation of injured innocence. But if we examine every circumſtance of thoſe fiery ordeals with due attention, we ſhall ſee ſufficient reaſon to ſuſpect that the whole was a groſs impoſition on the credulity of mankind. The accuſed perſon was committed wholly to the prieſt, who was to perform the ceremony three days before the trial, in which he had time enough to bargain with him for his deliverance, and give him inſtructions how to act his part. On the day of trial, no perſon was permitted to enter the church but the prieſt and the accuſed till after the iron was heated, when twelve friends of the accuſer, and twelve of the accuſed, and no more were admitted, and ranged along the wall on each ſide of the church, at a reſpectful diſtance. After the iron was taken out of the fire, ſeveral prayers were ſaid; the accuſed drank a cup of holy water and ſprinkled his hand with it, which might take a conſiderable time, if the prieſt was indulgent. The ſpace of nine feet was meaſured by the accuſed himſelf with his own feet, and he would probably give but ſcanty meaſure. He was obliged only to touch one of the marks with the toe of his right foot, and allowed to ſtretch the other foot as far towards the other mark as he could, ſo that the conveyance was almoſt inſtantaneous. His hand was not immediately examined, but wrapped up in a cloth prepared for that purpoſe three days. May we not then, from all theſe precautions, ſuſpect that theſe prieſts were in poſſeſſion of ſome ſecret that ſecured the hand from the impreſſions of ſuch a momentary touch of hot iron, or removed all appearances of theſe impreſſions in three days; and that they made uſe of this ſecret when they ſaw reaſon? Such readers as are curious in matters of this kind may find two different directions for making ointments that will have this effect, in Du Cange, Glaſſ. t. 3. p. 397. What greatly ſtrengthens theſe ſuſpicions is, that we meet with no example of any champion of the church who ſuffered the leaſt injury from the touch of hot iron in this ordeal; but when any one was ſo fool-hardy as to appeal to it, or to that of hot water, with a view to deprive the church of any of her poſſeſſions, he never failed to burn his fingers, and loſe his cauſe.

ORDER, in architecture, is a ſyſtem of the ſeveral members, ornaments, and proportions of columns and plaiſters; or a regular arrangement of the projecting parts of a building, eſpecially the column, ſo as to form one beautiful whole. See ARCHITECTURE.

ORDER is alſo uſed for a diviſion or claſs of any thing: thus the tribe of animals called *birds*, is ſubdivided into ſix orders. See ORNITHOLOGY, ZOOLOGY, &c.

ORDER, in rhetoric, is the placing of each word and member of a ſentence in ſuch a manner, as will moſt contribute to the force, beauty, or evidence of the whole; according to the genius and cuſtom of different languages. With regard to order, we may obſerve in general, that, in Engliſh, the nearer we keep to the natural or grammatical order, it is generally the beſt; but in Latin, we are to follow the uſe of the beſt writers; a joint regard being always had to the judgment of the ear, and the perſpicuity of the ſenſe, in both languages.

ORDER is alſo uſed for a claſs or diviſion of the members of the body of a ſtate; with regard to aſſemblies, precedency, &c. In this ſenſe, order is a kind of dignity, which, under the ſame name, is common to ſeveral perſons; and which, of itſelf, does not give them any particular authority, but only rank, and a capacity of arriving at honours and employments. To abridge this definition, order may be ſaid to be a dignity attended with an aptitude for public employ. By which it is diſtinguiſhed from an office, which is the exerciſe of a public truſt. In this ſenſe, nobility is an order, &c. The clericate is alſo an order, &c.

ORDER is alſo the title of certain ancient books, containing the divine office, with the order and manner of its performance. *Roman* order is that wherein are laid down the ceremonies which obtain in the Romiſh church. See RITUAL.

ORDER, in botany, is a name given to a ſubdiviſion of plants in the Linnæan ſyſtem. See BOTANY.

ORDERS, by way of eminency, or *holy* ORDERS, denote a character peculiar to eccleſiaſtics, whereby they are ſet apart for the miniſtry. See ORDINATION. This the Romaniſts make their ſixth ſacrament. In no reformed church are there more than three orders, viz. biſhops, prieſts, and deacons. In the Romiſh church there are ſeven, excluſive of the epiſcopate: all which the council of Trent enjoins to be received and believed, on pain of anathema. They are diſtinguiſhed into petty, or ſecular orders; and major, or ſacred orders.

ORDERS, the petty, or minor, are four; viz. thoſe of doorkeeper, exorciſt, reader, and acolyth. Thoſe in petty orders may marry without any diſpenſation: in effect, the petty orders are looked on as little other than formalities, and as degrees neceſſary to arrive at the higher orders. Yet the council of Trent is very ſerious about them: enjoins that none be admitted into them without underſtanding Latin; and recommends it to the biſhops, to obſerve the intervals of conferring them, that the perſons may have a ſufficient time to exerciſe the function of each order: but it leaves the biſhops a power of diſpenſing with thoſe rules; ſo that the four orders are uſually conferred the ſame day, and only make the firſt part of the ceremony of ordination. The Greeks diſavow theſe petty orders, and paſs immediately to the ſubdiaconate; and the reformed to the diaconate. Their firſt riſe Fleury dates in the time of the emperor Juſtinian. There is no call nor benefice required for the four petty orders; and even a baſtard may enjoy them without any diſpenſation; nor does a ſecond marriage diſqualify.

ORDERS, ſacred, or major, we have already obſerved are three: viz. thoſe of deacon, prieſt, and biſhop. The council of Trent retrieving the ancient diſcipline, forbids any perſon being admitted to the major orders, unleſs he be in peaceable poſſeſſion of a benefice, ſufficient for a decent ſubſiſtence; allowing no ordinations on patrimonies or penſions; except where the biſhop judges it for the ſervice of the church. A perſon is ſaid to be promoted to orders *per ſaltum*, when he has not before paſſed the inferior orders. The council of Conſtantinople forbids any biſhop being ordained without paſſing all the degrees; yet church-hiſtory furniſhes us with inſtances of biſhops conſecrated without having paſſed the order of prieſthood; and Panormas ſtill thinks ſuch an ordination valid.

Military ORDERS, are companies of knights inſtituted by kings and princes, either for defence of the faith, or to confer marks of honour, and make diſtinctions among their ſubjects.

Religious ORDERS, are congregations or ſocieties of monaſtics, living under the ſame ſuperior, in the ſame manner, and wearing the ſame habit.—Religious orders may be reduced to five kinds; viz. monks, canons, knights, mendicants, and regular clerks. See MONK, CANON, &c. Father Mabillon proves, that till the ninth century, almoſt all the monaſteries in Europe followed the rule of St. Benedict: and that the diſtinction of orders did not commence till upon the reunion of ſeveral monaſteries into one congregation: that St. Odo, abbot of Cluny, firſt began this reunion, bringing ſeveral houſes under the dependence of Cluny: that, a little afterwards, in the 11th century, the Camaldulians aroſe; then by degrees, the congregation of Vallombroſa; the Ciſtercians, Carthuſians, Auguſtines; and at laſt, in the 13th century the Mendicants. He adds, that Lupus Servatus, abbot of Ferrieres, in the ninth century, is the firſt that ſeems to diſtinguiſh the order of St. Benedict from the reſt, and to ſpeak of it as a particular order.

White ORDER, denotes the order of regular canons of St. Auguſtine. See AUGUSTINE.

Black ORDER denoted the order of BENEDICTINES. Theſe names were firſt given theſe two orders from the colour of their habit; but are diſuſed ſince the inſtitution of ſeveral other orders, who wear the ſame colours.

Grey ORDER was the ancient name of the CISTERCIANS; but ſince the change of the habit, the name ſuits them no more.

ORDERS, religious military, are thoſe inſtituted in defence of the faith, and privileged to ſay maſs; and who are prohibited marriage, &c. Of this kind are the knights of Malta, or of St. John of Jeruſalem. Such alſo were the knights Templars, the knights of Calatrava, knights of St. Lazarus, Teutonic knights, &c. See MALTA, TEMPLAR, &c. Father Putignani accounts thoſe military orders, where marriage is not allowed, real religious orders. Papebroch ſays, it is in vain to ſearch for military orders before the 12th century.

ORDERS, in a military ſenſe, all that is lawfully commanded by ſuperior officers. Orders are given out every day, whether in camp, garriſon, or on a march, by the commanding officer; which orders are afterwards given to every officer in writing by their reſpective ſerjeants.

ORDINAL, a book containing the order or manner of performing divine ſervice. See RITUAL.

ORDINAL *Numbers*, thoſe which expreſs order; as 1ſt, 2d, 3d, &c.

ORDINANCE, or ORDONNANCE, a law, ſtatute, or command of a ſovereign or ſuperior: thus the acts of parliament are ſometimes termed *ordinances of parliament*, as in the parliament-rolls. Though in ſome caſes we find a difference made between the two; ordinances being only temporary things, by way of prohibition; and capable of being altered by the commons alone: whereas an act is a perpetual law, and cannot be altered but by king, lords, and commons. Coke aſſerts, that an ordinance of parliament differs from an act, as the latter can only be made by the king, and the threefold conſent of the eſtates; whereas the former may be made by one or two of them.

ORDINANCE *of the Foreſt*, is a ſtatute made in the 34th year of Henry I. relating to foreſt matters. In the French juriſprudence, ordonnances are ſuch laws as are eſtabliſhed by the king's authority alone. All ordonnances begin with, *à tous preſens, & à venir ſalut.*

ORDINARY, in general, ſignifies common, uſual: thus, an ambaſſador or envoy in ordinary, is one ſent to reſide ſtatedly, and for a number of years, in the court of ſome foreign prince or ſtate, in order to keep up a good underſtanding, and watch over the intereſt of his own nation.—This term is alſo applied to ſeveral officers in the king's houſehold, who attend on common occaſions. Thus we ſay, phyſician in ordinary, &c.

ORDINARY, in naval language, denotes the eſtabliſhment of the perſons employed by government to take charge of the ſhips of war, which are laid up in the ſeveral harbours adjacent to the royal dock-yards. Theſe are principally compoſed of the warrant officers of the ſaid ſhips, as the gunner, boatſwain, carpenter, deputy-purſer, and cook, and three ſervants. There is beſides a crew of labourers inrolled in the liſt of the ordinary, who paſs from ſhip to ſhip occaſionally, to pump, moor, remove, or clean them, whenever it is neceſſary. The term *ordinary* is alſo applied ſometimes to the ſhips themſelves: it is likewiſe uſed to diſtinguiſh the inferior ſailors from the moſt expert and diligent. The latter are rated *able* on the navy books, and have 1l. 9s. 6d. *per* month; whereas thoſe who are rated *ordinary* have only 1l. 4s. 6d. *per* month.

ORDINARY, in common or canon law, means one who has ordinary or immediate juriſdiction in matters eccleſiaſtical, in any place. In this ſenſe archdeacons are ordinaries, but the appellation is moſt frequently applied to the biſhop of the dioceſe, who has of courſe the ordinary eccleſiaſtical juriſdiction, and the collation to benefices within ſuch dioceſe. There are ſome chapels, chapters, abbeys, &c. exempted from the juriſdiction of the ordinary. The archbiſhop is ordinary of the whole province, to viſit, and receive appeals from the inferior judicatures. The Romiſh writers on canon law call the pope by way of eminence *ordinary of ordinaries*, ſince by the Lateran council he has uſurped the right of collating, by probation to all benefices; in excluſion of the common collators.

ORDINARY *of Aſſizes and Seſſions*, was a deputy of the biſhop of the dioceſe, anciently appointed to give malefactors their neck-verſes, and judge whether they read or not; alſo to perform divine ſervice for them, and aſſiſt in preparing them for death. So the

ORDINARY *of Newgate*, is one who is attendant in ordinary upon the condemned malefactors in that priſon, to prepare them for death, and he records the behaviour of ſuch perſons.

ORDINARY, or *Honourable* ORDINARY, in heraldry, a denomination given to certain charges properly belonging to that art. See HERALDRY.

ORDINATES, in geometry and conics, are lines drawn from any point of the circumference of an elipſis or other conic ſection, perpendicularly acroſs the axis, to the other ſide. See CONIC-*Sections*.

ORDINATION, the act of conferring holy orders, or of initiating a perſon into the prieſthood by prayer, and the laying on of hands. Ordination has always been eſteemed the principal prerogative of biſhops, and they ſtill retain the function as a mark of ſpiritual ſovereignty in their dioceſe. Without ordination, no perſon can receive any benefice, parſonage, vicarage, &c. A perſon muſt be 23 years of age, or near it, before he can be ordained deacon, or have any ſhare in the miniſtry; and full 24 before he can be ordained prieſt, and by that means be permitted to adminiſter the holy communion. A biſhop, on the ordination of clergymen, is to examine them in the preſence of the miniſters, who, in the ordination of prieſts, but not of deacons, aſſiſt him at the impoſition of hands; but this is only done as a mark of aſſent, not becauſe it is thought neceſſary. In caſe any crime, as drunkenneſs, perjury, forgery, &c. be alleged againſt any one that is to be ordained, either prieſt or deacon, the biſhop ought to deſiſt from ordaining him. The perſon to be ordained, is to bring a teſtimonial of his life and doctrine to the biſhop, and to give account of his faith in Latin; and both prieſts and deacons are obliged to ſubſcribe the 39 articles. The ordination of biſhops is more properly and more commonly called *conſecration*.

In the ancient diſcipline there was no ſuch thing as a vague and abſolute ordination; but every one was to have a church, whereof he was to be ordained clerk, or prieſt. In the twelfth century they grew more remiſs, and ordained without any title or benefice. The council of Trent reſtored the ancient diſcipline, and appointed that none ſhould be ordained but thoſe who were provided of a benefice ſufficient to ſubſiſt them. Which practice ſtill obtains in England. The council of Rome in 744, orders, that no ordinations ſhall be held except on the firſt, fourth, ſeventh, and tenth months. In England, by can. 31. ordination-days are the four Sundays immediately following the Ember-weeks; being the ſecond Sunday in Lent, Trinity Sunday, and the Sundays following the firſt Wedneſday after September the 14th, and December the 13th. Theſe are the ſtated times; but ordinations may take place at any other time according to the diſcretion of the biſhop or circumſtances of the caſe.

Pope Alexander II. condemns *ordination per ſaltum*, as they call it; *i. e.* the leaping to a ſuperior order without paſſing through the inferior.

Ordination is one of the ſacraments of the church of Rome. In the eſtabliſhment of Scotland, where there are no biſhops, the power of ordination is lodged in the preſbytery, and by the Independents, in the ſuffrage of the people. See EPISCOPACY, PRESBYTERIANS, and INDEPENDENTS.

ORDNANCE, a general name for all ſorts of great guns uſed in war. See GUNNERY.

Boring of ORDNANCE. Till within theſe 20 years, iron ordnance were caſt with a cylindrical cavity, nearly of the dimenſion of the caliber of the piece, which was afterwards enlarged to the proper caliber by means of ſteel-cutters fixed into the dog-head of a boring-bar-iron. Three ſide cutters equidiſtant were requiſite to preſerve the caliber ſtraight and cylindrical; and a ſingle cutter was uſed at the end of the bar to ſmooth the breech of the piece. In boring ordnance caſt hollow, the piece was fixed upon a carriage that could be moved backwards and forwards in a direct line with the centre of a water-wheel; in this centre was fixed the boring bar, of a ſufficient length to reach up to the breech of the piece, or more properly to the further end of the caliber. The carriage with the piece being drawn backwards from the centre of the water-wheel to introduce the boring and finiſhing bars and cutters, it is then preſſed forwards upon this bar by means of levers, weights, &c. and the water-wheel being ſet agoing, the bar and fullers are turned round, and clean out and ſmooth the caliber to its proper dimenſions.

Experience at laſt pointed out many inconveniences ariſing from the method of caſting guns *hollow*, and widening the calibers by theſe boring bars. For the body of iron of the hollow gun, being, at caſting, in contact with the core that made the caliber within ſide, and with the mould without-ſide, began to conſolidate towards theſe ſides in the firſt place, ſooner than in the intermediate ſpace, where of courſe the contraction of the iron takes place; by which means, all guns caſt hollow became more or leſs ſpongy where they ought to have been moſt compact; and numberleſs cavities alſo were created round the cores, from ſtagnated air generated in them, which were too deep to be cut out by the boring.

To remedy theſe defects, iron ordnance is now univerſally caſt ſolid, by which means the column of iron is greatly enlarged, and the grain more compreſſed; and the contraction of the iron becomes in the heart of the column, and conſequently is cut out by the perforation for the caliber.

Guns are bored out of the ſolid reverſely from the hollow method. The piece A (pl. 18.) is placed upon two ſtandards BB, by means of two journeys, turned round by the water-wheel C, the breech D being introduced into the centre of the wheel, with the muzzle towards the ſliding carriage E, which is preſſed forwards by a ratch F, and weights in the ſame way as the gun-carriage was in hollow-boring. Upon this ſliding carriage is fixed, truly horizontal and centrical to the gun, the drill-bar G, to the end of which is fixed a carp's tongue drill or cutter H; which, being preſſed forward upon the piece whilſt it is turning round, perforates the bore, which is afterwards finiſhed with bars and cutters as the hollow guns were. The principal difficulty of perforated ſolid guns truly centrical, ariſes from the contraction of the iron above-mentioned; which, reſiſting the drill unequally, tends to throw it out of the centrical line.

Office of ORDNANCE, an office kept within the Tower of London, which ſuperintends and diſpoſes of all the arms, inſtruments, and utenſils of war, both by ſea and land, in all the magazines, garriſons, and forts in Great Britain. We have the following copious account of this eſtabliſhment in Beatſon's *Political Index*. In ancient times, before the invention of guns, this office was ſupplied by officers under the following names: the *bowyer*, the *croſs bowyer*, the *galeator* or *purveyor of helmets*, the *armourer*, and the *keeper of the tents*; and in this ſtate it continued till Henry VIII. placed it under the management of a maſter, a lieutenant, ſurveyor, &c. &c. Some improvements have been ſince made; and this very important branch is now under the direction of the maſter general of the ordnance, having under him a lieutenant general, a ſurveyor general, a clerk, a ſtorekeeper, a clerk of the deliveries, and a treaſurer, with a very great number of inferior officers, employed in the Tower of London, at Woolwich, and in almoſt all the forts, garriſons, and principal ports in his Majeſty's dominions. The office of ordnance is divided into two diſtinct branches, the civil and the military; the latter being ſubordinate, and under the authority

of the former. For the better underſtanding the buſineſs of the different officers, they ſhall be diſtinctly treated of, beginning with the principal one, viz.

Maſter General of the ORDNANCE is deemed the principal officer in the civil branch of the ordnance; yet he is always choſen from amongſt the firſt generals in his Majeſty's ſervice. His truſt is very great, as in him is veſted the ſole power of ſtoring all the military magazines in the king's dominions with proper munitions of war, and likewiſe to ſupply the royal navy with what they may need in his department, the parliament granting money in the moſt liberal manner for this purpoſe. He is colonel in chief of the royal regiment of artillery, at preſent conſiſting of five battalions; and he is inveſted with a peculiar juriſdiction over all his Majeſty's engineers employed in the ſeveral fortifications in his Majeſty's dominions; and to him they are all accountable for their proceedings, and from him they receive their particular orders and inſtructions, according to the directions and commands given by his Majeſty in Council. As maſter general of the ordnance, he has a ſalary of 1500l. *per annum*, and the appointment of almoſt all the inferior officers and ſervants. He has a ſecretary, who has a ſalary of 220l. a year, and an under-ſecretary, who has a ſalary of 180l. a-year. There is a ſecretary to the board of ordnance, who has a ſalary of 200l.; and a counſel to the board, who has a ſalary of 300l. a-year.

Lieutenant General of the ORDNANCE receives all orders and warrants ſigned by the maſter general, and from the other principal officers, and ſees them duly executed, iſſues orders as the occaſions of the ſtate require, and gives directions for diſcharging the artillery when required at coronations, birth-days, ſignal victories, and other ſolemn occaſions. It is alſo his peculiar office to ſee the train of artillery and all its equipage fitted for motion, when ordered to be drawn into the field, or ſent upon any particular ſervice. As lieutenant general of the ordnance, he has a ſalary of 1100l. *per annum*. He is colonel *en ſecond* of the royal regiment of artillery, and has a ſecretary and ſeveral inferior officers and clerks under him.

Surveyor General of the ORDNANCE inſpects the ſtores and proviſions of war in the cuſtody of the ſtorekeeper, and ſees that they are ranged and placed in ſuch order as is moſt proper for their preſervation. He allows all bills of debt, and keeps a check upon all labourers and artificers work: ſees that the ſtores received be good and ſerviceable, duly proved and marked, as they ought to be ſo, with the king's mark, taking to his aſſiſtance the reſt of the officers and proof-maſters. He has a ſalary of 500l. *per annum*; and, in order to aſſiſt him in the buſineſs of his office, he has under him the proof-maſter of England, and clerks, and other inferior officers.

Clerk of the ORDNANCE, an officer whoſe function is to record all orders and inſtructions given for the government of the office; all patents and grants; the names of all officers, clerks, artificers, gunners, labourers, &c. who enjoy thoſe grants, or any other fee for the ſame; to draw all eſtimates for proviſions and ſupplies to be made, and all letters, inſtructions, commiſſions, deputations, and contracts for his Majeſty's ſervice; to make all bills of impreſt and debentures, for the payment and ſatisfaction of work done and proviſions received in the ſaid office; and all quarter books for the ſalaries and allowances of all officers, clerks, &c. belonging to the office; and to keep journals and legers of the receipts and returns of his Majeſty's ſtores, to ſerve as a check between the two accountants of the office, the one for money, and the other for ſtores. He has 500l. a year ſalary, and 100l. a-year more for being a check on the ſtorekeeper. In his office he has a number of clerks, under-clerks, and leger keepers, who have all fixed ſalaries.

Storekeeper of the ORDNANCE takes into his cuſtody all his Majeſty's ordnance, munitions and ſtores belonging thereto, and indents and puts them in legal ſecurity, after they have been ſurveyed by the ſurveyor-general, any part of which he muſt not deliver without a warrant ſigned by the proper officers; nor muſt he receive back any ſtores formerly iſſued till they have been reviewed by the ſurveyor, and regiſtered by the clerk of the ordnance in the book of remains; and he muſt take care that whatever is under his cuſtody be kept ſafe, and in ſuch readineſs as to be fit for ſervice upon the moſt peremptory demand. He has a ſalary of 400l. a-year; and in this office he has ſeveral clerks at fixed ſalaries, for the diſpatch of buſineſs.

Clerk of the Deliveries of the ORDNANCE draws all orders for delivery of any ſtores, and ſees them duly executed; charges by indenture the particular receiver of the ſtores delivered; and, in order to diſcharge the ſtorekeeper, regiſters the copies of all warrants for the deliveries, as well as the proportions delivered. He has a ſalary of 400l. *per annum*, and has ſeveral clerks in his office at fixed ſalaries, for the diſpatch of buſineſs.

Treaſurer and Paymaſter of the ORDNANCE receives and pays all monies, both ſalaries and debentures in and belonging to this office. He has a ſalary of 500l. *per annum*. In his office are ſeveral clerks, ordinary and extraordinary, for the diſpatch of buſineſs.

Office of ORDNANCE. Beſides the principal officers already mentioned, there belongs to this office two proof-maſters, who have 20l. a-year each; a clerk of the works, who has 120l. a-year; a purveyor for the land, who has 100l. a-year, and a purveyor for the ſea, who has 40l. a-year; an architect, who has 120l. a-year; an aſtronomical obſerver, who has 100l. a-year, and other officers. The other part of this office, which is termed the military branch of the ordnance, is a chief engineer, who has under him two directors, four ſub directors, with an unlimited number of engineers in ordinary, engineers extraordinary, ſub-engineers, and practitioner engineers.

ORDNANCE *Bills*, commonly called *ordnance debentures*, are bills iſſued by the board of ordnance on the treaſurer of that office, for the payment of ſtores, &c. Theſe are not payable at any certain time, and do not bear any intereſt, ſo that the diſcount upon them is often very high; but they are ſeldom much above two years in arrear.

ORDONNANCE, in architecture, is the compoſition of a building, and the diſpoſition of its parts, both with regard to the whole and to one another; or, as Mr. Evelyn expreſſes it, determining the meaſure of what is aſſigned to the ſeveral apartments. Thus ordonnance is the judicious contrivance of the plan or mould; as when the court, hall, lodgings, &c. are neither too large nor too ſmall, but the court affords convenient light to the apartments about it; the hall is of fit capacity to receive company; and the bed-chamber, &c. of a proper ſize. When theſe diviſions are either too great or too ſmall, with reſpect to the whole, as where there is a large court to a little houſe, or a ſmall hall to a magnificent palace, the fault is in the ordonnance. See ARCHITECTURE.

ORDONNANCE, in painting, is uſed for the diſpoſition of the parts of a picture, either with regard to the whole piece, or to the ſeveral parts, as the groups, maſſes, contraſts, &c. See PAINTING.

ORDOVICES, ancient Britons, of whom we have the following account in Henry's Hiſtory of Great Britain. They lived "in that country which is now called North Wales, and contains the counties of Montgomery, Merioneth, Caernarvon, Denbigh and Flint. Theſe Ordovices, or (as they are called by Tacitus) Ordevices, are ſuppoſed to have been originally of the ſame tribe or nation with the Huicii of Warwickſhire, who were under ſome kind of ſubjection to the Cornavii; but the Huicii of North Wales, being a free and independent people, were called Ordh Huici, or the free Huici. When they were invaded by the Romans, they ſhowed a ſpirit worthy of their

name, and fought with great bravery in defence of their freedom and independency. Though they received a great defeat from the Roman general Oſtorius, in conjunction with the Silures, they maintained the war for a conſiderable time, until they were finally ſubdued, with great ſlaughter, by the renowned Agricola. It was probably owing to the nature of the country, and to the vicinity of Diva, now Cheſter, where a whole legion was quartered, that the Romans had ſo few towns or ſtations in the territories of the Ordovices. Mediolanium, which is mentioned by Ptolemy, was the capital of the nation, and was probably ſituated at Maywood, in Montgomeryſhire. It was a place of ſome conſideration in the Roman times, but was afterwards quite demoliſhed by Edwin, king of Northumberland. Beſides this, the Romans had a few other towns in this country; as Segontium, now Caernarvon; Conovium, now Conway; and Varæ, now Bodvary, which are all mentioned in the eleventh journey of Antoninus. The country of the Ordovices was comprehended in the Roman province which was called *Britannia Secunda*."

ORE, in natural hiſtory, the compound mineral glebe, earth, ſtone, or other ſubſtance, which is ſufficiently rich in metallic particles to be worth the while of purification, and by this means of ſeparating the metal from it, whether gold, ſilver, copper, &c. See METALLURGY and MINERALOGY.

ORELLANA (FRANCIS), the firſt European, as is commonly thought, who diſcovered the river of the Amazons. In 1529, he embarked near Quito, upon the river Coca, which farther down takes the name of Napo. From this he fell into another large river; and, leaving himſelf entirely to the direction of the current, he arrived at Cape North, on the coaſt of Guiana, after ſailing nearly 1800 leagues. Orellana periſhed ten years after, with three veſſels which had been intruſted to him in Spain, without being able to find again the mouth of this river. In ſailing down the river, he met with ſome armed women, againſt whom an Indian cacique had told him to be on his guard; and he thence named it *the river of the Amazons*.

ORENSE, an ancient town of Spain, in the kingdom of Galicia, with a biſhop's ſee. It is famous for its hot-baths; and is ſeated at the foot of a mountain, on the river Minho, over which there is a handſome bridge of one arch. W. Lon. 7. 27. N. Lat. 42. 16.

ORESTES, in ancient hiſtory, a ſon of Agamemnon and Clytemneſtra. When his father was cruelly murdered by Clytemneſtra and Ægiſthus, young Oreſtes was ſaved from his mother's dagger by means of his ſiſter Electra, called by Homer *Laodicea*, having been privately conveyed to the houſe of Strophius, who was king of Phocis, and who had married a ſiſter of Agamemnon. He was tenderly treated by Strophius, who carefully educated him with his ſon Pylades. The two young princes ſoon became acquainted, and from their familiarity aroſe the moſt inviolable attachment and friendſhip. When Oreſtes came to years of diſcretion, he viſited Mycenæ, and avenged his father's death by aſſaſſinating his mother Clytemneſtra and her adulterer Ægiſthus. Various accounts are given of the way in which theſe murders were committed. After their commiſſion, however, he was acknowledged king of Mycenæ; but being tormented by the furies, a puniſhment which the ancients always thought followed parricide, he exiled himſelf to Argos, where he was ſtill purſued by the avengeful goddeſſes. Apollo, however, purified him, and he was acquitted by the unanimous opinion of the Areopagites, whom Minerva herſelf inſtituted on this occaſion, according to the narration of the poet Æſchylus, who flatters the Athenians in his tragical ſtory, by repreſenting them as paſſing judgment even upon the gods themſelves. According to Pauſanias, Oreſtes was purified of the murder, not at Delphi, but at Trœzene, where ſtill was ſeen a large ſtone at the entrance of Diana's temple, upon which the ceremonies of purification had been performed by nine of the principal citizens of the place. There was alſo at Megalopolis, in Arcadia, a temple dedicated to the furies, near which Oreſtes cut off one of his fingers with his teeth in a fit of inſanity. Theſe different traditions are confuted by Euripides, who ſays that Oreſtes, after the murder of his mother, conſulted the oracle of Apollo at Delphi, where he was informed that nothing could deliver him from the perſecutions of the furies, if he did not bring into Greece Diana's ſtatue, which was in the Taurica Cherſoneſus, and which, as it is reported by ſome, had fallen down from heaven. This was an arduous enterprize. The king of Cherſoneſus always ſacrificed on the altars of the goddeſs all ſuch as entered the borders of his country. Oreſtes and his friend were therefore both carried before Thoas the king of the place, and they were doomed to be ſacrificed. Iphigenia, Oreſtes's ſiſter, was then prieſteſs of Diana's temple, and it was her office to immolate theſe ſtrangers. The intelligence that they were Grecians delayed the preparations, and Iphigenia was anxious to learn ſomething about a country which had given her birth. She even intereſted herſelf in their misfortunes, and offered to ſpare the life of one of them, provided he would convey letters to Greece from her hand. This was a difficult trial: never was friendſhip more truly diſplayed, according to the words of Ovid, *ex Pont. 3. el. 2.*

Ire jubet Pylades carum moriturus Oreſtem,
Hic negat; inque vicem pugnat utrque mori.

At laſt, however, Pylades gave way to the preſſing intreaties of his friend, and conſented to carry the letters of Iphigenia to Greece. Theſe were addreſſed to Oreſtes himſelf; and therefore theſe circumſtances ſoon led to a diſcovery of the connections of the prieſteſs with the man whom ſhe was going to immolate. Iphigenia was convinced that he was her brother Oreſtes; and when the cauſe of their journey had been explained, ſhe herſelf reſolved with the two friends to fly from Cherſoneſus, and to carry away the ſtatue of Diana. Their flight was diſcovered, and Thoas prepared to purſue them; but Minerva interfered, and told him that all had been done by the will and with the approbation of the gods. Some imagine that Oreſtes came to Cappadocia from Cherſoneſus, and that there he left the ſtatue of Diana at Comana. Others contradict this tradition; and Pauſanias thinks that the ſtatue of Diana Orthia was the ſame as that which had been carried away from the Cherſoneſus. Some again ſuppoſe that Oreſtes brought it to Aricia in Italy, where Diana's worſhip was eſtabliſhed. It was after this that Oreſtes aſcended the throne of Argos, where he reigned in perfect ſecurity, married Hermione the daughter of Menelaus, and gave his ſiſter to his friend Pylades. The marriage of Oreſtes with Hermione is alſo a matter of diſpute among the ancients. All are agreed that ſhe had been promiſed to the ſon of Agamemnon; but Menelaus had married her to Neoptolemus the ſon of Achilles, who had ſhown himſelf ſo truly intereſted in his cauſe during the Trojan war. The marriage of Hermione with Neoptolemus diſpleaſed Oreſtes; he remembered that ſhe had been early promiſed to him; he was therefore determined to recover her by force or artifice. This he did by procuring the aſſaſſination of Neoptolemus. According to Ovid's epiſtle of Hermione to Oreſtes, Hermione had always been faithful to her firſt lover, and even it was by her perſuaſions that Oreſtes removed her from the houſe of Neoptolemus, for ſhe was diſſatisfied with the partiality of Neoptolemus for Andromache, and her attachment for Oreſtes was increaſed. There are, indeed, various opinions likewiſe about this: he, however, certainly managed to ſecure her affections, and retired to his kingdom of Argos. His old age was crowned with peace and ſecurity, and he died in the 90th year of his age,

leaving his throne to his ſon Tiſamanes by Hermione. Three years after the Heraclidæ recovered the Peloponneſus, and baniſhed the deſcendants of Menelaus from the throne of Argos. Oreſtes died in Arcadia, as ſome ſay, by the bite of a ſerpent; and the Lacedemonians, who had become his ſubjects at the death of Menelaus, were directed by an oracle to bring his bones to Sparta. They were ſometime after diſcovered at Tegea, and his ſtature appeared to be ſeven cubits, according to the traditions mentioned by Herodotus and others. The friendſhip of Oreſtes and of Pylades became proverbial; and the two friends received divine honours among the Scythians, and were worſhipped in temples.

ORFA, a conſiderable town of Diarbeck in Aſia, very pleaſantly ſituated, pretty large, and well fortified. It formerly belonged to Perſia; but is now in the Turkiſh dominions, and is a place of very good trade. It has a ſtately caſtle ſtanding on a hill, which makes a great ſhow at a diſtance. They pretend to ſhow the well where Rachel watered her father's camels when Jacob met her, and they call it *Abraham's well*. E. Lon. 37. 45. N. Lat. 36. 20.

ORFORD, a town of Suffolk in England, 88 miles from London, ſituated between two channels, where the river Ore, after having joined the Ald, falls into the ſea. It was once a large populous town, with a caſtle; of which, and of a nunnery near the quay, there are ſtill ſome ruins. The towers of the caſtle and its church are a ſea-mark for colliers, coaſters, and ſhips that come from Holland. There is a light-houſe at Orford-Neſſe, which is alſo of great uſe to ſeamen, and is a ſhelter for them when a north-eaſt wind blows hard upon the ſhore. The town was incorporated by Henry III. has a mayor, 18 portmen, 12 chief burgeſſes, a recorder, a town-clerk, and two ſerjeants at mace. Though it ſent members to parliament in the 26th of Edward I. yet it had no more elections till the reign of Edward IV. It ſtill ſends two members to parliament, and has the title of an *earldom*. There are ſtill remaining the ruins of an holy houſe where the ſeamens wives uſed to pray for the ſafety of their huſbands. The town is now very mean, and no one contends for an intereſt in it, but ſuch as want to make themſelves a merit in the choice of the two members it returns to parliament. It has indeed, by the withdrawing of the ſea, been deprived of its chief advantage, for it now deſerves not the name of a harbour. It had the honour to give title of earl to the brave admiral Ruſſel, which, after being many years extinct, was revived in the perſon of Sir Robert Walpole. E. Lon. 1. 33. N. Lat. 52. 15.

ORGAGNA (Andrea), an excellent Italian painter, was born at Florence in 1329. In his youth he learned ſculpture; he was alſo a poet and an architect. He had a fruitful genius, and his manner reſembled that of the other painters of his time. Moſt of his works are at Piſa. The moſt admired of them is his picture of the Laſt Judgment, in which he painted his friends among the bleſſed, and his foes in hell. He died in 1389.

ORGAL, among dyers, denotes the lees of wine dried.

ORGAN, in general, is an inſtrument or machine deſigned for the production of ſome certain action or operation; in which ſenſe the mechanic powers, machines, and even the veins, arteries, nerves, muſcles, and bones of the human body, may be called *organs*.

Organ, in muſic, denotes the largeſt and moſt harmonious of all wind-inſtruments; on which account it is called the *organ* ὀργανον, the inſtrument by way of excellence; chiefly uſed for playing a thorough baſs, with all its accompaniments.

That organs are the invention of remote antiquity has been argued, and ſeems now to be generally allowed; but the particular time and country in which the diſcovery was made appears to be loſt amidſt the ruins of time. In ancient authors there are a variety of paſſages where mention is made of the organ, but it is at leaſt poſſible that an inſtrument is meant very different from that which now goes by the ſame name. From St. Auguſtin's commentary on the 4th verſe of the 150th pſalm we learn, that the Greeks had another name for thoſe inſtruments in which bellows were employed; that the name *organ* was appropriated to this particular inſtrument merely from the uſage of the Latin tongue; and that it was indifferently given to all inſtruments uſed to accompany the voice in concert. We mention this, not becauſe we doubt of the antiquity of the organ, but merely to ſhow that the time of its invention cannot be determined by the era of the authors where its name occurs.

It is certain that the uſe of the organ was very common in the latter ages of the church, and the propriety of it was undiſputed. In the laſt century, however, during the civil wars, organs were removed from the churches in England; and ſo generally reprobated, that, at the Reſtoration, there could ſcarce be found either organiſts, organ builders, or ſingers.

The organs in Germany (ſays Dr. Burney) in magnitude, and the organiſts in abilities, ſeem unrivalled in any other part of Europe, particularly in the uſe of pedals. In Marpurg's Eſſays, vol. iii. there is a minute account of a variety of organs in Germany; of all which the longeſt pipe of the manuals is 16 feet long, and of the pedals 32. One of the largeſt organs in Germany, but which Marpurg has omitted in his liſt, is at Gorliz in Upper Luſatia. It would be to no purpoſe to enlarge our article with a more minute account of the ſtate of organic muſic in different parts of the world: in various parts of the article Music, obſervations connected with this ſubject will be found, and to that we muſt refer. We may particularly mark, for the peruſal of thoſe who wiſh for further information on this ſubject, ſeveral paſſages of the article Music. We need ſcarcely refer to the life of Handel, which all our readers who are fond of muſic of any kind, particularly ſacred, have undoubtedly peruſed.

The church-organ conſiſts of two parts; the main body, called the *great organ*; and the poſitive or *little organ*, which forms a ſmall caſe or buffet, commonly placed before the great organ. The ſize of an organ is generally expreſſed by the length of its largeſt pipe: thus they ſay, an organ of 8, 16, 32 feet, &c. The organ in the cathedral church at Ulm in Germany is 93 feet high and 28 broad: its largeſt pipe is 13 inches diameter, and it has 16 pair of bellows.

The ſeveral parts of the church-organ are as follow. (See pl. 19. fig. 1.) HHH is the ſound-board: which is compoſed of two parts, the upper board or cover HHH, and the under board HI, which is much thicker than the other; each of theſe conſiſts of ſeveral planks laid with their edges to each other, and joined very cloſe together. In the under ſide of the lower board there are made ſeveral channels, which run in the direction LL, MM, &c. and are continued as far as there are ſtops in the organ, and come almoſt to the edge HK. Theſe channels are covered over very cloſe with parchment or leather all the way, except a hole that is commonly at the fore end next HK, upon which a valve or puff is placed. Theſe channels are called *partitions*. When this valve or flap is ſhut, it keeps out the air, and admits it when open. On the upper ſide of the lower board there are likewiſe cut ſeveral broad ſquare channels, lying croſs the former, but not ſo deep as to reach them; theſe lie in the direction LN, PQ, &c. To fit theſe channels, there are the ſame number of wooden ſliders or regiſters *f*, *f*, *f*, &c. running the whole length; and theſe may be drawn out or thruſt in at pleaſure. The number of theſe is the ſame as that of the ſtops in the organ.

IKKK is the wind cheſt, which is a ſquare box fitted cloſe to

the under ſide of the lower board, and made air-tight, ſo that no air can get out but what goes through the valves along the partitions.

VV are the valves or puffs which open into the wind cheſt; they are all incloſed in it, and may be placed in any part of it, as occaſion ſhall require. One of theſe valves, with the ſpring that ſhuts it, and the wire that opens it, is repreſented by fig. 2.

C, D, E, F, &c. are the keys on which the fingers are placed when the organ is played: theſe keys lie over the horizontal bar of wood W, in which are ſtuck an equal number of wire-pins *z*, *z*, on which keys are fixed; and the keys move up and down on the bar, as on a centre. There is another bar, againſt which the keys fall when put down, and which is here marked 3: on this alſo are ſeveral wires, which go through the keys, to guide them; and on this bar a liſt is faſtened to hinder the keys from knocking againſt the wood.

The keys are made to communicate with the valves ſeveral ways, as we ſhall now deſcribe. Firſt, *s*, *s*, *s*, are the key-rollers, moving on the pivots *t*, *t*: theſe rollers lie horizontally, one above another, and are of ſuch a length as to reach from the valve to the key: *a*, *a*, *a*, are arms or levers fixed to the key-rollers: *w*, *w*, the valve wires fixed to the arms *a*, *a*, and to the valves V, and go through the holes *b*, *b*, in the bottom of the wind-cheſt: *b*, *b*, *b*, are likewiſe arms fixed to the key-rollers: *d*, *d*, *d*, the key-wires, fixed to the arms *b*, *b*, and to the keys C, D, E. Now, when the end of any one of the keys C, D, E, is put down, it pulls down the arm *b*, by the wire *d*, which turns about the roller *s* with the arm *a*, that pulls down the wire *w*, which opens the valve that is ſhut by the ſpring as ſoon as the preſſure is taken off the key. In this conſtruction there muſt be a worm-ſpring faſtened to the key, and to the bar W on the further ſide, to keep down the end 5 of the key.

Another method of opening the valves is thus: *xy*, *xy*, are ſlender levers, moveable on the centres 1, 1; 5*x*, 5*x*, are wires going from the further ends of the keys to the ends *x* of the levers; *y*V, *y*V, are other wires, reaching from the ends *y* of the levers, through the holes *b*, to the valves V. So that putting down the key C, D, &c. raiſes the end 5, which thruſts up the end *x* of the lever, by the wire 5*x*: this depreſſes the end *y* of the lever, which pulls down the wire *y*V, and opens the valve V.

A third way of opening the valves is this: At the end of the key *b*, is a lever 8, 9, moving in the centre 7. This makes, with the key, a compound lever. From the end 9, a wire goes to the valve. Now the putting down the end 6 of the key, raiſes the end 8, which depreſſes the end 9, of the lever 8, 9, pulls down the wire, and opens the valve. There is only one of theſe drawn in the ſcheme, and but a few of the others, to avoid confuſion.

R, R, are the rollers, to move the ſliders, by help of the arms *cf*, *cf*, which are fixed horizontally in theſe rollers: *ke*, *ke*, are alſo levers fixed in the rollers; *le*, *le*, are the handles, which lie horizontally, and paſs through the holes *ll*; they are faſtened to the lever *ke*, being moveable about a joint at *e*.

Now, any handle *lp*, being drawn out, pulls the end *e* toward *l*, which turns about R*k*, along with the arm *cf*; and the end *f* pulls out the ſlider *fg*; and when *p* is thruſt in, the arm *cf* likewiſe thruſts in the ſlider *fg*.

Upon the ſeveral rows of holes which appear on the top of the upper board, there are ſet up an equal number of rows of pipes. The pipes of an organ are of two kinds; the one has a mouth like a flute, the other with reeds. The firſt, called *pipes of mutation*, conſiſt, (1.) of a foot AABB (fig. 3.), which is a hollow cone, that receives the wind that is to ſound the pipe: (2.) To this foot is faſtened the body of the pipe BBDD. Between the foot and the body of the pipe is a diaphragm or partition FEF, that has a long but narrow aperture by which the wind comes out; over this aperture is the mouth BBC, whoſe upper lip C, being level, cuts the wind as it comes out.

The pipes are of pewter, of lead mixed with a twelfth part of tin, and of wood. Thoſe of pewter are always open at their extremities: their diameter is very ſmall, and their ſound very clear and ſhrill. Thoſe of lead mixed with tin are larger; the ſhorteſt are open, the longeſt quite ſtopped; thoſe of a mean ſize are partly ſtopped, and have beſide a little ear on each ſide the mouth, to be drawn cloſer or ſet further aſunder, in order to raiſe or lower the ſound. The wooden pipes are ſquare, and their extremity is ſtopped with a valve or tampion of leather. The ſound of the wooden and leaden pipes is very ſoft; the large ones ſtopped are commonly of wood, the ſmall ones of lead. The longeſt pipes give the graveſt ſound, and the ſhorteſt the moſt acute: their lengths and widths are determined by a fixed proportion to their ſounds; and their diviſions are regulated by a rule, which is called the *diapaſon*. The longeſt has commonly 16 feet; but in very large organs it has 32 feet. The pedal tubes are always open, though made of wood and of lead. Whatever note any open pipe ſounds, when its mouth is ſtopped it will ſound an octave lower; and a pipe of twice its capacity will likewiſe ſound an octave lower.

A reed-pipe conſiſts of a foot AABB (fig. 4.), that carries the wind into the ſhallot or reed CD, which is a hollow demi-cylinder, fitted at its extremity D, into a ſort of mould, by a wooden tampion G. The ſhallot is covered with a plate of copper KKLL, fitted at its extremity H, into the mould, by the ſame wooden tampion. Its other extremity KK is at liberty: ſo that the air entering the ſhallot makes it tremble or ſhake againſt the reed; and the longer that part of the tongue IL, which is at liberty, is made, the deeper is the ſound. The mould H, that ſerves to fix the ſhallot or reed, the tongue, tampion, &c. ſerves alſo to ſtop the foot of the pipe, and make the wind go out wholly at the reed. Laſtly, in the mould is ſoldered the tube HH, whoſe inward opening is a continuation of that of the reed: the form of this tube is different in different ranks of pipes. The degree of acuteneſs or gravity in the ſound of a reed pipe, depends on the length of the tongue, and that of the pipe CK, taken from the extremity of the ſhallot to the extremity of the tube. The quantity or intenſion of the ſound depends on the width of the reed, the tongue, and the tube; as alſo on the thickneſs of the tongue, the figure of the tube, and the quantity of wind. To diverſify the ſounds of the pipes, a valve is added to the port-vent, which makes the wind go out in fits or ſhakes. In fig. 1. X repreſents a flute pipe of wood, Z a flute pipe of metal, Y a trumpet-pipe of metal. The pipes, to prevent them from falling, paſs through holes made in boards, placed upon the upper board.

The pipes are made to communicate with the wind-cheſt in the following manner. There are holes bored that go through the upper and lower boards, and through the ſlider (when it is drawn out), into the partition below; ſo that any pipes placed upon thoſe holes will then communicate with the partition, which by its valve communicates with the wind-cheſt. But when the ſlider is thruſt in, its holes do not anſwer to thoſe in the upper and lower boards; therefore, the communication is ſtopped, ſo that no wind can get to the pipe.

To every large organ there muſt be at leaſt two pair of bellows, which are marked in fig. 1. by TU, TU. O, O, are the handles, moving upon the axis *nn*, *nn*. Each of theſe bellows conſiſt of two boards, the loweſt of which is immoveable; and in this there is a valve *r*, opening inwards, and a tube leading to it, called the *conveying tube*. There is alſo a hole in this under board, from which a tube leads to the port-

vent, which is a ſquare tube marked 4, riſing upward, and inſerted into the under ſide of the wind-cheſt at 2. In the tube leading to the port vent, there is a valve that opens towards the port-vent, and ſuffers the air to go up the port-vent, but not to return. Now the handle O being pulled down, raiſes the upper board T, and the air enters through the valve *r*; and when the handle is let go, the weight of the upper board, which carries three or four pound to every ſquare foot, continually deſcending, drives the air through the port-vent to the ſound-board: and as the bellows work alternately, one pair is conſtantly deſcending, which occaſions a continual blaſt through the port-vent. In chamber organs there is but one pair of bellows; but they are formed of three boards, in the manner of a ſmith's bellows, and ſo have a continual blaſt. All the internal ſtructure of the organ is concealed from the ſight by the front of the inſtrument, which ſtands upon the part between the numbers 3 and 6 (fig. 1.)

In every organ the number of partitions LL, MM, &c. there are in the ſound-board (fig. 1.) that of the valves VV, that of the rollers *ss*, or of the levers *xy* or 8 9 and their wires, and that of the keys AB, &c. muſt be always equal. Large organs have commonly four or five ſets of keys, beſide thoſe that belong to the pedals or large pipes, the ſtops to which are played by the feet; ſaid to be the invention of Bernhard, a German, about the year 1470. Theſe command certain pipes, which, to increaſe the harmony, are turned below the diapaſon. The keys of an organ are uſually divided into four octaves; which are, the firſt ſub-octave, ſecond ſub-octave, middle octave, and firſt octave. Each octave is divided into 12 ſtops or frets, of which ſeven are black and five white; the former mark the natural notes, and the latter the artificial notes, that is, flats and ſharps. The number of keys, therefore, when there are four octaves, muſt be 48. Some organiſts add one or more ſtops to the firſt and ſecond ſub-octaves. The pedals have two or three octaves, at the option of the organiſt; ſo that the number of ſtops is indeterminate. The keys are placed between GG (fig. 1.), but the ſcheme could not contain them all. There are alſo as many handles *l*, *l*, &c. rollers RR, &c. ſliders *f*, *f*, &c. as there are ſtops upon the organ; and it muſt be obſerved, that between the ſliders *f*, *f*, &c. there are as many ſliders on the right hand, and the ſame number of handles and rollers, and other rows of pipes placed between LN, PQ, which could not be expreſſed in the figure.

The leaſt pipes and partitions are placed toward the middle of the organ, and the greateſt on the outſide. The ſtops of an organ have various denominations, according to the ſounds they are to produce; ſome of which are diapaſon, principal, fifteenth, twelfth, tearce, cornet, trumpet, French horn, vox humana, flute, baſſoon, cremona, &c. The foreign organs, eſpecially thoſe of Germany, have many more: particularly that in the abbey church of Weingarten, a town in the upper Palatine, which has 66 ſtops, and contains no fewer than 6666 pipes. The organ at Haerlem is ſaid to have 60 ſtops, many of them but little known to the Engliſh workmen, and diſtinguiſhed by names that expreſs the ſound which they produce.

When this magnificent inſtrument is played, the handle O of the bellows is firſt put down, which raiſes the upper board T, and gives room for the air to enter by the valve *r*. Then the other handle O is put down: in the mean time the board T, belonging to the firſt handle, deſcending, and ſhutting the valve *r*, drives the air through the other valve, up the port-vent, and into the wind-cheſt. Then drawing out any handle, as that of the flute-ſtop *p l*, which draws out the ſlider *f g*, all the pipes in the ſet LN are ready to play, as ſoon as the keys C, D, E, &c. are put down: therefore, if the key D be put down, it opens the correſponding valve *m* V, through which the air enters into the pipe X, and makes it ſound. In the ſame manner any other pipe in the ſet LN, will ſound when its key is put down; but no pipe, in any other ſet, will ſound till the ſlider be drawn out by its correſponding handle.

Among the modern improvements of the organ, the moſt remarkable are the ſwell and the tremblant: the former, invented by an Engliſh artiſt, conſiſts in a number of pipes placed in a remote part of the inſtrument, and incloſed in a kind of box, which, being gradually opened by the preſſure of the foot, increaſes the ſound as the wind does the ſound of a peal of bells, or ſuppreſſes it in like manner by the contrary action. The tremblant is a contrivance by means of a valve in the port-vent or paſſage from the wind cheſt, to check the wind, and admit it only by ſtarts; ſo that the notes ſeem to ſtammer, and the whole inſtrument to ſob, in a manner very offenſive to the ear. There is a tremblant in the organ at the German chapel in the Savoy. See Hawkins's *Hiſtory of Muſic*, and Burney.

Hydraulic ORGAN, denotes a muſical machine that plays by water inſtead of wind. Of theſe there are ſeveral in Italy, in the grottos of vineyards. Cteſebes of Alexandria, who lived in the time of Ptolemy Evergetes, is ſaid to have invented organs that played by compreſſing the air with water, as is ſtill practiſed. Archimedes and Vitruvius have left us deſcriptions of the hydraulic organ. In the cabinet of Queen Chriſtina is a beautiful and large medallion of Valentinian, on the reverſe whereof is ſeen one of theſe hydraulic organs; with two men, one on the right, the other on the left, ſeeming to pump the water which plays it, and to liſten to its ſound. It has only eight pipes, placed on a round pedeſtal. The inſcription is PLACEA SPETRI, if it be not wrong copied, which we ſuſpect to be the caſe.

ORGASM *οργασμος*, denoting violence or turgeſcency; formed from *οργαω*, turgeo, "I ſwell," an ecſtacy or impetuous deſire of coition, occaſioned by a turgeſcency of the ſeminal veſſels, which are no longer able to reſtrain their contents. The ancients alſo extend orgaſm to the other humours, and even excrements, which being accumulated, and coming to ferment, demand excretion. Quincy uſes orgaſm for an impetuous or too quick motion of the blood or ſpirits; whereby the muſcles are diſtended with an uncommon force.

ORGIA, feaſts and ſacrifices in honour of Bacchus, held every third year, and chiefly celebrated by wild diſtracted women, called *Bacchæ*. The chief ſolemnities were performed in the night, to conceal, perhaps, their ſhocking impurities; and a mountain was generally choſen as the place of celebration. They were inſtituted by Orpheus; and from him are ſometimes called *Orphica*. Authors are not agreed as to the derivation of the word; but if we conſider the frantic proceedings of the Bacchanalians, *οργη*, *furor*, bids fair for the true etymology. See BACCHANALIA. *Orgia*, according to Servius, was a common name for all kinds of ſacrifices among the Greeks, as *ceremoniæ* was amongſt the Romans.

ORGUES, in the military art, are thick long pieces of wood, pointed at one end, and ſhod with iron clear one of another; hanging each by a particular rope or cord, over the gateway of a ſtrong place, perpendicularly, to be let fall in caſe of the approach of an enemy. Orgues are preferable to herſes, or portcullices, becauſe theſe may be either broke by a petard, or they may be ſtopped in their falling down: but a petard is uſeleſs againſt an orgue; for if it break one or two of the pieces, they immediately fall down again and fill up the vacancy; or if they ſtop one or two of the pieces from falling, it is no hindrance to the reſt; for being all ſeparate, they have no dependence upon one another.

ORGUES, is alſo uſed for a machine compoſed of ſeveral harquebuſs or muſket barrels bound together, by means whereof ſe-

veral explosions are made at the same time. It is used to defend breaches and othes places attacked.

ORGYA, ὀργυια, an ancient Grecian measure containing six feet.

ORIBASIA, in botany: A genus of the monygania order, belong to the pentandria class of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is small, tubulated, and monopetalous. The pericarpium is a globular berry, grooved longitudinally; is quinquelocular, and contains one seed. Of this there are six species, all natives of the warmer parts of America, *viz.* 1. Officinalis: the natives of Guiana make infusions of the leaves, and give them in cases of spasmodic asthma. 2. Racemosa. 3. Violacea. 4. Lutea. 5. Paniculata. 6. Longiflora. The habit of all these plants resembles those of Psychotria.

ORIBASUS, a celebrated physician greatly esteemed by the emperor Julian, in whose reign he flourished. He abridged the works of Galen, and of all the most respectable writers on physic. This was done at the request of the emperor. He accompanied Julian into the east, but his skill proved ineffectual in attempting to cure the fatal wound which his benefactor had received. After Julian's death he fell into the hands of the barbarians.

ORICHALCUM, or AURICHALCUM, a metallic substance resembling gold in colour, but very inferior in value. It was well known to the old Romans, who often took advantage of its resemblance to gold: for some sacrilegious characters, who could not resist the temptation of taking gold from temples and other public places, chose to conceal their guilt by replacing it with orichalcum. It was thus that Julius Cæsar acted when he robbed the capital of 3000 pound weight of gold; in which he was followed by Vitellius, who despoiled the temples of their gifts and ornaments, and replaced them with this inferior metal. It has been a matter of dispute with philosophers and others, what this metal could be, or how it was procured or made; it is probable at least, that it was greatly analogous to our brass, if not wholly the same with it. (See BRASS) The value of our brass is much less than that of gold, and the resemblance of brass to gold, in colour, is obvious at first sight. Both brass and gold, indeed, are susceptible of a variety of shades of yellow; and, if very pale brass be compared with gold, mixed with much copper, such as the foreign goldsmiths, especially, use in their toys, a disparity may be seen; but the nearness of the resemblance is sufficiently ascertained in general, from observing that substances gilded with brass, or as it is commonly called *Dutch leaf*, are not easily distinguished from such as are gilded with gold leaf.

The Romans were not only in possession of a metallic substance, called by them *orichalcum*, and resembling gold in colour, but they knew also the manner of making it, and the materials from which they made it, were the very same from which we make brass. There are, indeed, authors of great repute who think very differently; and who consider the art of making brass as an invention wholly modern. Thus M. Cronstedt does not think it just to conclude from old coins and other antiquities, that it is evidently proved that the making of brass was known in the most ancient times; and the authors of the French Encyclopedie assure us, that our brass is a very recent invention *. It appears, however, from Pliny's Nat. Hist. lib. xxxiv. § 2. and from the concurring testimony of other writers, that orichalcum was not a pure or original metal; but that its basis was copper, which the Romans changed into orichalcum by means of *cadmia*, a species of earth which they threw upon the copper, and which it absorbed. It has indeed been contended that the cadmia of Pliny was native arsenic, an opinion which scarcely merits confutation, but which must appear extremely groundless, when we reflect that it is impossible to make either brass or copper from arsenic, and that Pliny expressly calls it a *stone* from which brass was made. The testimony of Ambrose bishop of Milan, in the 4th century, and of Primasius bishop of Adrumetum in Africa, in the 6th, and of Isidorus bishop of Seville in the 7th, all seem to confirm Pliny's account. We may therefore safely conclude that the Romans knew the method of making brass by mixing *cadmia* or *calamine* with copper; yet it is probable they were not the inventors of this art, but that they borrowed it from some other country. It appears from a variety of testimonies that brass was made in Asia, in a manner very similar to that at Rome; and a variety of places are mentioned in that extensive country where it was commonly made: and it is supposed by some that in India, as well as in other parts of Asia, it was made in the remotest ages.

With respect to orichalcum, it is generally supposed that there were two sorts of it, one factitious, the other natural. The factitious, whether we consider its qualities or composition, appears to have been the same with our brass. As to the natural orichalcum, there is no impossibility in supposing, that copper ore may be so intimately blended with an ore of zinc, or of some other metallic substance, that the compound, when smelted, may yield a mixed metal of a paler hue than copper, and resembling the colour of either gold or silver. In Du Halde's history of China, we meet with the following account of the Chinese white copper. "The most extraordinary copper is called *de tong*, or white copper: it is white when dug out of the mine, and still more white within than without. It appears by a vast number of experiments made at Peking, that its colour is owing to no mixture; on the contrary all mixtures diminish its beauty; for, when it is rightly managed, it looks exactly like silver: and were there not a necessity of mixing a little *tutenag*, or some such metal with it, to soften and prevent its brittleness, it would be so much the more extraordinary, as this sort of copper is perhaps to be met with nowhere but in China, and that only in the province of *Yun-nan*." Notwithstanding what is here said of the colour of this copper being owing to no mixture, it is certain that the Chinese white copper, as brought to us is a mixed metal; so that the ore from which it is extracted, must consist of various metallic substances, and from some such ore it is possible that the natural orichalcum, if ever it existed, may have been made. But, notwithstanding that the existence of natural orichalcum cannot be shown to be impossible, yet there is some reason to doubt whether it ever had a real existence or not.

We know of no country in which it is found at present; nor was it anywhere found in the age of Pliny; nor does he seem to have known the country where it ever had been found. He admits, indeed, its having formerly been dug out of the earth; but it is remarkable that in the very passage where he is mentioning by name, the countries most celebrated for the production of different kinds of copper, he only says in general, concerning orichalcum, that it had been found in other countries, without specifying any particular country. Plato acknowledges, that orichalcum was a thing only talked of even in his time; it was nowhere then to be met with, though in the island of Atlantis it had been formerly extracted from its mine. The Greeks were in possession of a metallic substance, called *orichalcum*, before the foundation of Rome; for it is mentioned by Homer and by Hesiod, and by both of them in such a manner as shows that it was then held in great esteem. Other ancient writers have expressed themselves in similar terms of commendation; and it is principally from the circumstance of the high reputed value of orichalcum that authors are induced to suppose the ancient orichalcum to have been a natural substance, and very different from the factitious one in use at Rome, and probably

* Art. Orichalque.—"The vessels here called brazen, after ancient authors, cannot have been of the materials our present brass is composed of; the art of making it is a modern discovery." See *Laughton's Hist. of Ancient Egypt*, p. 58.

in Aſia, and which it has been ſhown was nothing different from our braſs.

But this concluſion cannot be validly drawn from their encomiums upon it; for at whatever time the method of making it was firſt diſcovered, both its novelty and ſcarceneſs joined to its utility, would enhance its value; at leaſt there can be no abſurdity in ſuppoſing, that when firſt introduced it was greatly prized, even though it be granted, that it poſſeſſed no other properties than ſuch as appertain to braſs.

Reſpecting the etymology of the word there is great diverſity of opinions. Thoſe who write it *aurichalcum* think it is compoſed of the Latin word *aurum*, "gold," and the Greek χαλκος, "braſs or copper." The moſt general opinion is, however, that it is compoſed of ὀρος "a mountain" and χαλκος, alluding perhaps to its being found in mountains, or mountainous countries. The above account is chiefly extracted from a paper in the ſecond volume of Memoirs of the Literary and Philoſophical Society of Mancheſter, written by the preſent biſhop of Landaff, Dr. Watſon, and communicated by Dr. Percival. To this paper then we refer our readers, who deſire a more copious account of it. To the above two etymological meanings of the word we ſhall ſubjoin the following, mentioned by the learned biſhop, and which, in our opinion, is equally well founded, and certainly as ingenious, as the other two.

The Hebrew word *Or*, *Aur*, ſignifies light, fire, flame; the Latin terms *uro* "to burn," and *aurum* "gold," are derived from it, inaſmuch as gold reſembles the colour of flame: and hence it is not improbable, that orichalcum may be compoſed of a Hebrew and a Greek term, and that it is rightly rendered, *flame-coloured copper*. In confirmation of this it may be obſerved, that the Latin epithet *lucidum*, and the Greek one φαεινον are both applied to the orichalcum by the ancients.

ORIGANUM, Origany, or *Marjoram:* A genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Verticillatæ*. There is a ſtrobilus or cone collecting the calyces together. The principal ſpecies are, two hardy perennials and an annual for the open ground, and five perennials for the green-houſe: *viz.* 1. The *vulgare*, or wild pot-marjoram; 2. The *heracloeticum*, or winter ſweet-marjoram. Theſe are finely ſcented aromatics, excellent for culinary purpoſes, particularly for broths, ſoups, &c. they have likewiſe merit for medical uſes, and for giving fragrance to ointments; ſo that the plants are proper both for kitchen and phyſic gardens, and may alſo be employed in the pleaſure-ground as plants of variety. 3. The *marjorana*, or annual ſweet-marjoram, is an aromatic of the higheſt fragrance, is admirable for kitchen uſe, and excellent for noſegays; ſo is proper both for the kitchen and pleaſure garden, but more particulary for the former. It is often called *knotted marjoram*, from the flowers growing in cloſe knotted-like heads. The following moſtly aſſume an underſhrubby growth; frequently with abiding ſtalks, if they have ſhelter here in winter. 4. The *dictamnus* or dittany of Crete. 5. The *ſipyleum* or origanum of mount Siplus. 6. The *creticum*, or Cretan origany. 7. The *ſmyrnæum*, or Smyrna origany. 8. The *Ægyptiacum*, or Egyptian origany. All theſe eight ſpecies of origanum flower in July and Auguſt; the flowers are ſmall, monopetalous, ringent, univerſally hermaphrodite, and collected into verticilli round the ſtalks; ſucceeded by ripe ſeed in autumn; though in this country the annual marjoram and the three green houſe ſorts ſeldom perfect ſeed well, unleſs the autumn proves remarkably fine and warm: in default, however, of ſeed, the propogation of all the perennial ſorts, both hardy and green-houſe kinds, is eaſily effected by ſlips of the roots, &c. And the ſeed of the annual ſort is imported plentifully from France or Italy by the ſeed-dealers.

ORIENT, or Port L'Orient, a regular and handſome town of France, in the department of Morbihan and late province of Bretagne, built in 1720, by the French Eaſt India Company, who made it the excluſive mark of their commerce. The harbour, which is defended by a citadel, oppoſite Port Louis at the bottom of the ſame bay, can contain but a ſmall number of men of war. The Engliſh attempted to become maſters of it in 1746, but miſcarried. It is five miles SW of Hennebon. W. Lon. 3. 20. N. Lat. 47. 46.

ORIGEN, one of the moſt celebrated eccleſiaſtical writers, greateſt geniuſes, and moſt learned men of the primitive church, during the third century, was born at Alexandria in the year 185; and was ſurnamed *Adamantus*, either from his indefatigable application to ſtudy, or from the firmneſs he diſcovered amidſt the torments he ſuffered for the faith. Leonidas his father trained him at home with great care, and made him apply to the ſtudy of the Holy Scriptures from his infancy, in which he made ſurpriſing progreſs. The ſon's inclination and turn ſuited exactly with the father's deſign; for he purſued his ſtudies with a moſt extraordinary zeal and ardour: and, being endued with a quick apprehenſion, and a ſtrong imagination, did not content himſelf with that ſenſe which at firſt preſented itſelf, but farther endeavoured to dive into myſterious and allegorical explications of the ſacred books. He would ſometimes even puzzle his father, by too much ſoliciting him for recondite meanings; which obliged the good man to reprehend him a little, and withal to adviſe him not to attempt to penetrate too far in the ſtudy of the holy ſcriptures, but to content himſelf with their moſt clear, obvious, and natural ſenſe. Hence it appears, how early he was ſeized with that *furor allegoricus*, as a learned modern calls it, that rage of expounding the ſcriptures allegorically, which grew afterwards to be even a diſtemper, and carried him to exceſſes which can never be excuſed. He had afterwards in philoſophy Ammonius the celebrated Chriſtian philoſopher, and St. Clement of Alexandria for his maſter in divinity. At 18 years of age, he ſucceeded that great man in the office of catechiſt; an important employment, which conſiſted in teaching divinity, and expounding the ſcriptures. Leonidas his father had ſuffered martyrdom the year before, during the perſecution of Severus in 202; and Origen had ſhown ſuch eagerneſs to follow his father to martyrdom, that his mother was obliged to hide his clothes to prevent his going abroad. Origen had a great concourſe of auditors who attended his ſchool, ſome of whom were of the faithful, and the others pagans. He confirmed and ſtrengthened the firſt in their faith, and converted moſt of the others; and there were ſuch a number of martyrs amongſt his diſciples, that it might be ſaid, that he kept rather a ſchool of martyrdom than of divinity. He taught the doctrines of Chriſtianity to the girls and women as well as to the men: and taking in a too literal ſenſe what Chriſt ſays of becoming voluntary eunuchs, caſtrated himſelf, to prevent his deſerving or ſuffering ſcandal. He took a voyage to Rome in 211, in the beginning of Caracalla's reign, and under the pontificate of Zepherinus. At his return he publiſhed many works, by which he acquired an extraordinary reputation, that drew to him a great number of auditors. But Demetrius, biſhop of Alexandria, conceiving a jealouſy of him, endeavoured by various pretences to injure him. At length Origen went to Antioch, whither the empreſs Mamæa had ſent for him, to hear him diſcourſe on the Chriſtian religion. He did not however ſtay long there, but returned to Alexandria, where he continued to teach till the year 228, when he left that city, and travelled into Achaia. In that journey he went into Paleſtine, and was ordained by the biſhops of that province at 42 years of age. His being ordained by foreign biſhops without the permiſſion of Demetrius, renewed that prelate's reſentment againſt him; on which Origen haſtily returned to Alexandria, to endeavour to molliſy him: but Demetrius drove him from

thence, in 231, and caused him to be excommunicated, and even deposed in a council held in Egypt. Origen then retired to Cæsarea in Palestine, where he raised a celebrated school, and had St. Gregory Thamaturgus, and a great number of other persons who were illustrious for their virtue and learning, for his disciples. He afterwards travelled to Athens; and then, at the desire of Firmilianus, staid some time at Cæsarea in Cappadocia; whence he was invited into Arabia, to convince and bring back to the truth Beryllus bishop of Bostra, who maintained that the Word had no existence before his incarnation. Origen had the happiness to make him sensible of his mistake; and some years after was sent for into Arabia by an assembly of bishops, to dispute against the Arabians, who maintained that the souls of the dead remained in a state of insensibility till the general resurrection. At length the seventh persecution of the Christians began in the reign of Decius, and none were used with greater severity than Origen. He supported with incredible constancy the dreadful torments which the persecutors of the Christians invented against them; torments that were the more insupportable, as they were made to continue a long time, and as they took the greatest care to prevent his expiring in the midst of his tortures: but in the midst of the most excruciating torments, he discovered an heroic courage, and suffered nothing to escape him that was unworthy a disciple of Jesus Christ. He died at Tyre in 254, aged 69. He was the author of a great number of excellent works. The principal of those which have been handed down to us are, 1. A Treatise against Celsus, of which Spencer has given a good edition in Greek and Latin, with notes: this learned treatise has been translated into French by Elias Bouhereau, a protestant minister born at Rochelle. 2. A great number of Homilies, with Commentaries on the Holy Scriptures. 3. *Philocalia*, and several other treatises. 4. Fragments of his Hexaples, collected by father Montfaucon, in two volumes folio. Of all Origen's books, the loss of the Hexaples is most to be regretted. This work was thus named from its containing six columns; in the first of which was the Hebrew text of the Bible; in the second, the same text in Greek characters; in the third, the Greek version of the Septuagint; in the fourth, that of Aquila; in the fifth, that of Symacchus; and in the sixth, Theodosian's Greek version. This admirable work gave the first hint for our Polyglot Bibles. 5. The book of Principles; of which we have only an incorrect Latin version. In all his writings he discovers a surprising degree of modesty, candour, and humility; a noble and sublime genius, profound learning, and vast erudition. His manners were extremely pure, and he had a warm zeal for spreading the truths and morals of the gospels.

Much has been written both for and against this celebrated father, both by his contemporaries and others: he has indeed suffered great abuse, which he did not deserve, and which we shall not retail; contenting ourselves with the following account of his character by Dupin, and some remarks on it by Dr. Jortin. "Origen (says Dupin) had very quick parts, a very strong and enlarged imagination; but he relied too much on the vivacity of his genius, and often lost himself, out of too great earnestness to fathom and subtilise every thing. He had a very happy invention, and a more happy delivery of what he invented: but he had not that exactness in his inventions, nor that gracefulness of delivery, as might be wished. He carried on his works with so great ease, that he is said to have dictated to seven or eight persons at a time; and he was so ready in expressing himself, that he made the greatest part of his homilies extempore: upon which account his style was not very correct or coherent. He had a vast memory, but often trusted too much to it. He was a person of most profound learning: he particularly studied Plato's philosophy, and was indeed too much addicted to it for a Christian. He understood likewise the doctrines of other philosophers. He applied himself mightily to the study of human learning. He was neither ignorant of history nor mythology; and he had as great a knowledge in all the profane sciences, as those who studied nothing else. But he particularly excelled in the knowledge of the Holy Scriptures, which he learned all by heart; and that he might neglect nothing for attaining a right understanding of the letter thereof, he carefully examined all the versions of the Bible, and compared them all together with the Hebrew text, subjoining a literal commentary upon the most difficult places. He was not very well skilled in the Hebrew; yet he knew enough of it to understand it, and to observe the difference of the text and the translations. Nevertheless, he did not adhere to the literal explication of the Bible, but thought it necessary, for the sake of gaining it credit with the heathens, who despised its plainness and simplicity, and of rendering it more useful to the world, to give mystical and allegorical interpretations of every thing in it."

Dr. Jortin tells us, "That Origen was very learned and ingenious, and indefatigably industrious. His whole life from his early years was spent in examining, teaching, and explaining the Scriptures, to which he joined the study of philosophy and of all polite literature. He was humble, modest, and patient under great injuries and cruel treatment, which he received from Christians and Pagans: for though he ever had a considerable number of friends and admirers, on account of his amiable qualities and useful accomplishments, he was persecuted and calumniated by men, who had neither his learning nor his virtue, degraded from the order of presbyters, driven from his home, and excommunicated by one Demetrius bishop of Alexandria, who envied him, says Eusebius, for the reputation which he had gained. His inquisitive genius, and his mixing philosophy with Christianity, led him perhaps into some learned singularities and ingenious reveries; but he was by temper far from dogmatizing in such points, from fomenting schisms, and setting up himself for the head of a party. He lived in times when Christians were not so shackled with systems and determinations, as they were afterwards, nor so much exposed to disingenuous and illiberal objections; and had more liberty to pursue their inquiries and to speak their mind.—He was ever extremely sober and exemplary, practising what he preached to others; and he lived and died poor, and destitute even of common conveniences."—The most complete edition of his works is that of Father Delarue, a Benedictine, in Greek and Latin. The celebrated Montfaucon likewise published, in 2 vols. folio, some remains and fragments of his *Hexapla*.

He ought not to be confounded with another ORIGEN, a Platonic philosopher, and the disciple and friend of Porphyry, who studied philosophy under Ammonius: perhaps this Origen was the founder of the ORIGENIANS.

ORIGENIANS *(Origeniani)*, ancient heretics, who even surpassed the abominations of the Gnostics. Epiphanius speaks of them as subsisting in his time; but their numbers, he says, were inconsiderable. He seems to fix their rise about the time of the great *Origen*; but does not say that they derived their name from him. On the contrary, he distinguishes them from the *Origenists*, whom he derives from *Origen Adamantius*; adding, indeed, that they first took their name from one *Origen*; by which he intimates, that it was not the great *Origen*. And St. Augustine expressly asserts, that it was another. Their doctrines were shameful: they rejected marriage; they used several apocryphal books, as the acts of St. Andrew, &c. and endeavoured to excuse their open crimes, by saying, that the Catholics did the same in private.

ORIGENISTS, in church-history, a Christian sect in the fourth century, so called from their drawing their opinions from the writings of Origen. The Origenists maintained, that

the ſouls of men had a pre-exiſtent ſtate: that they were holy intelligences, and had ſinned in heaven before the body was created: that Chriſt is only the ſon of God by adoption; that he has been ſucceſſively united with all the angelical natures, and has been a cherub, a ſeraph, and all the celeſtial virtues one after another; that, in future ages, he will be crucified for the ſalvation of the devils, as he has already been for that of men; and that their puniſhment, and that of the damned, will continue only for a certain limited time.

ORIGUELA, a town of Spain in Valentia. It is ſeated between the mountains on the banks of the river Segura, in a place fortified by nature, and in a fertile plain, abounding in all things, eſpecially corn. It is ſurrounded with pleaſant gardens, and has an univerſity and a biſhop's ſee. It is defended by an old caſtle; and is the capital of a government independent of Valentia, whoſe juriſdiction extends 30 miles in length and 15 in breadth. W. Lon. 0. 56. N. Lat. 38. 22.

ORILLON, in fortification, is a ſmall rounding of earth, faced with a wall; raiſed on the ſhoulder of thoſe baſtions that have caſemates, to cover the cannon in the retired flank, and prevent their being diſmounted by the enemy. See FORTIFICATION.

ORIOLUS, or ORIOLE. See BALTIMORE *Bird*.

ORION, in fabulous hiſtory, was the ſon of Jupiter, Neptune, and Mercury. For as theſe gods were viſiting the earth, they entered the houſe of Hyrieus, a native of Tanagra, in Bœotia, under the character of benighted travellers, on account of his being famed for hoſpitality to ſtrangers. Hyrieus treated them in the beſt manner in his power; and even killed an ox, the only one he had, for their entertainment. At which the gods were ſo pleaſed, that they offered the old man whatever he would aſk; who letting them know that he deſired nothing ſo much as a ſon, they, to gratify his wiſh, cauſed the ox's hide to be brought before them, in which, having depoſited their urine, they bad him keep it under ground for nine months. He then dug for the ſkin, and found in it a beautiful child, whom he called *Urion ab urina*. The name was afterwards changed into Orion by the corruption of one letter, as Ovid obſerves: *Perdidit antiquum litera prima ſonum*. Orion ſoon became conſpicuous; and Diana took him among her attendants, and even became deeply enamoured of him. His gigantic ſtature, however, diſpleaſed Œnopion king of Chios, whoſe daughter Hero or Merope he requeſted in marriage. The king, not willing to deny him openly, promiſed to make him his ſon-in law as ſoon as he delivered his iſland from wild beaſts. This taſk, which Œnopion ſuppoſed to be impracticable, was ſoon performed by Orion, who eagerly demanded his reward. Œnopion, on pretence of complying, intoxicated his illuſtrious gueſt, and put out his eyes on the ſea-ſhore, where he had laid himſelf down to ſleep. Orion found himſelf blind when he awoke. He went, directed by the ſound, to a neighbouring forge, where he placed one of the workmen on his back, and by his directions went to a place where the riſing ſun was ſeen with the greateſt advantage. Here he turned his face towards the luminary; and, according to report, he immediately recovered his eye-ſight, and haſtened to puniſh the perfidious cruelty of Œnopion. Orion was reported to be an excellent workman in iron, and to have fabricated a ſubterraneous palace for Vulcan.

Aurora, whom Venus had inſpired with love, carried him away into the iſland of Delos, that ſhe might enjoy his company with greater ſecurity; but Diana, who was jealous of this, deſtroyed him with her arrows. Some ſay, that Orion had provoked Diana's reſentment, by offering violence to Opis, one of her female attendants; or, as others ſay, becauſe he had attempted the virtue of the goddeſs herſelf. According to Ovid, Orion died of the bite of a ſcorpion, which the earth produced to puniſh his vanity, in boaſting that no animal on earth could conquer him. Some ſay that Orion was ſon of Neptune and Euryale, and that he had received from his father the privilege and power of walking over the ſea without wetting his feet. Others aſſert, that he was a ſon of Terra, like the reſt of the giants. He had married a nymph called *Sida*, before his connection with the family of Œnopion; but Sida was the cauſe of her own death, by boaſting herſelf fairer than Juno. Diodorus ſays, that Orion was a celebrated hunter, ſuperior to the reſt of mankind, by his ſtrength and uncommon ſtature. He built the port of Zancle, and fortified the coaſt of Sicily againſt the frequent inundations of the ſea, by heaping a mound of earth called *Pelorum*, on which he built a temple to the gods of the ſea. After death Orion was placed in heaven, where one of the conſtellations ſtill bears his name. The conſtellation of Orion was placed near the feet of the bull. It was was compoſed of 17 ſtars in the form of a man holding a ſword; for which reaſon the poets often ſpeak of Orion's ſword. As the conſtellation of Orion, which riſes about the 9th day of March, and ſets about the 21ſt of June, is generally ſuppoſed to be accompanied at its riſing with great rains and ſtorms, it has acquired the epithet of *aquoſis* given it by Virgil. Orion was buried in the iſland of Delos; and the monument which the people of Tanagra in Bœotia ſhowed, as containing his remains, was nothing but a Cenotaph. The daughters of Orion diſtinguiſhed themſelves as much as their father; and when the oracle had declared that Bœotia ſhould not be delivered from a dreadful peſtilence before two of Jupiter's children were immolated on the altars, they joyfully accepted the offer, and voluntarily ſacrificed themſelves for the good of their country. Their names were Menippe and Metioche. They had been carefully educated by Diana; and Venus and Minerva had made them very rich and valuable preſents. The deities of hell were ſtruck at the patriotiſm of theſe two females; and inſtantly two ſtars were obſerved to ariſe from the earth, which ſtill ſmoked with their blood, and they were placed in the heavens in the form of a crown. According to Ovid, their bodies were burned by the Thebans, and from their aſhes aroſe two perſons, whom the gods ſoon after changed into conſtellations.

ORION, in aſtronomy, one of the conſtellations of the ſouthern hemiſphere. The word is formed from the Greek ὑρεῖν, "to make water;" the ancients ſuppoſing that it raiſed tempeſts at its riſing and ſetting. The ſtars in the conſtellation Orion, in Ptolemy's catalogue are 37, in Tycho's 62, in the Britannic catalogue 80.

ORISTAGNI, an ancient town of the iſland of Sardinia, with an archbiſhop's ſee. It is pretty large and well fortified; but thinly inhabited, on account of the unhealthy air: it is ſeated on the weſtern coaſt, in a bay of the ſame name, in E Lon. 8. 58. N. Lat. 39. 55.

ORIXA, a kingdom of Indoſtan, lying on the Gulph of Bengal. It is divided from the ancient kingdom of Golconda, by a ridge of mountains, the end of which runs a little way into the ſea. It is fertile in corn and cattle, and they have ſeveral good towns and harbours on the coaſt; there are alſo manufactures of different kinds carried on throughout the kingdom. The prince is a Gentoo, who pays to the Great Mogul a tribute to the amount of about 12,000l. yearly.

ORIXA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking with thoſe that are doubtful. The calyx is quadripartite; the petals are four, plain and lanceolated; the ſtigma globular; the capſule and ſeeds unknown. Of this there are two ſpecies, *viz.* 1. The fruteſcens; 2. Japonica, both natives of Japan.

ORKNEY ISLANDS, a cluſter of iſlands to the north of

Scotland, from which they are ſeparated by Pentland Frith. They are twenty-ſix in number, of which one greatly exceeds the other in extent. This, like the principal one of Shetland, is dignified with the appellation of Mainland: it is alſo frequently called Pomona. See MAINLAND. Beyond this iſland, to the north-eaſt, are ſeen, among others, Rowſay and Weſtra, Shappinſha and Edda, Stronſa, Sanda, and North Ronalſha; and to the ſouth appear Hoy, and South Ronalſha, with others of inferior note. The currents and tides which flow between theſe iſlands are extremely rapid and dangerous; and, near the ſmall iſle of Swinna are two whirlpools, that have been known to ſnatch in boats and light veſſels, which were inſtantly ſwallowed up. Springs of pure water are found in all the mountainous parts of theſe iſlands; and there are numerous lakes and rivulets abounding in fiſh. The heath, on theſe mountains, ſhelters grouſe, plovers, ſnipes, &c. but here are neither partridges, hares, nor foxes. There are numbers of ſheep and ſmall black-cattle. The products of the vallies and plains are big and oats, but no other ſort of grain. In general, the air is moiſt; and they are often viſited by dreadful ſtorms of wind, rain, and thunder. For about three weeks in midſummer, they enjoy the ſight of the ſun, almoſt without intermiſſion: but, for the ſame ſpace in winter, that luminary hardly riſes above the horizon, and is commonly obſcured by clouds and miſts. In this gloomy ſeaſon, the abſence of day is ſupplied partly by moonlight, and partly by the radiance of the Aurora Borealis. See SHETLAND. The chief exports are linen and woollen yarn, ſtockings, butter, dried fiſh, herrings, oil, feathers and ſkins of various kinds, and kelp. The Engliſh language prevails in all theſe iſlands, though there are many words in the Norſe, or Norwegian, ſtill in uſe. The churches are numerous; but the office of a miniſter is truly laborious, the parochial duty being often extended to ſeveral diſtant iſlands.

ORLE, ORLET, or *Orlo*, in architecture, a fillet under the ovolo, or quarter round of a capital. When it is at the top or bottom of a ſhaft, it is called *cincture*. Palladio uſes the word orlo for the plenith of the baſes of the columns.

ORLE, in heraldry. See HERALDRY.

ORLEANOIS, a late province of France, now forming the department of Loiret. It is divided by the river Loire into the Upper and Lower, and is a very plentiful country.

ORLEANS, an ancient city of France, capital of the department of Loiret and late province of Orleanois, with an epiſcopal ſee. It is ſeated on the Loire, in the form of an oval, and is ſuppoſed to contain 40,000 ſouls. Under the ſons of Clovis, it was the capital of a kingdom. It ſtood a memorable ſiege in 1428, againſt the Engliſh, which was raiſed by the celebrated Joan of Arc, called the Maid of Orleans. The ſtreets of Orleans are ſpacious and pleaſant, and that of the fauxbourg of Paris is of a prodigious length. Its commerce conſiſts in wine, brandy, corn, grocery, and particularly ſugar, which is brought raw from Nantes and Rochelle. Sheep ſkins, and ſtockings, both knit and woven, form alſo a conſiderable article of trade. The fauxbourg or ſuburb of Olivet, on the left ſide of the Loire, has a communication with the city by a bridge of nine arches, the centre one 100 feet wide. Near the city is a foreſt, containing 100,000 acres, planted with oak and other valuable trees. Orleans is 30 miles NE. of Blois, and 60 SSW. of Paris. E. Lon. 1. 59. N. Lat. 47. 54.

ORLEANS (Peter Joſeph), a French Jeſuit, whom it is proper to mention, becauſe he wrote an *Hiſtoire des Revolutions d'Angleterre*, was born at Bourges in 1641. He taught the belles lettres for ſome time in his ſociety, but afterwards devoted himſelf to the writing of hiſtory. This purſuit he continued till his death, which happened in 1698. He wrote alſo A Hiſtory of the Revolutions of Spain; A Hiſtory of Two conquering Tartars, Chunchi and Camhi; The Life of Father Coton, &c. His Hiſtory of the Revolutions in England, under the Family of the Stuarts, from the year 1603 to 1690, was tranſlated into Engliſh, and publiſhed at London, 1711, in one vol. 8vo: to which is prefixed an Introduction, by Laurence Echard, M. A. who ſays, that "the great varieties and wonderful changes in theſe reigns are here judiciouſly compriſed in a moderate volume with no leſs perſpicuity than ſtrictneſs; and with a beautiful mixture of ſhort characters, nice reflections, and noble ſentences, which render the whole agreeable and inſtructive. But while the reader is entertained with ſo much ſkill and fineneſs, we ought to caution him with relation to the education and religion of the author: for though he has great marks of a generous candour, and a laudable deference to all ſuperiors; yet he is to be conſidered, in all places, as one in favour with the French king, and not only a true papiſt, but a complete jeſuit."

ORLOPE, in the ſea language, the uppermoſt ſpace or deck in a great ſhip, reaching from the main to the mizen maſt. In three deck ſhips, the ſecond and loweſt decks are ſometimes called *orlopes*.

ORMOND, the northern diviſion of the county of Tipperary, in the province of Munſter in Ireland. For a long time it gave the title of *earl*, and afterwards of *marquis* and *duke*, to the noble family of Butler, deſcended from a ſiſter of Thomas à Becket archbiſhop of Canterbury; till, at the acceſſion of George I. the laſt duke was attainted of high treaſon, and died abroad. In that part of the country the family had great prerogatives and privileges granted by Edward III.

ORMSIDE, a town of England, near Appleby, in Weſtmoreland, with a church and pariſh, but ſmall. A great number of veſſels of braſs, ſome of which ſeemed to have been gilt, were diſcovered near the manor-houſe, by the water waſhing away the ſoil. The manor-houſe is built caſtleways.

ORMSKIRK, in Lancaſhire, in England, is a handſome town, with a good inland trade. By the late inland navigation, it has communication with the rivers Merſey, Dee, Ribble, Ouſe, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancaſter, Weſtmoreland, Stafford, Warwick, Leiceſter, Oxford, Worceſter, &c. There is a bituminous earth about this place, from which oil of amber is extracted, that preſerves raw fleſh, and ſerves the poor people inſtead of candles. There is nothing remarkable at Ormſkirk, but the monuments of ſome of the ancient family of the Stanleys before they were ennobled. Not far from it is Latham Houſe; to which belongs a large eſtate, and a fine park. It is remarkable only becauſe it was gallantly defended in the civil wars by lady Charlotte counteſs of Derby, who held it to the laſt extremity againſt the parliament forces, which could never oblige her to capitulate. She held out glorioufly till ſhe was relieved by Prince Rupert. It was, however, ruined in a ſecond ſiege; and ſold by the family to the late Sir Thomas Bootle, who built a very magnificent houſe upon it.

ORMUS, a ſmall iſland of Aſia, at the bottom of the gulph of the ſame name, at the entrance of the Gulph of Perſia. It is about two leagues from the main land, and about ſix leagues in circuit. They catch excellent oyſters about the iſland; and it yields plenty of fine white ſalt; alſo a kind of ſhining black ſand, which is uſed for duſting writings, and is tranſported in conſiderable quantity to Europe. There is neither ſweet water nor graſs upon it, the ſoil being of a ſalt ſulphureous nature. It was taken by the Portugueſe in 1507, who fortified it; and it was afterwards frequented by a vaſt number of merchants, who were extremely rich. In 1622 the Perſians, by the aſſiſtance of the Engliſh, conquered this place, and demoliſhed the houſes, which were 4000 in number, containing 40,000 inhabitants.

Some time after, the Perſians rebuilt the fort, and placed a garriſon in it; but they could never bring it to be a place of trade as before: however, it is the key of the Perſian Gulph, as well on account of the importance of the place, as the commodiouſneſs of the harbour. It is now almoſt deſerted, for it produces nothing but ſalt, which ſometimes is two inches deep upon the ſurface of the earth. E. lon. 56. 25. N. lat. 27. 20.

ORNICUS LAPIS, a name given by ſome authors to the ſapphire of the ancients, which is a peculiar ſpecies of our lapis lazuli, in which the gold-coloured matter is not diſpoſed in veins, but in ſeparate ſpots, of the form of a ſtar. It was firſt called *orniſcus* and *orinus*, by corruption from *aurinus*, "golden;" and thence came at length the word *ornicus*.

ORNITHIÆ, a name given by the ancients to certain winds, which uſually blew in the ſpring, at the time when the birds of paſſage came over to them. Pliny ſays, that theſe winds blew from the weſt, and that by ſome the Eteſian winds were called by this name. Others ſuppoſe that they blew from the north, or north-weſt.

ORNITHOGALUM, STAR of BETHLEHEM: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The corolla is hexapetalous, erect, perſiſting, and patent above the middle; the filaments alterdilated at the baſe. There are ſeven ſpecies; all of them herbaceous perennials, riſing from ſix inches to three feet high, having ſtalks terminated with long ſpikes of hexapetalous, ſtar-ſhaped, white, and yellow flowers. Six of the ſpecies are very hardy, and will proſper in any ſituation; but one, named the *capenſe*, a native of the Cape of Good Hope, requires the aſſiſtance of artificial warmth to preſerve it in this country. They are all eaſily propagated by off-ſets from the roots. The bulbous roots of all the ſpecies are nutritious and wholeſome.

ORNITHOLOGY,

THE ſcience which treats of birds; deſcribes their form, external and internal; and teaches their œconomy and their uſes.

A bird is an animal covered with feathers; furniſhed with a bill; having two wings, and only two legs; with the faculty, except in a very few inſtances, of removing itſelf from place to place through the air.—But before proceeding to analiſe the characteriſtic parts of birds, it will be proper to premiſe an explanation of the terms uſed by naturaliſts in deſcribing them.

EXPLANATION of ſome Technical Terms in Ornithology uſed by PENNANT and LINNÆUS.

Fig.		
1.	*Cere. Cera*	THE naked ſkin that covers the baſe of the bill in the hawk kind.
2.	*Capiſtrum*	A word uſed by Linnæus to expreſs the ſhort feathers on the forehead juſt above the bill. In crows theſe fall forwards over the noſtrils.
3.	*Lorum*	The ſpace between the bill and the eye, generally covered with feathers; but in ſome birds naked, as in the black and white grebe.
4.	*Orbits. Orbita*	The ſkin that ſurrounds the eye, which is generally bare; particularly in the heron and parrot.
5.	*Emarginatum*	A bill is called *roſtrum emarginatum* when there is a ſmall notch near the end: this is conſpicuous in that of butcher-birds and thruſhes.
6.	*Vibriſſæ*	*Vibriſſæ pectinatæ*, ſtiff hairs that grow on each ſide the mouth, formed like a double comb, to be ſeen in the goatſucker, fly-catcher, &c.
7.	*Baſtard wing Alula ſpuria*	A ſmall joint riſing at the end of the middle part of the wing, or the *cubitus*; on which are three or five feathers.
8.	*Leſſer coverts of the wings. Tectrices primæ*	The ſmall feathers that lie in ſeveral rows on the bones of the wings. The under coverts are thoſe that line the inſide of the wings.
9.	*Greater coverts Tectrices ſecundæ*	The feathers that lie immediately over the quill feathers and ſecondary feathers.
10.	*Quill feathers Primores*	The largeſt feathers of the wings, or thoſe that riſe from the firſt bone.
11.	*Secondary feathers Secundariæ*	Thoſe that riſe from the ſecond.
12.	*Coverts of the tail Uropygium*	Thoſe that cover the baſe of the tail.
13.	*Vent-feathers*	Thoſe that lie from the vent to the tail. *Criſſum Linnæi.*
14.	*The tail. Rectrices*	
15.	*Scapular feathers*	That riſe from the ſhoulders, and cover the ſides of the back.
16.	*Nucha*	The hind part of the head.
17.	*Roſtrum ſubulatum*	A term Linnæus uſes for a ſtraight and ſlender bill.
18.	*Pes ambulatorius.*	All the toes divided to the bottom.
19.	*Pes graſſorius*	The outer toe more or leſs united to the middle one, particularly conſpicuous in the feet of the kingfiſher.
20.	*Pes ſcanſorius*	The foot of the woodpecker formed for climbing. Climbing feet.
21.	*Finned foot. Pes cobatus*	Such as thoſe of the grebes.
22.	*Scolloped foot. Pes pinnatus*	The webs indented in the ſides, as in the coots and ſcolloped-toed ſandpipers.
23.	*Pes tridactylus vel curſorius*	Such as want the back toe.
24.	*Pes didactylus*	In which the foot is compoſed of two toes, obſerved only in the oſtrich.
25.	*Semipalmated. Pes ſemipalmatus*	When the webs reach only half way of the toes.
26.	*Ungue poſtico ſeſſili*	When the hind-claw adheres to the leg without any toe, as in the petrels.
27.	*Digitis 4 omnibus palmatis Roſtrum cultratum*	All the four toes connected by webs, as in the corvorants. When the edges of the bill are very ſharp, ſuch as in that of the crow.
28.	*Unguiculatum*	A bill with a nail at the end, as in thoſe of the gooſanders and ducks.
29.	*Lingua ciliata*	When the tongue is edged with fine briſtles, as in ducks.
30.	*Integra*	When plain or even.
31.	*Lumbriciformis*	When the tongue is long, round, and ſlender like a worm, as that of the woodpecker.

Pedes compedes	When the legs are placed ſo far behind as to make the bird walk with difficulty, or as if in fetters; as is the caſe with the auks, grebes, and divers.
32. *Nares Lineares*	When the noſtrils are very narrow, as in ſea-gulls.
33. *Emarginatæ*	With a rim round the noſtrils, as in the ſtare.

Sect. I. *External Parts of Birds.*

A Bird may be divided into *head*, *body*, and *limbs*.

I. HEAD.

1. Bill (*roſtrum*), is a hard horny ſubſtance, conſiſting of an upper and under part, extending from the head, and anſwering to the mandibles in quadrupeds. Its edges generally plain and ſharp, like the edge of a knife, *cultrated*, as are the bills of crows; but ſometimes *ſerrated*, as in the toucan; or *jagged*, as in the gannet and ſome herons; or *pectinated*, as in the duck; or *denticulated*, as in the merganſers; but always deſtitute of real teeth immerſed in ſockets.

The baſe in falcons is covered with a naked ſkin or cere (*cera*); in ſome birds with a carneous appendage, as the turkey; or a callous, as the curaſſo.

In birds of prey, the bill is hooked at the end, and fit for tearing: in crows, ſtraight and ſtrong for picking: in water-fowl, either long and pointed, for ſtriking; or ſlender and blunt, for ſearching in the mire; or flat and broad, for gobbling. Its other uſes are for building neſts; feeding the young; climbing, as in parrots; or laſtly, as an inſtrument of defence or offence.

2. Nostrils (*nares*), the nice inſtruments of diſcerning their food, are placed either in the middle of the upper mandible, or near the baſe, or at the baſe, as in parrots; or behind the baſe, as in toucans and hornbills: but ſome birds, as the gannet, are deſtitute of noſtrils. The noſtrils are generally naked; but ſometimes covered with briſtles reflected over them, as in crows; or hid in the feathers, as in parrots, &c.

The fore-part of the head is called the *front* (*capiſtrum*); the ſummit (*vertex*), or the *crown*: the hind part, with the next joint of the neck (*nucha*), the *nape*: the ſpace between the bill and the eyes, which in herons, grebes, &c. is naked (*lora*), the *ſtraps*: the ſpace beneath the eyes (*genæ*), the *cheeks*.

3. Orbits (*orbitæ*), the eye-lids; in ſome birds naked, in others covered with ſhort ſoft feathers.

Birds have no eye-brows; but the grous kind have in lieu a ſcarlet naked ſkin above, which are called *ſupercilia*; the ſame word is alſo applied to any line of a different colour that paſſes from the bill over the eyes.

4. Ears. Birds are deſtitute of auricles or external ears, having an orifice for admiſſion of ſound; open in all but owls, whoſe ears are furniſhed with valves.

5. The Chin, the ſpace between the parts of the lower mandible and the neck, is generally covered with feathers; but, in the cock and ſome others, has carneous appendages called *wattles* (*palearia*); in others, is naked, and furniſhed with a pouch, capable of great dilatation (*ſacculus*), as in the pellican and corvorants.

6. Neck (*collum*), the part that connects the head to the body is longer in birds than in any other animals; and longer in ſuch as have long legs than in thoſe that have ſhort, either for gathering up their meat from the ground or ſtriking their prey in the water, except in web-footed fowl, which are, by reverſing their bodies, deſtined to ſearch for food at the bottom of waters, as ſwans, and the like. Birds, eſpecially thoſe that have a long neck, have the power of retracting, bending, or ſtretching it out, in order to change their centre of gravity from their eggs to their wings.

II. BODY.

1. Conſiſts of the Back (*dorſum*), which is flat, ſtraight, and inclines; terminated by the

2. Rump (*uropygium*), furniſhed with two glands, ſecreting a ſattiſh liquor from an orifice each has, which the birds expreſs with their bills to oil or anoint the diſcompoſed parts of their feathers. Theſe glands are particularly large in moſt web-footed water-fowl; but in the grebes, which want tails, they are ſmaller.

3. Breast (*pectus*), is ridged and very muſcular, defended by a forked bone (*clavicula*), the merry-thought.

The ſhort winged birds, ſuch as grous, &c. have their breaſts moſt fleſhy or muſcular; as they require greater powers in flying than the long-winged birds, ſuch as gulls and herons, which are ſpecifically lighter and have greater extent of ſail.

4. Belly (*abdomen*), is covered with a ſtrong ſkin, and contains the entrails.

5. The Vent, or vent-feathers (*criſſum*), which lies between the thighs and the tail. The anus lies hid in thoſe feathers.

III. LIMBS.

1. Wings (*alæ*), adapted for flight in all birds except the dodo, oſtriches, caſſowary, great auk, and the pinguin, whoſe wings are too ſhort for the uſe of flying; but in the dodo and oſtrich, when extended, ſerve to accelerate their motion in running; and in the pinguins perform the office of fins, in ſwimming or diving.

The wings have near their end an appendage covered with four or five feathers, called the *baſtard wing* (*ala notha*), and *alula ſpuria*.

The leſſer coverts (*tectrices*), are the feathers which lie on the bones of the wings.

The greater coverts are thoſe which lie beneath the former, and cover the quill feathers and the ſecondaries.

The quill feathers (*primores*), ſpring from the firſt bones (*digiti* and *metacarpi*) of the wings, and are 10 in number.

Quill-feathers are broader on their inner than exterior ſides.

The ſecondaries (*ſecondariæ*) are thoſe that riſe from the ſecond part (*cubitus*), and are about 18 in number, are equally broad on both ſides. The primary and ſecondary wing-feathers are called *remiges*.

A tuft of feathers placed beyond the ſecondaries near the junction of the wings with the body. This in water fowl is generally longer than the ſecondaries, cuneform, and may not unaptly be called the *tertials*.

The ſcapulars are a tuft of long feathers ariſing near the junction of the wings (*brachia*) with the body, and lie along the ſides of the back, but may be eaſily diſtinguiſhed, and raiſed with one's finger.

The inner coverts are thoſe that clothe the under ſide of the wing.

The ſubaxillary are peculiar to the greater Paradiſe. The wings of ſome birds are inſtruments of offence. The anhima of Marcgrave has two ſtrong ſpines in the front of each wing. A ſpecies of plover, Edw. *tab.* 47. and 280. has a ſingle one in each; the whole tribe of jacana, and the gambo, or ſpur-winged gooſe of Mr Willoughby, the ſame.

2. The Tail is the director, or rudder, of birds in their flight; they riſe, ſink, or turn by its means; for when the head points one way, the tail inclines to the other ſide: it is, beſides, an equilibrium or counterpoiſe to the other parts; the uſe is very evident in the kite and ſwallows.

The tail conſiſts of ſtrong feathers (*rectrices*), 10 in number, as in the woodpeckers, &c.; 12 in the hawk tribe, and many others; in the gallinaceous, the merganſers, and the duck kind, of more.

It is either even at the end, as in moſt birds, or forked, as in

ſwallows; or cuneated, as in magpies, &c.; or rounded, as in the purple jackdaw of Cateſby. The grebe is deſtitute of a tail, the rump being covered with down; and that of the caſſowary with the feathers of the back.

Immediately over the tail are certain feathers that ſpring from the lower part of the back, and are called the *coverts of the tail (uropygium)*.

3. Thighs (*femora*), are covered entirely with feathers in all land-birds, except the buſtards and the oſtriches; the lower part of thoſe of all waders, or cloven footed water-fowl, are naked; that of all webbed footed fowl the ſame, but in a leſs degree; in rapacious birds, are very muſcular.

4. Legs (*crura*); thoſe of rapacious fowls very ſtrong, furniſhed with large tendons, and fitted for tearing and a firm gripe. The legs of ſome of this genus are covered with feathers down to the toes, ſuch as the golden eagle; others to the very nails; but thoſe of moſt other birds are covered with ſcales, or with a ſkin divided into ſegments, or continuous. In ſome of the pies, and in all the paſſerine tribe, the ſkin is thin and membranous; in thoſe of web-footed water-fowl, ſtrong.

The legs of moſt birds are placed near the centre of gravity: in land-birds, or in waders that want the back toe, exactly ſo; for they want that appendage to keep them erect. Auks, grebes, divers, and pinguins, have their legs placed quite behind, ſo are neceſſitated to ſit erect: their pace is awkward and difficult, walking like men in fetters: hence Linnæus ſtyles their feet *pedes compedes*.

The legs of all cloven-footed water-fowl are long, as they muſt wade in ſearch of food: of the palmated, ſhort, except thoſe of the flamingo, the avoſet, and the courier.

5. Feet (*pedes*), in all land-birds that perch, have a large back toe: moſt of them have three toes forward, and one backward. Woodpeckers, parrots, and other birds that climb much, have two forward, two backward; but parrots have the power of bringing one of their hind toes forward while they are feeding themſelves. Owls have alſo the power of turning one of their fore toes backwards. All the toes of the *ſwift* turn forwards, which is peculiar among land birds: the tridactylous woodpecker is alſo anomalous, having only two toes forward, one backward: the oſtrich is another, having but two toes.

6. Toes (*digiti*). The toes of all waders are divided; but, between the exterior and middle toe, is generally a ſmall web, reaching as far as the firſt joint.

The toes of birds that ſwim are either plain, as in the ſingle inſtance of the common water-hen or gallinule; or pinnated, as in the coots and grebes; or entirely webbed or palmated, as in all other ſwimmers.

All the plover tribe, or charadrii, want the back toe. In the ſwimmers the ſame want prevails among the albatroſſes and auks. No water-fowl perch, except certain herons, the corvorant, and the ſhag.

7. Claws (*ungues*). Rapacious birds have very ſtrong, hooked, and ſharp claws, vultures excepted. Thoſe of all land-birds that rooſt on trees have alſo hooked claws, to enable them to perch in ſafety while aſleep.

The gallinaceous tribe have broad concave claws for ſcraping up the ground.

Grebes have flat nails like the human.

Among water-fowl, only the ſkua, *Br. Zool.* II. p. 529. No. 243. and the black-toed gull, *Br. Zool.* II. p. 532. No. 244. have ſtrong hooked or aquiline claws. All land birds perch on trees, except the ſtruthious and ſome of the gallinaceous tribes. Parrots climb; woodpeckers creep up the bodies and boughs of trees; ſwallows cling.

All water-fowl reſt on the ground, except certain herons, and one ſpecies of ibis, the ſpoonbill, one or two ſpecies of ducks and of corvorants.

IV. FEATHERS.

Feathers are deſigned for two uſes; as coverings from the inclemency of the weather, and inſtruments of motion through the air. They are placed in ſuch a manner as to fall over one another *(tegulatim)*, ſo as to permit the wet to run off, and to exclude the cold; and thoſe on the body are placed in a quincuncial form; moſt apparent in the thick-ſkinned water-fowl, particularly in the divers.

1. The parts of a feather are, the ſhafts: corneous, ſtrong, light, rounded, and hollow at the lower part; at the upper, convex above, concave beneath, and chiefly compoſed of a pith.

2. On each ſide the ſhafts are the vanes, broad on one ſide, narrow on the other; each vane conſiſts of a multitude of thin laminæ, ſtiff, and of the nature of a ſplit quill. Theſe laminæ are cloſely braced together by the elegant contrivance of a multitude of ſmall briſtles; thoſe on one ſide hooked, the other ſtraight, which lock into each other, and keep the vanes ſmooth, compact, and ſtrong. The *vanes* near the bottom of the ſhafts are ſoft, unconnected, and downy.

3. Feathers are of three kinds: (1.) Such as compoſe inſtruments of flight; as the pen-feathers, or thoſe which form the wings and tail, and have a large ſhaft. The vanes of the exterior ſide bending downward of the interior upward, lying cloſe on each other, ſo that when ſpread not a feather miſſes its impulſe on the air. The component parts of theſe feathers are deſcribed before. (2.) The feathers that cover the body, which may be properly called the *plumage*, have little ſhaft, and much vane; and never are exerted or relaxed unleſs in anger, fright, or illneſs. (3.) The Down (*plumæ*), which is diſperſed over the whole body amidſt the plumage, is ſhort, ſoft, unconnected, conſiſts of lanuginous vanes, and is intended for excluding that air or water which may penetrate or eſcape through the former. This is particularly apparent in aquatic birds, and remarkably ſo in the anſerine tribe. There are exceptions to the forms of feathers. The vanes of the ſubaxillary feathers of the Paradiſe are unconnected, and the laminæ diſtant, looking like herring-bone. Thoſe of the tail of the oſtrich, and head of a ſpecies of curaſſo, curled. Thoſe of the caſſowary conſiſt of two ſhafts, ariſing from a common ſtem at the bottom: as do at the approach of winter (after moulting) thoſe of the ptarmigans of arctic countries. The feathers of the pinguins, particularly thoſe of the wings, conſiſt chiefly of thin flat ſhafts, and more reſemble ſcales than feathers; thoſe of the tail, like ſplit whale-bone.

Sect. II. *Flight of Birds.*

The flight of birds is various; for, had all the ſame, none could elude that of rapacious birds. Thoſe which are much on wing, or flit from place to place, often owe their preſervation to that cauſe: thoſe in the water, to diving.

Kites, and many of the falcon tribe, glide ſmoothly through the air, with ſcarce any apparent motion of the wings.

Moſt of the order of pies fly quick, with a frequent repetition of the motion of the wings. The Paradiſe floats on the air. Woodpeckers fly awkwardly, and by jerks, and have a propenſity to ſink in their progreſs.

The gallinaceous tribe, in general, fly very ſtrong and ſwiftly; but their courſe is ſeldom long, by reaſon of the weight of their bodies.

The columbine race is of ſingular ſwiftneſs; witneſs the flight of the carrier-pigeon. See Carrier-*Pigeon*.

The paſſerine fly with a quick repetition of ſtrokes; their flight, except in migration, is ſeldom diſtant.

Among them, the ſwallow tribe is remarkable agile, their evolutions ſudden, and their continuance on wing long.

Nature hath denied flight to the ſtruthious; but ſtill, in running, their ſhort wings are of uſe, when erect, to collect the wind, and like ſails to accelerate their motion.

Many of the greater cloven-footed water-fowl, or waders, have a ſlow and flagging flight; but moſt of the leſſer fly ſwiftly, and moſt of them with extended legs, to compenſate the ſhortneſs of their tails. Rails and gallinules fly with their legs hanging down.

Coots and grebes with difficulty are forced from the water; but when they riſe, fly ſwiftly. Grebes and alſo divers fly with their hind parts downwards, by reaſon of the forwardneſs of their wing.

Web-footed fowl are various in their flight. Several have a ſailing or flagging wing, ſuch as gulls. Penguins, and a ſingle auk, are denied the power of flight. Wild geeſe, in their migrations, do not fly pell mell, but in a regular figure, in order to cut the air with greater eaſe; for example, in long lines, in the figure of a $>$, or ſome pointed form or letter, as the ancients report that the cranes aſſumed in their annual migrations, till their order was broken by ſtorms.

From obſervation it appears, that the flight of birds is much aſſiſted by their being endowed with the peculiar faculty of enlarging their bulk at will; and from this circumſtance the animal is enabled to buoy itſelf up the eaſier in the air, its ſpecific gravity being leſſened in proportion as the bulk is increaſed.

This ariſes from certain air veſſels communicating with the lungs, and diſperſed over various parts of the body, even to the bones; whereby the bird, by filling or emptying theſe veſſels, has the power of contracting or dilating itſelf according to the occaſion it may have for the change. See COMPARATIVE *Anatomy*, n° 121—123.

SECT. III. *Of the Nuptials, Nidification, and Eggs of Birds.*

1. MOST birds are monogamous, or pair; in ſpring fixing on a mate, and keeping conſtant till the cares of incubation and educating the young brood is paſt. This is the caſe, as far as we know, with all the birds of the firſt, ſecond, fourth and fifth orders.

Birds that loſe their mates early, aſſociate with others; and birds that loſe their firſt eggs will pair and lay again. The male, as well as the female, of ſeveral, join alternately in the trouble of incubation, and always in that of nutrition; when the young are hatched, both are buſied in looking out for and bringing food to the neſtlings; and, at that period, the mates of the melodious tribes, who, before, were perched on ſome ſprig, and by their warbling alleviated the care of the females confined to the neſt, now join in the common duty.

Of the gallinaceous tribe, the greateſt part are polygamous, at leaſt in a tame ſtate; the pheaſant, many of the grous, the partridges, and buſtards, are monogamous; of the grous, the cock of the wood, and the black game, aſſemble the females during the ſeaſon of love, by their cries, "*Et venerem incertam rapiunt.*"

The males of polygamous birds neglect their young; and, in ſome caſes, would deſtroy them, if they met with them. The œconomy of the ſtruthious order, in this reſpect, is obſcure. It is probable that the birds which compoſe it are polygamous, like the common poultry, for they lay many eggs; the dodo, however, is ſaid to lay but one.

All waders or cloven-footed fowl are monogamous; and all with pinnated feet are alſo monogamous, except the ruffs.

The ſwimmers or web-footed fowl obſerve the ſame order, as far as can be remarked with any certainty; but many of the auks aſſemble in the rocks in ſuch numbers, and each individual ſo contiguous, that it is not poſſible to determine their method in this article. It may be remarked, that the affection of birds to their young is very violent during the whole time of nutrition, or as long as they continue in a helpleſs ſtate; but as ſoon as the brood can fly and ſhift for itſelf, the parents neglect, and even drive it from their haunts, the affection ceaſing with the neceſſity of it: but, during that period,

> The mothers nurſe it, and the ſires defend.
> The young diſmiſs'd, to wander earth, or air,
> There ſtops the inſtinct, and there ends the care:
> The link diſſolves; each ſeeks a freſh embrace;
> Another love ſucceeds, another race.

2. The NEST of a bird is one of thoſe daily miracles that, from its familiarity, is paſſed over without regard. We ſtare with wonder at things that rarely happen, and neglect the daily operations of nature that ought firſt to excite our admiration and claim our attention.

Each bird, after nuptials, prepares a place ſuited to its ſpecies, for the depoſiting its eggs and ſheltering its little brood: different genera and different ſpecies, ſet about the taſk in a manner ſuitable to their ſeveral natures; yet, every individual of the ſame ſpecies collects the very ſame materials, puts them together in the ſame form, and chooſes the ſame ſort of ſituation for placing this temporary habitation. The young bird of the laſt year, which never ſaw the building of a neſt, directed by a heaven-taught ſagacity, purſues the ſame plan in the ſtructure of it, and ſelects the ſame materials as its parent did before. Birds of the ſame ſpecies, of different and remote countries, do the ſame. The ſwallows of Britain, and of the remoter parts of Germany, obſerve the ſame order of architecture; and in many inſtances have been known to return to the ſame places in which they had reared their young the year before.

The neſts of the larger rapacious birds are rude, made of ſticks and bents, but often lined with ſomething ſoft; they generally build in high rocks, ruined towers, and in deſolate places: enemies to the whole feathered creation, they ſeem conſcious of attacks, and ſeek ſolitude. A few build upon the ground.

Shrikes, allied to the rapacious birds, build their neſts in buſhes, with moſs, wool, &c.

The order of *pies* is very irregular in the ſtructure of their neſts. Parrots, and in fact all birds with two toes forward and two backward, lay their eggs in the hollows of trees. And moſt of this order creep along the bodies of trees, and lodge their eggs alſo within them.

Crows build in trees: among them, the neſt of the magpie, compoſed of rude materials, is made with much art, quite covered with thorns, and only a hole left for admittance.

The neſts of the *orioles* are contrived with wonderful ſagacity, and are hung at the end of ſome bough, or between the forks of extreme branches. In Europe, only three birds have penſile neſts; the common oriole, the parus pendulinus or hang-neſt titmouſe, and one more. But in the torrid zone, where the birds fear the ſearch of the gliding ſerpent and inquiſitive monkey, the inſtances are very frequent; a marvellous inſtinct implanted in them for the preſervation of their young. See BALTIMORE *Bird*.

All of the gallinaceous and ſtruthious orders lay their eggs on the ground. The oſtrich is the only exception, among birds, of the want of natural affection: "Which leaveth her eggs in the earth, and warmeth them in the duſt, and forgetteth that the foot may cruſh them, or the wild beaſt may break them."

The columbine race makes a moſt artleſs neſt, a few ſticks laid acroſs may ſuffice.

Moſt of the paſſerine order build their neſts in ſhrubs or buſhes, and ſome in holes of walls or banks. Several in the torrid zone are penſile from the boughs of high trees; that of the taylor-bird, a wondrous inſtance (ſee MOTACILLA). Some of

this order, such as larks, and the goatsucker, on the ground. Some swallows make a curious plaster-nest beneath the roofs of houses; and an Indian species, nests of a certain glutinous matter, which are collected as delicate ingredients for soups of Chinese epicures. See the article BIRDS *Nests*.

Most of the cloven-footed water-fowl, or waders, lay upon the ground. Spoonbills and the common heron build in trees, and make up large nests with sticks, &c. Storks build on churches, or the tops of houses.

Coots make a great nest near the water-side.

Grebes, in the water, a floating nest, perhaps adhering to some neighbouring reeds.

Web-footed fowl breed on the ground, as the avoset, terns, some of the gulls, mergansers, and ducks: the last pull the down from their breasts, to make a softer and warmer bed for their young. Auks and guillemots lay their eggs on the naked shelves of high rocks; pinguins, in holes under ground: among the pelicans, that which gives name to the genus, makes its nest in the desart, on the ground. Shags, sometimes on trees; corvorants and gannets, on high rocks, with sticks, dried algæ, and other coarse materials.

3. Rapacious birds, in general, lay few EGGS; eagles and the larger kinds, fewer than the lesser. The eggs of falcons and owls are rounder than those of most other birds; they lay more than six.

The order of pies vary greatly in the number of their eggs.

Parrots lay only two or three white eggs.

Crows lay six eggs, greenish, mottled with dusky.

Cuckoos, as far as we can learn, two.

Woodpeckers, *wryneck*, and *kingsfisher*, lay eggs of a clear white and semi-transparent colour. The woodpeckers lay six, the others more.

The *nuthatch* lays often in the year, eight at a time, white, spotted with brown.

The *hoopoe* lays but two cinerous eggs.

The *creeper* lays a great number of eggs.

The *honeysucker*, the least and most defenceless of birds, lays but two: but Providence wisely prevents the extinction of the genus, by a swiftness of flight that eludes every pursuit.

The gallinaceous order, the most useful of any to mankind, lay the most eggs, from 8 to 20. *Benigna circa hoc natura, innocua et esculenta animalia fœcunda generavit*, is a fine observation of Pliny. With exception to the bustard, a bird that hangs between the gallinaceous and the waders, which lays only two.

The columbine order lays but two white eggs; but the domestic kind, breeding almost every month, supports the remark of the Roman naturalist.

All of the passerine order lay from four to six eggs; except the titmouse and the wren, which lay 15 or 18, and the goatsucker, which lays only two.

The struthious order disagrees much in the number of eggs: the ostrich laying many, as far as 50; the dodo but one.

The cloven-footed water-fowl, or waders, lay, in general, four eggs: The crane, and the Norfolk plover seldom more than two. All those of the snipe and plover genus are of a dirty white, or olive spotted with black, and scarce to be distinguished in the holes they lay in. The bird called the Land Rail (an ambiguous species), lays from 15 to 20. Of birds with pinnated feet, the coot lays seven or eight eggs, and sometimes more. Grebes, from four to eight, and those white.

The web-footed, or swimmers, differ in the number of their eggs. Those which border on the order of waders, lay few eggs; the avoset two; the flamingo three; the albatross, the auks and guillemots, lay only one egg a-piece: the eggs of the two last are of a size strangely large in proportion to the bulk of the birds. They are commonly of a pale green colour, spotted, and striped so variously, that not two are alike; which gives every individual the means of distinguishing its own on the naked rock where such multitudes assemble.

Divers only two.

Terns and *gulls* lay about three eggs, of a dirty olive, spotted with black.

Ducks lay from eight to twenty eggs; the eggs of all the genus are of a pale green, or white, and unspotted.

Pinguins probably lay but one egg.

Of the *pelican* genus, the gannet lays but one egg; the shags or corvorants, six or seven, all white; the last, the most oblong of eggs.

A minute account of the eggs of birds might occupy a treatise of itself, this is only meant to show the great conformity nature observes in the shape and colours of the eggs of congenerous birds; and also that she keeps the same uniformity of colour in the eggs as in the plumage of the birds they belong to.

Zinanni published, at Venice, in 1737, A Treatise on Eggs, illustrated with accurate figures of 106 eggs. Mr. Reyger of Dantzick published, in 1766, a posthumous work by Klein, with 21 plates, elegantly coloured: but much remains for future writers.

SECT. IV. *System.*

CONSIDERING the many systems that have been offered to the public of late years, Mr. Pennant gives preference to that composed by Mr. Ray in 1667, and afterwards published in 1678; but observes, at the same time, that it would be unfair to conceal the writer, from whom our great countryman took the original hint of forming that system which has proved the foundation of all that has been composed since that period.

He was a Frenchman, Belon of Mans, who first attempted to range birds according to their natures; and performed great matters, considering the unenlightened age he lived in; for his book was published in 1555. His arrangement of rapacious birds is as judicious as that of the latest writers. For his second chapter treats of vultures, falcons, shrikes, and owls: in the two next, he passes over to the web-footed water-fowl, and to the cloven-footed: in the fifth, he includes the gallinaceous and struthious; but mixes with them the plovers, buntings, and larks: in the sixth, are the pies, pigeons, and thrushes; and the seventh takes in the rest of the passerine order.

Notwithstanding the great defects that every naturalist will at once see in the arrangement of the lesser birds of this writer, yet he will observe a rectitude of intention in general, and a true notion of system which was left to the following age to mature and bring to perfection. Accordingly Mr. Ray, and his illustrious pupil the honourable Francis Willoughby, assumed the plan; but with great judgment flung into their proper stations and proper genera those which Belon had confusedly mixed together. They formed the great division of terrestial and aquatic birds; they made every species occupy their proper place, consulting at once exterior form and natural habit. They could not bear the affected intervention of aquatic birds in the midst of terrestial birds. They placed the last by themselves; clear and distinct from those whose haunts and œconomy were so different.

The subjoined scheme of arrangement by Mr. Pennant, is introduced with the following observations. "Mr Ray's general plan is so judicious, that to me it seems scarce possible to make any change in it for the better: yet, notwithstanding he was in a manner the founder of systematic zoology, latter discoveries have made a few improvements on his labours. My candid friend Linnæus did not take it amiss, that I, in part, neglect his example: for I permit the land-fowl to follow one another, undivided by the water-fowl, the gralæ, and answers of his system; but, in my generical arrangement, I most punctually attend to the order he has given in his several divisions, except in those of his anseres, and a few of his gralæ. For, after the manner

of Mr Briſſon, I make a diſtinct order of water-fowl with pinnated feet, placing them between the waders or cloven-footed water-fowl and the web-footed. The oſtrich and land-birds with wings uſeleſs for flight, I place as a diſtinct order. The trumpeter (*Pſophia Linnæi*), and the buſtards, I place at the end of the gallinaceous tribe. All are land-birds. The firſt multiparous, like the generality of the gallinaceous tribe; the laſt granivorous, ſwift runners, avoiders of wet-places; and both have bills ſomewhat arched. It muſt be confeſſed, that both have legs naked above the knees; and the laſt, like the waders, lay but few eggs. They ſeem ambiguous birds that have affinity with each other; and it is hoped that each naturaliſt may be indulged the toleration of placing them as ſuits his own opinion."

TABLE of *Pennant's* ARRANGEMENT, with the correſpondent ORDERS and GENERA in the SYSTEMA NATURÆ of *Linnæus*.

DIVISION I. LAND-BIRDS. DIV. II. WATER-FOWL.

Diviſ. I.
- Order I. Rapacious. — *Accipitres* LINNÆI.
- II. Pies. — *Picæ.*
- III. Gallinaceous. — *Gallinæ.*
- IV. Columbine. — *Paſſeres.*
- V. Paſſerine. — *Paſſeres.*
- VI. Struthious. — *Gallinæ.* / *Grallæ.*

Diviſ. II.
- Order VII. Cloven-footed or Waders. — *Grallæ.*
- VIII. Pinnated feet. — *Anſeres.* / *Grallæ.*
- IX. Web-footed. — *Anſeres.* / *Grallæ.*

DIV. I.

ORD. I. RAPACIOUS.

1	Vulture	*Vultur*	3	Owl	*Strix*
2	Falcon	*Falco*			

ORD. II. PIES.

4	Shrike	*Lanius*	17	Curucui	*Trogon*
5	Parrot	*Pſittacus*	18	Barbet	*Bucco*
6	Toucan	*Ramphaſtos*	19	Cuckoo	*Cuculus*
7	Motmot	*Ramphaſtos*	20	Wryneck	*Junx*
8	Hornbill	*Buceros*	21	Woodpecker	*Picus*
9	Beefeater	*Buphaga*	22	Jacamar	*Alcedo*
10	Ani	*Crotophaga*	23	Kingsfiſher	*Alcedo*
11	Wattle		24	Nuthatch	*Sitta*
12	Crow	*Corvus*	25	Tody	*Todus*
13	Roller	*Coracias*	26	Bee-eater	*Merops*
14	Oriolle	*Oriolus*	27	Hoopoe	*Upupa*
15	Grakle	*Gracula*	28	Creeper	*Certhia*
16	Paradiſe	*Paradiſæa*	29	Honeyſucker	*Trochillus*

ORD. III. GALLINACEOUS.

30	Cock	*Phaſianus*	35	Pheaſant	*Phaſianus*
31	Turkey	*Meleagris*	36	Grous	*Tetrao*
32	Pintado	*Numida*	37	Partridge	*Tetrao*
33	Curaſſo	*Crax*	38	Trumpeter	*Pſophia*
34	Peacock	*Pavo*	39	Baſtard	*Otis*

ORD. IV. COLUMBINE.

40	Pigeon	*Columba*			

ORD. V. PASSERINE.

41	Stare	*Sturnus*	45	Groſbeak	*Loxia*
42	Thruſh	*Turdus*	46	Bunting	*Emberiza*
43	Chatterer	*Ampelis*	47	Tanager	*Tanagra*
44	Coly	*Loxia*	48	Finch	*Fringilla*
49	Flycatcher	*Muſcicapa*	53	Manakin	*Pipra*
50	Lark	*Alauda*	54	Titmouſe	*Parus*
51	Wagtail	*Motacilla*	55	Swallow	*Hirundo*
52	Warblers	*Motacilla*	56	Goatſucker	*Caprimulgus*

ORD. VI. STRUTHIOUS.

57	Dodo	*Didus*	58	Oſtrich	*Struthio*

DIV. II.

ORD. VII. CLOVEN-FOOTED, or WADERS.

59	Spoonbill	*Platalea*	68	Sandpiper	*Tringa*
60	Screamer	*Palamedea*	69	Plover	*Charadrius*
61	Jabiru	*Mycteria*	70	Oyſtercatcher	*Hæmatopus*
62	Boatbill	*Cancroma*	71	Jacana	*Parra*
63	Heron	*Ardea*	72	Pratincole	*Hirundo*
64	Umbre	*Scopus* BRISS	73	Rail	*Rallus*
65	Ibis	*Tantalaus*	74	Sheathbill	
66	Curlew	*Scolopax*	75	Gallinule	*Fulica*
67	Snipe	*Scolopax*			

ORD. VIII. PINNATED-FEET.

76	Phalarope	*Tringa*	78	Grebe	*Colymbus*
77	Coot	*Fulica*			

ORD. IX. WEB-FOOTED.

79	Avoſetta	*Recurviroſtra*	88	Gull	*Larus*
80	Courier	*Curriva* BRISS	89	Petrel	*Procellaria*
81	Flammant	*Phœnicopterus*	90	Merganſer	*Mergus*
82	Albatroſs	*Diomedia*	91	Duck	*Anas*
83	Auk	*Alca*	92	Pinguin	*Diomedea* / *Phaeton*
84	Guillemot	*Colymbus*			
85	Diver	*Colymbus*	93	Pelican	*Pelicanus*
86	Skimmer	*Rhyncops*	94	Tropic	*Phaeton*
87	Tern	*Sterna*	95	Darter	*Plotus*

To the above, we have thought it neceſſary to ſubjoin an extract of the orders and genera as they ſtand in the *Index Ornithologicus* and General Synopſis of birds as publiſhed by Mr. Latham; as from the copious manner in which he has treated the ſubject, and from a very great addition he has been enabled to make to this branch of natural hiſtory, ſome deviations from the plan of preceding authors, as well as the formation of ſome new genera, have neceſſarily ariſen.

TABLE of the ORDERS and GENERA of BIRDS, according to Mr. LATHAM.

Ind. Orn. AVIUM ORDINES.	*Syn. of Birds.* ORDERS OF BIRDS.
DIV I.	DIV. I.
I. Accipitres,	*Rapacious*
II. Picæ	*Pies*
III. Paſſeres.	*Paſſerine*
IV. Collumbæ	*Columbine*
V. Gallinæ	*Gallinaceous*
VI. Struthiones	*Strathious*
DIV. II.	DIV. II.
VII. Grallæ	*Waders*
VIII. Pinnatipedes	*Pinnated feet*
IX. Palmipedes	*Web-footed*

AVIUM GENERA.	GENERA OF BIRDS.
DIV. I.	DIV. I.
AVES TERRESTRES	*LAND BIRDS.*
ORDO. I.	ORDER I.
ACCIPITRES.	RAPACIOUS.
1 Vultur	*Vulture*

Ind. Orn.	*Syn. of Birds.*
2 Falco	*Falcon*
3 Strix	*Owl*
ORDO II.	ORDER II.
PICÆ.	PIES.
4 Lanius	*Shrike*
5 Pſittaccus	*Parrot*
6 Ramphaſtos	*Toucan*
7 Momotus	*Motmot*
8 Scythrops	
9 Buceros	*Hornbill*
10 Buphaga	*Beefeater*
11 Crotophaga	*Ani*
12 Callæas	*Wattle-Bird*
13 Corvus	*Crow*
14 Coracias	*Roller*
15 Oriolus	*Oriole*
16 Gracula	*Grakle*
17 Paradiſæa	*Paradiſe Bird*
18 Trogon	*Curucui*
19 Bucco	*Barbet*
20 Cuculus	*Cuckoo*
21 Yunx	*Wryneck*
22 Picus	*Woodpecker*
23 Galbula	*Jacamar*
24 Alcedo	*Kingsfiſher*
25 Sitta	*Nuthatch*
26 Todus	*Tody*
27 Merops	*Bee eater*
28 Upupa	*Hoopoe*
29 Certhia	*Creeper*
30 Trochilus	*Humming Bird*
ORDO III.	ORDER III.
PASSERES.	PASSERINE.
31 Sturnus	*Starling*
32 Turdus	*Thruſh*
33 Ampelis	*Chatterer*
34 Colius	*Coly*
35 Loxia	*Groſbeak*
36 Imberiza	*Bunting*
37 Tanagra	*Tanager*
38 Fringilla	*Finch*
39 Phytotoma	
40 Muſcicapa	*Flycatcher*
41 Alauda	*Lark*
42 Motacilla	*Wagtail*
43 Sylvia	*Warbler*
44 Pipra	*Manakin*
45 Parus	*Titmouſe*
46 Hirundo	*Swallow*
47 Caprimulgus	*Goatſucker*
ORDO IV.	ORDER IV.
COLUMBÆ.	COLUMBINE.
48 Columba	*Pigeon*
ORDO V.	ORDER V.
GALLINÆ.	GALLINACEOUS.
49 Pavo	*Peacock*
50 Meleagris	*Turkey*
51 Penelope	
52 Numida	*Pintado*
53 Crax	*Curraſſo*

Ind. Orn.	*Syn. of Birds.*
54 Phaſianus	*Pheaſant*
55 Tinamus	*Tinamon*
56 Tetrao	*Grous*
57 Perdix	*Partridge*
58 Pſophia	*Trumpeter*
59 Otis	*Buſtard*
ORDO VI.	ORDER VI.
STRUTHIONES.	STRUTHIOUS.
60 Didus	*Dodo*
61 Struthio	*African Oſtrich*
62 Caſuarius	*Caſſowary*
63 Rhea	*American Oſtrich*
DIV. II.	DIV. II.
AVIS AQUATICÆ.	*WATER BIRDS.*
ORDO VII.	ORDER VII.
GRALLÆ.	WADERS.
64 Platalea	*Spoonbill*
65 Palamedea	*Screamer*
66 Mycteria	*Jabiru*
67 Cancroma	*Boatbill*
68 Scapus	*Umbre*
69 Ardea	*Heron*
70 Tantalus	*Ibis*
71 Numenius	*Curlew*
72 Scolopax	*Snipe*
73 Tringa	*Sandpiper*
74 Charadrius	*Plover*
75 Curſorius	
76 Hæmatopus	*Oyſter-catcher*
77 Glareola	*Pratincole*
78 Rallus	*Rail*
79 Parra	*Jacana*
80 Gallinoula	*Gallinule*
81 Vaginalis	*Sheath-bill*
ORDO VIII.	ORDER VIII.
PINNATIPEDES.	With PINNATED FEET.
82 Phalaropus	*Phalarope*
83 Fulica	*Coot*
84 Podicepo	*Grebe*
ORDO IX.	ORDER IX.
PALMIPEDES.	WEB-FOOTED.
* Pedibus longioribus	**With long legs*
85 Recurviroſtra	*Avoſet*
86 Corrira	*Courier*
87 Phœnicopterus	*Flamingo*
†† Pedibus brevioribus	*††With ſhort legs*
88 Diomedea	*Albatroſs*
89 Alca	*Auk*
90 Uria	*Guillemot*
91 Colymbus	*Diver*
92 Rhynchops	*Skimmer*
93 Sterna	*Tern*
94 Larus	*Gull*
95 Procellaria	*Petrel*
96 Mergus	*Merganſer*
97 Anas	*Duck*
98 Aptenodytes	*Pinguin*
99 Pelicanus	*Pelican*
100 Phaeton	*Tropic Bird*
101 Plotus	*Darter*

In the latter arrangements of birds, although it cannot be ſaid that the authors have loſt ſight of their great predeceſſor Linnæus, yet the neceſſity of deviating from him muſt ſeem obvious, when the very great number of ſpecies which have come to our knowledge of late years, ſufficient to juſtify ſuch alteration, and ſatisfy the moſt ſcrupulous advocates of this great man, is conſidered. In his laſt edition of the *Syſtema Naturæ*, Linnæus enumerates about 930 birds only; but in the Index and Synopſis of Mr. Latham, they have been increaſed to very near 4000, a number never imagined by former writers on the ſubject to exiſt in nature.

Mr. Biberg, in his excellent treatiſe *Oeconomia Naturæ amæn. acad.* vol. 2. calculates the probability of the vegetable kingdom furniſhing as far as 10,000 ſpecies; that of the vermes 2000; inſects 10,000; amphibia 300; fiſhes, 2000; birds, 2000; quadrupeds 200. How far we have already exceeded this number in every department the naturaliſt can teſtify; but how much farther the liſt may be increaſed no one will pretend to foretel, whilſt the ardour and indefatigable induſtry of the preſent race of naturaliſts, added to the taſte for poſſeſſing new acquiſitions, and exploring new countries, ſhall continue.

See the article ZOOLOGY.

ORO

ORNITHOMANCY, a ſpecies of divination performed by means of birds; being the ſame with augury. See DIVINATION and AUGURY.

ORNITHOPUS, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The legumen is articulated, cylindrical, and bent in the form of a bow.

ORNUS FRAXINUS, is that ſpecies of the aſh tree in the Linnæan ſyſtem, which, according to Dr. Cirillo of Naples, produces the manna. It is the aſh tree, whoſe ſmaller leaves are ſawed, with flowers having petals. In order to obtain the manna, thoſe whoſe buſineſs it is, in July and Auguſt, make an oblong inciſion, and take off from the bark of the tree about three inches in length and two in breadth: they leave the wound open, and by degrees the manna runs out, and is almoſt ſuddenly thickened to its proper conſiſtence, and is found adhering to the bark of the tree. This is collected in baſkets, and called *manna graſſa*. When they want fine manna, they apply to the inciſion of the bark thin ſtraw, or ſmall bits of ſhrubs; ſo that the manna in coming out runs upon theſe bodies, and is collected in a ſort of regular tubes which give it the name of *manna in cannoli*.

OROBANCHE, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants: and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is bifid; the corolla ringent; the capſule unilocular, bivalved, and polyſpermous; there is a glandule under the baſe of the germen,

OROBIO (DON BALTHASAR), a celebrated Jew of Spain. He was carefully educated in Judaiſm by his parents, who were Jews, though they outwardly profeſſed themſelves Roman Catholics; abſtaining from the practice of their religion in every thing, except only the obſervation of the faſt of expiation, in the month Piſis or September. Orobio ſtudied the ſcholaſtic philoſophy uſual in Spain, and became ſo ſkilled in it, that he was made profeſſor of metaphyſics in the univerſity of Salamanca. Afterwards, however, applying himſelf to the ſtudy of phyſic, he practiſed that art at Seville with ſucceſs, till, accuſed of Judaiſm, he was thrown into the inquiſition, and ſuffered the moſt dreadful cruelties, in order to force a confeſſion. He himſelf tells us, that he was put into a dark dungeon, ſo ſtrait that he could ſcarce turn himſelf in it; and ſuffered ſo many hardſhips, that his brain began to be diſturbed. He talked to himſelf often in this way: "Am I indeed that Don Balthaſar Orobio, who walked freely about in Seville, who was entirely at eaſe, and had the bleſſings of a wife and children?" Sometimes, ſuppoſing that his paſt laſt life was but a dream, and that the dungeon where he then lay was his true birth-place, and which to all appearance would alſo prove the place of his death. At other times, as he had a very metaphyſical head, he

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firſt formed arguments of that kind, and then reſolved them; performing thus the three different parts of the opponent, reſpondent, and moderator, at the ſame time. In this whimſical way he amuſed himſelf from time to time, and conſtantly denied that he was a Jew. After having appeared twice or thrice before the inquiſitors, he was uſed as follows: At the bottom of a ſubterraneous vault, lighted by two or three ſmall torches, he appeared before two perſons, one of whom was judge of the inquiſition, and the other ſecretary; who, aſking him whether he would confeſs the truth? proteſted, that in caſe of a criminal's denial, the holy office would not be deemed the cauſe of his death if he ſhould expire under the torments, but that it muſt be imputed entirely to his own obſtinacy. Then the executioner ſtript off his clothes, tied his feet and hands with a ſtrong cord, and ſet him upon a little ſtool, while he paſſed the cord through ſome iron buckles which were fixed in the wall: then drawing away the ſtool, he remained hanging by the cord, which the executioner ſtill drew harder and harder, to make him confeſs, till a ſurgeon aſſured the court of examinants, that he could not poſſibly bear more without expiring. Theſe cords put him to exquiſite tortures, by cutting into the fleſh, and making the blood burſt from under his nails. As there was certainly danger that the cords would tear off his fleſh, to prevent the worſt, care was taken to gird him with ſome bands about the breaſt, which however were drawn ſo very tight, that he would have run the riſk of not being able to breathe, if he had not held his breath in while the executioner put the bands round him; by which device his lungs had room enough to perform their functions. In the ſevereſt extremity of his ſufferings, he was told that this was but the beginning of his torments, and that he would better confeſs before they proceeded to extremities. Orobio added further, that the executioner, being on a ſmall ladder, in order to frighten him, frequently let it fall againſt the ſhin-bones of his legs; ſo that the ſtaves being ſharp, created exquiſite pain. At laſt, after three years confinement, finding themſelves baffled by his perſeverance in denying his religion, they ordered his wounds to be cured, and diſcharged him. As ſoon as he had got liberty, he reſolved to quit the Spaniſh dominions; and, going to France, was made profeſſor of phyſic at Thouloufe. The theſes which he made as candidate for this place were upon putrefaction; and he maintained them with ſo much metaphyſical ſubtlety, as embarraſſed all his competitors. He continued in this city for ſome time, ſtill outwardly profeſſing popery: but at laſt, weary of diſſembling, he repaired to Amſterdam, were he was circumciſed, took the name of Iſaac, and profeſſed Judaiſm; ſtill continuing, however, to practiſe phyſic, in which he was much eſteemed. Upon the publication of Spinoza's book, he deſpiſed a ſyſtem the falſeneſs of which he quickly diſcovered; and when Bredenbourg's anſwer to it came to his hands, Orobio, being perſuaded that the writer, in refuting Spinoza,

had alſo admitted ſome principles which tended to Atheiſm, took up his pen againſt them both, and publiſhed a piece to that purpoſe, intituled, *Certamen philoſophicum adverſus J. B. Principia.* But the diſpute which he held with the celebrated Philip Limborch againſt the Chriſtian religion made the greateſt noiſe. Here he exerted the utmoſt force of his metaphyſical genius, and carried himſelf with great temper. The three papers which he wrote on the occaſion were afterwards printed by his antagoniſt, in an account which he publiſhed of the controverſy, under the title of *Amica Collatio cum Judæo.* Orobio died in 1687.

OROBUS, BITTER VETCH: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ.* The ſtyle is linear: the calyx obtuſe at the baſe, with the upper ſegments deeper and ſhorter than the reſt. There are nine ſpecies. All of them have fibrated roots, which are perennial, but are annual in ſtalk, riſing early in ſpring and decaying in autumn. They are very hardy plants, and proſper in any common ſoil of a garden. Moſt of the ſorts are very floriferous, and the flowers conſpicuous and ornamental for adorning the flower compartments. The flowers are univerſally of the papilionaceous or butterfly kind, conſiſting each of four irregular petals, *i. e.* a ſtandard, two wings, and a keel; and are all ſucceeded by long taper ſeed-pods, furniſhing plenty of ripe ſeed in autumn; by which the plants may be propagated abundantly, as alſo by parting the roots. The Scots Highlanders have a great eſteem for the tubercles of the roots of the tuberoſus, or ſpecies ſometimes called *wood-pea.* They dry and chew them in general to give a better reliſh to their liquor; they alſo affirm that they are good againſt moſt diſorders of the breaſt, and that by the uſe of them they are enabled to reſiſt hunger and thirſt for a long time. In Breadalbane and Roſsſhire, they ſometimes bruiſe and ſteep them in water, and make an agreeable fermented liquor with them. They have a ſweet taſte, ſomething like the roots of liquorice; and, when boiled, we are told, they are nutritious and well flavoured; and in times of ſcarcity they have ſerved as a ſubſtitute for bread.

ORODES, a prince of Parthia, who murdered his brother Mithridates, and aſcended his throne. He defeated Craſſus the Roman triumvir, and poured melted gold down the throat of his fallen enemy, to reproach him for his avarice and ambition. He followed the intereſt of Caſſius and Brutus at Philippi. It is ſaid, that when Orodes became old and infirm, his 30 children applied to him, and diſputed in his preſence their right to the ſucceſſion. Phraates, the eldeſt of them, obtained the crown from his father; and, to haſten him out of the world, he attempted to poiſon him. The poiſon had no effect; and Phraates, ſtill determined on his father's death, ſtrangled him with his own hands, about 35 years before the Chriſtian æra. Orodes had then reigned about 50 years.

ORONTIUM, in botany: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the ſecond order, *Piperitæ.* The ſpadix is cylindrical, covered with florets; the corolla hexapetalous and naked; there is no ſtyle; the follicles are monoſpermous.

ORONOKO, a great river of terra firma, in South America, which riſes in Popayan, and falls into the ſea with 16 mouths.

ORPHEUS, a celebrated poet and muſician of antiquity. His reputation was eſtabliſhed as early as the time of the Argonautic expedition, in which he was himſelf an adventurer; and is ſaid by Apollonius Rhodius not only to have incited the Argonauts to row by the ſound of his lyre, but to have vanquiſhed and put to ſilence the ſirens by the ſuperiority of his ſtrains. Yet, notwithſtanding the great celebrity he had ſo long enjoyed, there is a paſſage in Cicero, which ſays, that Ariſtotle, in the third book of his *Poetics*, which is now loſt, *doubted if ſuch a perſon as Orpheus ever exiſted.* But as the work of Cicero, in which this paſſage occurs, is in dialogue, it is not eaſy to diſcover what was his own opinion upon the ſubject, the words cited being put into the mouth of Caius Cotta. And Cicero, in other parts of his writings, mentions Orpheus as a perſon of whoſe exiſtence he had no doubts. There are ſeveral ancient authors, among whom is Suidas, who enumerate five perſons of the name of *Orpheus*, and relate ſome particulars of each. And it is very probable that it has fared with Orpheus as with Hercules, and that writers have attributed to *one* the actions of *many.* But, however that may have been, we ſhall not attempt to collect all the fables that poets and mythologiſts have invented concerning him; they are too well known to need inſertion here. We ſhall, therefore, in ſpeaking of him, make uſe only of ſuch materials as the beſt ancient hiſtorians, and the moſt reſpectable writers among the moderns, have furniſhed towards his hiſtory.

Dr. Cudworth, in his *Intellectual Syſtem*, Book I. Sect. 17. after examining and confuting the objections that have been made to the being of an Orpheus, and with his uſual learning and abilities clearly eſtabliſhing his exiſtence, proceeds, in a very ample manner, to ſpeak of the opinions and writings of our bard, whom he regards not only as the firſt muſician and poet of antiquity, but as a great mythologiſt, from whom the Greeks derived the Thracian religious rites and myſteries.

He is alſo of opinion, that the poems aſcribed to Orpheus were either written by him, or that they were very ancient, and contained his doctrines. He farther argues, that though Orpheus was a polytheiſt, and aſſerted a multiplicity of gods, he nevertheleſs acknowledged one ſupreme unmade deity, as the original of all things; and that the Pythagoreans and Platoniſts not only had Orpheus in great eſteem, being commonly called by them the *Theologer*, but were alſo thought in great meaſure to have owed their theology and philoſophy to him, deriving it from his principles and traditions.

Warburton ſpeaks no more doubtfully of the exiſtence of Orpheus than of Homer and Heſiod, with whom he ranks him, not only as a poet, but alſo as a theologian, and founder of religion.

The family of Orpheus is traced by Sir Iſaac Newton for ſeveral generations: "Seſac paſſing over the Helleſpont, conquers Thrace; kills Lycurgus, king of that country; and gives his kingdom and one of his ſinging-women to Œagrus, the ſon of Tharops, and father of Orpheus; hence Orpheus is ſaid to have had the muſe Calliope for his mother."

He is allowed by moſt ancient authors to have excelled in poetry and muſic, particularly the latter; and that to ſuch a degree, that he is repreſented as taming the moſt ferocious animals, changing the courſe of the winds by his melody, and as cauſing the trees of the foreſt to dance in concert with his lyre. This account, though we muſt ſuppoſe it fabulous, yet proves his excellence to have been great before it could have given riſe to ſuch fictions. He is ſaid to have early cultivated the lyre, in preference to every other inſtrument: ſo that all thoſe who came after him were contented to be his imitators; whereas, according to Plutarch, he adopted no model; for before his time no other muſic was known, except a few airs for the flute. Muſic was ſo cloſely connected in ancient times with the moſt ſublime ſciences, that Orpheus united it not only with philoſophy, but with theology and legiſlation. He abſtained from eating animal food; and held eggs in abhorrence as aliment, being perſuaded that the egg ſubſiſted before the chicken, and was the principle of all exiſtence: both his knowledge and prejudices, it is probable, were acquired in Egypt, as well as thoſe of Pythagoras many ages after.

With reſpect to his abſtaining from the fleſh of oxen. Geſner ſuppoſes it may have proceeded from the veneration ſhown to that animal ſo uſeful in tillage, in the Eleuſinian myſteries inſtituted in honour of Ceres, the goddeſs of agriculture. He might have added, that, as theſe myſteries were inſtituted in imitation of thoſe eſtabliſhed in Egypt in honour of Oſiris and Iſis, this abſtinence from animal food was of the like origin, and a particular compliment to Apis. But Abbé Fraguier, in an ingenious diſſertation upon the *Orphic Life*, gives ſtill more importance to the prohibition; for as Orpheus was the legiſlator and humanizer of the wild and ſavage Thracians, who were cannibals, a total abolition of eating human fleſh could only be eſtabliſhed by obliging his countrymen to abſtain from every thing that had life.

With reſpect to theology, Diodorus Siculus tells us, that his father Œeagrus gave him his firſt inſtructions in religion, imparting to him the myſteries of Bacchus, as they were then practiſed in Thrace. He became afterwards a diſciple of the Idæi Dactyli in Crete, and there acquired new ideas concerning religious ceremonies. But nothing contributed ſo much to his ſkill in theological matters, as his journey into Egypt; where being initiated into the myſteries of Iſis and Oſiris, or of Ceres and Bacchus, he acquired a knowledge concerning initiations, expiations, funeral rites, and other points of religious worſhip, far ſuperior to any one of his age and country. And being much connected with the deſcendants of Cadmus, the founder of Thebes in Bœotia, he reſolved, in order to honour their origin, to tranſport into Greece the whole fable of Oſiris, and apply it to the family of Cadmus. The credulous people eaſily received this tale, and were much flattered by the inſtitution of the ceremonies in honour of Oſiris. Thus Orpheus, who was held in great veneration at the Grecian Thebes, of which he was become a citizen, admirably adapted this fable, and rendered it reſpectable, not only by his beautiful verſes and manner of ſinging them, but by the reputation he had acquired of being profoundly ſkilled in all religious concerns. Diodorus Siculus alſo ſays that he was a moſt attentive ſtudent in all kinds of literature, whether ſacred or profane.

At his return into Greece, according to Pauſanias, he was held in the higheſt veneration by the people, as they imagined he had diſcovered the ſecret of expiating crimes, purifying criminals, curing diſeaſes; and appeaſing the angry gods. He formed and promulgated an idea of a hell, from the funeral ceremonies of the Egyptians, which was received throughout all Greece. He inſtituted the myſteries and worſhip of Hecate among the Eginetes, and that of Ceres at Sparta.

Juſtin Martyr ſays, that he introduced among the Greeks near 360 gods; Heſiod and Homer purſued his labours, and followed the ſame clue, agreeing in the like doctrines, having all drank at the ſame Egyptian fountain.

Profane authors look upon Orpheus as the inventor of that ſpecies of magic called *evocation of the manes*, or raiſing ghoſts; and indeed the hymns which are attributed to him are moſtly pieces of incantation, and real conjuration. By all accounts he was an admirable muſician: he is ſaid to have received a lyre from Apollo, or according to ſome from Mercury, upon which he played with ſuch a maſterly hand, that even the moſt rapid rivers ceaſed to flow, the ſavage beaſts of the foreſt forgot their wildneſs, and the mountains came to liſten to his ſong. All nature ſeemed charmed and animated, and the nymphs were his conſtant companions. Eurydice was the only one who made a deep impreſſion on the melodious muſician, and their nuptials were celebrated. Their happineſs, however, was but ſhort: for Ariſtæus became enamoured of her; and as ſhe fled from her purſuer, a ſerpent that was lurking in the graſs bit her foot, and ſhe died of the poiſoned wound. Her loſs was ſeverely felt by Orpheus, and he reſolved to recover her or periſh in the attempt. With his lyre in his hand, he entered the infernal regions, and gained an eaſy admiſſion to the palace of Pluto. The king of hell was charmed with the melody of his ſtrains; and according to the beautiful expreſſions of the poets, the wheel of Ixion ſtopped, the ſtone of Siſyphus ſtood ſtill, Tantalus forgot his perpetual thirſt, and even the furies relented. Pluto and Proſerpine were moved with his ſorrow, and conſented to reſtore him Eurydice, provided he forbore looking behind him till he had come to the extremeſt borders of hell. The conditions were gladly accepted, and Orpheus was already in ſight of the upper regions of the air, when he forgot his promiſes, and turned back to look at his long loſt Eurydice.

He ſaw her indeed but ſhe inſtantly vaniſhed from his eyes: He attempted to follow her, but was refuſed admiſſion; and the only comfort he could find was to ſooth his grief at the ſound of his muſical inſtrument in grottoes or on the mountains. He totally ſeparated himſelf from the ſociety of mankind; and the Thracian women, whom he had offended by his coldneſs to their amorous paſſion, or, according to others, by his unnatural gratifications and impure indulgencies, attacked him while they celebrated the orgies of Bacchus; and after they had torn his body to pieces, they threw his head into the Hebrus, which ſtill articulated the words Eurydice! Eurydice! as it was carried down the ſtream into the Ægean ſea. Others think, that, as he attempted to conjure his wife from the dead, which they underſtand by the ſtory of his going down to hell, he thought he ſaw her; and when afterwards, on looking back, he miſſed her, he died of grief. There is certainly ſome reaſon for ſuppoſing this to be the caſe: for there were perſons and temples publicly appointed for the purpoſe; and Pauſanias really ſpeaks of that temple which was in Theſprotia, and where Orpheus went to call up the ghoſt of Eurydice. Poets often mention this ſubject; and inſtances of it occur in hiſtory both ſacred and profane. The witch of Endor is well known to thoſe who read the hiſtorical part of the Bible. But to particulariſe inſtances, whether ſacred or profane, would be endleſs. Some maintain that he was killed by a thunder-bolt. He was buried at Pieria in Macedonia, according to Apollodorus. The inhabitants of Dion boaſted that his tomb was in their city, and the people of Mount Libethrus in Thrace claimed the ſame honour; and farther obſerved that the nightingales which built their neſts near his tomb, ſang with greater melody than all other birds. Orpheus, as ſome report, after death received divine honours; the muſes gave an honourable burial to his remains, and his lyre became one of the conſtellations in the heavens.

Tzetzes explains the fable of his drawing his wife Eurydice from hell, by his great ſkill in medicine, with which he prolonged her life, or, in other words, ſnatched her from the grave. Æſculapius, and other phyſicians, have been ſaid to have raiſed from the dead thoſe whom they had recovered from dangerous diſeaſes.

Warburton, in his learned, ample, and admirable account of the Eleuſinian myſteries, ſays, "While theſe myſteries were confined to Egypt their native country, and while the Grecian lawgivers went thither to be initiated, as a kind of deſignation to their office, the ceremony would be naturally deſcribed in terms highly allegorical. This way of ſpeaking was uſed by Orpheus, Bacchus, and others: and continued even after the myſteries were introduced into Greece, as appears by the fables of Hercules, Caſtor, Pollux, and Theſeus's deſcent into hell; but the allegory was ſo circumſtanced, as to diſcover the truth concealed under it. So Orpheus is ſaid by Virgil to get to hell by the power of his harp: "*Threicia fretus cithara, fidibuſque canoris.*" That is, in quality of lawgiver; the harp being the known ſymbol of his laws, by which he humanized

a rude and barbarous people.—Had an old poem, under the name of *Orpheus*, intitled *A deſcent into Hell*, been now extant, it would perhaps have ſhown us, that no more was meant than Orpheus's *initiation*."

Many ancient writers, in ſpeaking of his death, relate, that the Thracian women, as hinted at above, enraged at being abandoned by their huſbands, who were diſciples of Orpheus, concealed themſelves in the woods, in order to ſatiate their vengeance; and, notwithſtanding they poſtponed the perpetration of their deſign ſome time through fear, at length, by drinking to a degree of intoxication, they ſo far fortified their courage as to put him to death. And Plutarch aſſures us, that the Thracians ſtigmatized their women, even in his time, for the barbarity of this action.

Our venerable bard is defended by the author of the *Divine Legation*, from ſome inſinuations to his diſadvantage in Diogenes Laertius. "It is true (ſays he), if uncertain report was to be believed, the myſteries were corrupted very early; for Orpheus himſelf is ſaid to have abuſed them. But this was an art the debauched myſtæ of later times employed to varniſh their enormities; as the deteſted pæderaſts of after-ages ſcandalized the blameleſs Socrates. Beſides, the ſtory is ſo ill laid, that it is detected by the ſureſt records of antiquity: for in conſequence of what they fabled of Orpheus in the myſteries, they pretended he was torn in pieces by the women; whereas it appeared from the inſcription on his monument at Dium in Macedonia, that he was ſtruck dead with lightning, the envied death of the reputed favourites of the gods."

This monument at Dium, conſiſting of a marble urn on a pil'ar, was ſtill to be ſeen in the time of Pauſanias. It is ſaid, however, that his ſepulchre was removed from Libethra upon Mount Olympus, where Orpheus was born, and from whence it was transferred to Dium by the Macedonians, after the ruin of Libethra by a ſudden inundation which a dreadful ſtorm had occaſioned. This event is very minutely related by Pauſanias.

Virgil beſtows the firſt place in his Elyſium upon the legiſlators, and *thoſe who brought mankind from a ſtate of nature into ſociety*: "*Magnanimi heroës, nati meliorbus annis.*" At the head of theſe is Orpheus, the moſt renowned of the European lawgivers, but better known under the character of a poet: for the firſt laws being written in meaſure, to allure men to learn them, and, when learnt, to retain them, the fable would have it, that by the force of harmony Orpheus ſoftened the ſavage inhabitants of Thrace:

> ——*Threïcius Linga cum veſte ſacerdos*
> *Obloquitur numeris ſeptem diſcrimina vocum:*
> *Jamque eadem digitis, jam pectine pulſat eburno.*
>
> ÆN. lib. vi. ver. 645.

The ſeven ſtrings given by the poet in this paſſage to the lyre of Orpheus, is a circumſtance ſomewhat hiſtorical. The firſt Mercurean lyre had, at moſt, but four ſtrings. Others were afterwards added to it by the ſecond Mercury, or Amphion: but, according to ſeveral traditions preſerved by Greek hiſtorians, it was Orpheus who completed the ſecond tetrachord, which extended the ſcale to a heptachord, or *ſeven ſounds*, implied by the *ſeptem diſcrimina vocum*. For the aſſertion of many writers, that Orpheus added two new ſtrings to the lyre, which before had ſeven, claſhes with the claims of Pythagoras to the invention of the octachord, or addition of the ſound *proſlambanomenos* to the heptachord, of which almoſt all antiquity allows him to have been the inventor. And it is not eaſy to ſuppoſe, that the lyre ſhould have been repreſented in ancient ſculpture with four or five ſtrings only, if it had had nine ſo early as the time of Orpheus, who flouriſhed long before ſculpture was known in Greece. See the article LYRE.

With reſpect to the writings of Orpheus, he is mentioned by Pindar as author of the Argonautics, and Herodotus ſpeaks of his Orphics. His hymns, ſays Pauſanias, were very ſhort, and but few in number; the Lycomides, an Athenian family, knew them by heart, and had an excluſive privilege of ſinging them, and thoſe of their old poets, Muſæus, Onomacritus, Pamphus, and Olen, at the celebration of the Eleuſinian myſteries; that is, the prieſthood was hereditary in this family.

Jamblicus tells us, that the poems under the name of *Orpheus* were written in the Doric dialect, but have ſince been tranſdialected, or moderniſed. It was the common opinion in antiquity that they were genuine; but even thoſe who doubted of it, gave them to the earlieſt Pythagoreans, and ſome of them to Pythagoras himſelf, who has frequently been called the *follower of Orpheus*, and has been ſuppoſed to have adopted many of his opinions.

Of the poems that are ſtill ſubſiſting under the name of *Orpheus*, which were collected and publiſhed at Nuremberg 1702, by Andr. Chriſt. Eſchenbach, and which have been ſince reprinted at Leipſic 1764, under the title of ΟΡΦΕΩΣ ΑΠΑΝΤΑ, ſeveral have been attributed to Onomacritus, an Athenian, who flouriſhed under the Pyſiſtratidæ, about 500 years before Chriſt. Their titles are, 1. The Argonautics, an epic poem. 2. Eighty ſix hymns; which are ſo full of incantations and magical evocation, that Daniel Heinſius has called them *veram Satanæ liturgiam*, "the true liturgy of the devil." Pauſanias, who made no doubt that the hymns ſubſiſting in his time were compoſed by Orpheus, tells us, that though leſs elegant, they had been preferred for religious purpoſes to thoſe of Homer. 3. *De lapidibus*, a poem on precious ſtones. 4. Fragments, collected by Henry Stevens. Orpheus has been called the *inventor*, or at leaſt the *propagator*, of many arts and doctrines among the Greeks. 1. The *combination of letters*, or the art of writing. 2. *Muſic*, the lyre, or *cithara*, of ſeven ſtrings, adding three to that of Mercury. 3. *Hexameter verſe*. 4. *Myſteries* and *theology*. 5. *Medicine*. 6. *Magic* and *divination*. 7. *Aſtrology*. Servius upon the ſixth Æneid, p. 450, ſays Orpheus firſt inſtituted *the harmony of the ſpheres*. 8 He is ſaid likewiſe to have been the firſt who imagined *a plurality of worlds*, or that the moon and planets were inhabited.

ORPHUS, in ichthyology, the name of a fiſh caught in the Archipelago. It is of a broad and flat figure, and of a fine purple colour; its eyes are large and prominent, and its teeth ſerrated; it has only one fin on the back, and the anterior rays of that are prickly, the others ſoft to the touch; its anus is ſmall, and is ſaid to have no paſſage for the ſemen. This was the fiſh called *orphus* by the ancients, but the modern Greeks call another fiſh by that name. It is a ſpecies of the ſparus, of a flat figure, but very thick, has a ſmall mouth, and is covered with ſmall but very rough ſcales, which adhere very firmly to the fleſh; the tail is not forked; it has fleſhy lips, and very ſmall teeth; its back and ſides are black; its belly white: it has a large black ſpot at the root of the tail; its head is reddiſh, and its fins are very elegantly diverſified with various colours; it has only one back fin, and that has the anterior ray prickly, the hinder ones not at all ſo. It grows ſometimes to 20 pounds weight, and is much eſteemed among the modern Greeks.

ORPIMENT, *auripigmentum*, in natural hiſtory, a bituminous mineral compoſed of ſulphur and arſenic, ſometimes artificially produced, but found alſo native in the earth, and conſtituting one of the ores of arſenic. It is of two kinds, red and yellow, the former generally found in an indurated ſtate; though Cronſtedt ſuppoſes that it may alſo be met with in looſe ſcaly powder, as it is ſometimes met with in the ſhops. It is commonly found in ſhapeleſs maſſes, very ſeldom cryſtalliſed; though Baron Borne once found it in a polyhedral form on a

blue clay in Hungary. The name *red orpiment* has been given by the more judicious to fandarach, and by the vulgar to red arſenic; but it is to be reſtrained only to this foſſile, which is of a fine bright red, and of the regular texture of the orpiments, and anſwering all their characters. It is a very beautiful ſubſtance of a fine bright red, very gloſſy, and a little tranſparent, and is found in the Turkiſh dominions, in the iſlands of the Archipelago, and even in our own country, Dr. Hill having received ſome of it from Cornwall, under the name of *red mundic*. The yellow kind is met with commonly of ſhining flexible lamellæ like mica, the ſpecific gravity about 5515. It burns with a blue flame, and contains about one tenth of its weight of ſulphur. It is found native in Hungary, and in many parts of Germany and the Turkiſh dominions: it is the common orpiment of the ſhops. Some are of opinion, that the noxious qualities of the arſenic are ſo much counteracted by the ſulphur with which this ſubſtance is mixed, that it may be ſwallowed with ſafety; but Macquer poſitively aſſerts the contrary, and very ſeriouſly cautions againſt its uſe, even though we be certain that the orpiment is native. There is beſides a broad flaked, gold coloured kind, well known among the ancients, as is plain from the deſcription of it left us by Dioſcorides, and much eſteemed at preſent by our painters. This is found in ſeveral places, as in the iſlands of the Archipelago, in the mines of Goſſelaer in Saxony, in ſome parts of Turkey, and the Eaſt Indies, and in its utmoſt purity about Smyrna; this makes the fineſt of all yellows in painting. The ſmall flaked, yellow kind, which is the common orpiment of the ſhops, is alſo a fine colour, though greatly inferior to the former. The Indians uſe orpiment, corrected with juice of lemons, with good ſucceſs againſt fevers.

The red arſenic, or *realgar*, is likewiſe found in an indurated ſtate, and in irregular or ſtalactitical maſſes. It is either opaque or ſemitranſparent; ſometimes it is found quite tranſparent, and regularly cryſtalliſed in octoedral priſms or pyramids; in which laſt form it is called *ruby of arſenic*. Its ſpecific gravity is about 3225; it contains 16 *per cent.* of ſulphur; and its red colour is eaſily deſtroyed by the nitrous acid. In order to analyſe theſe two kinds of orpiment, they ought to be digeſted in marine acid, adding the nitrous by degrees to aſſiſt the ſolution. The ſulphur is then left on the filter, while the arſenic remains in the ſolution, from which it may be precipitated in its matallic form by zinc, adding ſpirit of wine to the ſolution.

ORPINE, in botany. See SEDUM.

ORRERY, a curious machine for repreſenting the motions or phaſes of the heavenly bodies. See ASTRONOMY. The reaſon of its being called an *Orrery*, was this: Mr. Rowley, a mathematical inſtrument-maker, having got one from Mr. George Graham, the original inventor, to be ſent abroad with ſome of his own inſtruments, he copied it, and made the firſt for the earl of Orrery. Sir Richard Steel, who knew nothing of Mr. Graham's machine, thinking to do juſtice to the firſt encourager, as well as to the inventor, of ſuch a curious inſtrument, called it an *Orrery*, and gave Mr. Rowley the praiſe due to Mr. Graham.

It would be too great an undertaking here to give an account of the mechaniſm of the larger ſort of orreries, which repreſent the movements of all the heavenly bodies; nor indeed can it be done either by diagram or deſcription, to render it intelligible to the moſt diſcerning reader: but, inſtead of that, we ſhall exhibit an idea of the theory and ſtructure of an uſeful, conciſe, and portable planetarium, which any gentleman may have made for a ſmall expence, and will exhibit very juſtly the motions of all the primary planets about the ſun, by wheel-work; and thoſe that have ſecondaries, or moons, may have them placed about their primaries moveable by the hand, ſo that the whole ſhall be a juſt repreſentation of the ſolar ſyſtem, or true ſtate of the heavens, for any given time of the year.

In order to this, we muſt compare, and find out the proportion, which the periodical times, or revolutions of the primary planets, bear to that of the earth: which, with reſpect to the Georgium Sidus, are not as yet ſufficiently aſcertained; but thoſe of the other planets are ſuch as are expreſſed in the table below, where the firſt column is the time of the earth's period in days and decimal parts; the ſecond, that of the planets; the third and fourth are numbers in the ſame proportion to each other: as,

365,25 : 88	☿	: : 83 : 20, for Mercury.
365,25 : 224,7	♀	: : 52 : 32, for Venus.
365,25 : 686,9	♂	: : 40 : 75, for Mars.
365,25 : 4332,5	♃	: : 7 : 83, for Jupiter.
365,25 : 10759,3	♄	: : 5 : 148, for Saturn.

If we now ſuppoſe a ſpindle or arbor with ſix wheels fixed upon it in an horizontal poſition, having the number of teeth in each correſponding to the numbers in the third column, viz. the wheel AM (pl. 18.) of 83 teeth, BL of 52, CK of 50 (for the earth), DI of 20, EH of 7, and FG of 5; and another ſet of wheels moving freely about an arbor, having the number of teeth in the fourth column, viz. AN of 20, BO of 32, CP of 50 (for the earth), DQ of 75, ER of 83, and FS of 148; then, if thoſe two arbors of fixed and moveable wheels are made of the ſize, and fixed at the diſtance from each other, as here repreſented in the ſcheme, the teeth of the former will take thoſe of the latter, and turn them very freely when the machine is in motion.

Theſe arbors, with their wheel, are to be placed in a box, of an adequate ſize, in a perpendicular poſition; the arbor of fixed wheels to move in pivots at the top and bottom of the box; and the arbor of moveable wheels to go through the top of the box, to a proper height, on the top of which is to be placed a round ball gilt with gold to repreſent the ſun. On each of the moveable wheels is to be fixed a ſocket, or tube, aſcending above the top of the box, and having on the top a wire fixed, and bent at a proper diſtance into a right angle upwards, bearing on the top a ſmall round ball, repreſenting its proper planets.

If then on the lower part of the arbor of fixed wheels be placed a pinion of ſcrew-teeth, a winch turning a ſpindle with an endleſs ſcrew, playing in the teeth of the arbor, will turn it with all its wheels; and theſe wheels will move the others about, with their planets, in their proper and reſpective periods of time, very exactly. For while the fixed wheel CK moves its equal CP once round, the wheel AM will move AN a little more than four times round, and ſo will nearly exhibit the motion of Mercury; and the wheel FG will turn the wheel FS about $\frac{1}{29,5}$ round, and ſo will truly repreſent the motion of Saturn: and the ſame is to be obſerved of all the reſt.

ORRICE. See IRIS.

ORRUS, in botany, a name by which many of the ancients called the cultivated pine-tree, from its being remarkably full of juice. The firſt perſon who has given us the name is Theophraſtus; but he is followed in it not only by the other Greeks, but alſo by the Latins, who have called the ſame tree for the ſame reaſon *ſapinus*, a contraction or abbreviation of the word *ſapapinus*, the juicy pine. Pliny tells us, that this laſt was the name of the manured pitch tree; but in this he errs; for Vitruvius, and others, tell us, that the pine-nuts, *nuces pinæ*, which were eaten and uſed in medicine, were the fruit of the *ſapapinus*, or *ſapinus*; and it is evident, that theſe muſt be the produce of a pine-tree, not of a pitch-tree, or any thing of the fir kind.

ORSATO (SERTORIO), a celebrated antiquarian, hiſtorian,

and poet, was born at Padua in 1617, and early diſcovered a taſte for literature and the ſciences. He applied himſelf to ſearching out antiquities and ancient inſcriptions; for which purpoſe he travelled through all the different parts of Italy, and in the mean time poetry was his amuſement. When advanced in age, he taught natural philoſophy in the univerſity of Padua. He was alſo a member of the academy of the Ricovrati. Having preſented to the doge and ſenate of Venice the hiſtory of Padua, which he had dedicated to them, he made a long ſpeech, during which he ſtruggled with a natural want, and died of ſuppreſſion of urine, on the 3d of July 1678. He wrote a great number of books which are eſteemed, ſome in Latin, and others in Italian. He ought not to be confounded with *John Baptiſt* ORSATO, an able phyſician and antiquary, who was born at Padua in 1673, and wrote, 1. *Diſſertatio epiſtolaris de Lucernis antiquis.* 2. A diſſertation *De patera antiquorum.* 3. A ſmall treatiſe *De ſternis veterum*; and ſome other works.

ORSI (JOHN JOSEPH), an ingenious philologer and poet, was born at Bologna in the year 1652; and ſtudied polite literature, philoſophy, the civil law, and mathematics. His houſe was a kind of academy, where many perſons of literature regularly aſſembled. He wrote many ingenious ſonnets, paſtorals, and other works in Italian, and died in 1733.

ORTEGAL CAPE, the moſt northern promontory of Spain, where there is alſo a caſtle of the ſame name. W. lon. 8. 20. N. lat. 44. 0.

ORTELIUS (ABRAHAM), a celebrated geographer, born at Antwerp, in 1527, was well ſkilled in the languages and the mathematics, and acquired ſuch reputation by his ſkill in geography, that he was ſurnamed the *Ptolemy of his time.* Juſtus Lipſius, and moſt of the great men of the 16th century, were Ortelius's friends. He reſided at Oxford in the reign of Edward VI. and came a ſecond time into England in 1577. His *Theatrum Orbis* was the completeſt work of the kind that had ever been publiſhed, and gained him a reputation equal to his immenſe labour in compiling it. He alſo wrote ſeveral other excellent geographical works; the principal of which are his *Theſaurus*, and his *Synonyma Geographica.* The world is likewiſe obliged to him for the *Britannia*, which he perſuaded Cambden to undertake. He died at Antwerp in 1598.

ORTHODOX, in church hiſtory, an appellation given to thoſe who are ſound in all the articles of the Chriſtian faith.

ORTHOGRAPHIC PROJECTION *of the* SPHERE, that wherein the eye is ſuppoſed to be at an infinite diſtance; ſo called, becauſe the perpendiculars from any point of the ſphere will all fall in the common interſection of the ſphere with the plane of the projection. See GEOGRAPHY, and PROJECTION.

ORTHOGRAPHY, that part of grammar which teaches the nature and affections of letters, and the juſt method of ſpelling or writing words, with all the proper and neceſſary letters, making one of the four greateſt diviſions or branches of grammar. See GRAMMAR.

ORTHOGRAPHY, in geometry, the art of drawing or delineating the fore right plan of any object, and of expreſſing the heights or elevations of each part. It is called *Orthography*, for its determining things by perpendicular lines falling on the geometrical plane.

ORTHOGRAPHY, in architecture, the elevation of a building.

ORTHOGRAPHY, in perſpective, is the fore-right ſide of any plane, *i. e.* the ſide or plane that lies parallel to a ſtraight line, that may be imagined to paſs through the outward convex points of the eyes, continued to a convenient length.

ORTHOPNOEA, a ſpecies or degree of aſthma, where there is ſuch a difficulty of reſpiration that the patient is obliged to ſit or ſtand upright in order to be able to breathe.

ORTIVE, in aſtronomy, the ſame with *eaſtern.* The ortive or eaſtern amplitude, is an arch of the horizon intercepted between the place where a ſtar riſes, and the eaſt point of the horizon, or point where the horizon and equator interſect.

ORTOLAN, in ornithology. See EMBERIZA.

ORTNAU, a county of Germany, in the circle of Suabia, lying along the Rhine, and ſeparating it from Alſace. It is bounded on the ſouth by Breſlau, on the north by the margravate of Baden, and on the eaſt by the duchy of Wirtemberg. It contains three imperial towns; namely, Offenburg, Gegenbach, and Zell. It belongs partly to the houſe of Auſtria, partly to the biſhopric of Spire, and partly to the county of Hannau.

ORTYGIA, the birth place of Diana, was a beautiful grove of trees of various kinds, chiefly cypreſſes, near Epheſus; on the coaſt, a little up from the ſea. This place was filled with ſhrines and images. The prieſts of the goddeſs were eunuchs, and exceedingly reſpected by the people. A general aſſembly was held there yearly, and ſplendid entertainments were provided, and myſtic ſacrifices ſolemnized. The Cenchrius, probably a crooked river, ran through it; and above it was the mountain Solmiſſus, on which, it was fabled, the Curetes ſtood, and rattled on their ſhields, to divert the attention of Juno. The improved face of a country is periſhable like human beauty. Not only the birth place of Diana and its ſanctity are forgotten, but the grove and buildings which adorned it appear no more; and perhaps, ſays Dr. Chandler, the land has encroached on the ſea, and the valley, in which Arviſia is, was once Ortygia. See EPHESUS and DIANA, &c.

ORVIETO, a town of Italy, in the patrimony of St. Peter, with a biſhop's ſee, and a magnificient palace. It is the capital of the province of Orvietano, in the eccleſiaſtical ſtate, in E. lon. 13. lat. 43. It is a large ſtrong town, ſituated at the conflux of the Tiber and the Chiane, on a ſteep hill, ſurrounded on every ſide with rocks and precipices. To this ſituation it is owing that it has no ſprings; but there is a very ſurpriſing well cut into the rock, to ſupply it with freſh water. The mules which bring up the water on their backs, go down by a ſtaircaſe of 150 ſteps, and 60 windows, and come up by another, without meeting. The architect of this ſingular building was the famous Antonio da San Gallo, employed by Clement VII. At the entrance is this inſcription, *Quod natura munimento invideraat, induſtria adjecit.* The city, called *Herbanum* by Pliny, and *Urbevetanum* by Procopius, is the ſee of a biſhop ſuffragan of Rome. The cathedral, which is of Gothic architecture, is a handſome building, which was begun in 1260 by Nicolo Piſano. The front is adorned with fine ſtatues, among the reſt the Virgin Mary and the four Evangeliſts, with a baſſo-relievo of the laſt judgment, by the ſaid Nicolo Piſano, and others repreſenting ſome hiſtories of the old teſtament. The other half of the front is a ſurpriſing work in Moſaic, by Scalzi, expreſſing the hiſtory of the new teſtament. In the church there is a very fine organ, and a baſſo-relievo of Raphael da Monte Lupo. Here is alſo a chapel, which was begun to be painted by F. Angelo, a dominican, and finiſhed by Luke Signorelli, where you ſee a very beautiful repreſentation of the laſt judgment. Orvieto was once a potent and populous city, but is now much upon the decline.

ORYZA, RICE, in botany: A genus of the digynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina.* The calyx is a bivalved uniflorous glume; the corolla bivalved, nearly equal, and adhering to the ſeed. There is but one ſpecies, namely the ſativa or common rice. This plant is greatly cultivated in moſt of the eaſtern countries, where it is the chief ſupport of the inhabitants; and great quantities of it are brought into England and other European countries every year, where it is much eſteemed for puddings, &c. it being too tender to be produced in theſe northern countries without the aſſiſtance of artificial

heat; but from ſome ſeeds which were formerly ſent to Carolina there have been great quantities produced, and it is found to ſucceed as well there as in the eaſtern countries.

This plant grows upon moiſt ſoils, where the ground can be flowed over with water after it is come up. So that whoever would cultivate it in this country ſhould ſow the ſeeds upon a hot-bed; and when the plants are come up, they ſhould be removed into pots filled with light rich earth, and placed in pans of water, which ſhould be plunged into a hot bed; and as the water waſtes, it muſt from time to time be renewed again. In July theſe plants may be ſet abroad in a warm ſituation, ſtill preſerving the water in the pans, otherwiſe they will not thrive; and, toward the latter end of Auguſt, they will produce their grain, which will ripen tolerably well, provided the autumn proves favourable. The leaves of rice are long, like the reed, and fleſhy; the flowers blow on the top like barley; but the ſeed which follows is diſpoſed in cluſters, each of which is incloſed in a yellow huſk, ending in a ſpiral thread. The ſeed is oblong, or rather oval, and white.

Rice is the chief commodity and riches of Damieta in Egypt. Dr. Haſſelquiſt gives the following deſcription of the manner in which they dreſs and ſeparate it from the huſks. "It is pounded by hollow iron peſtles of a cylindrical form, lifted up by a wheel worked by oxen. A perſon ſitting between the two peſtles, puſhes forward the rice when the peſtles are riſing; another ſifts, winnows, and lays it under the peſtles. In this manner they continue working it until it is entirely free from chaff and huſks. When clean, they add a 30th part of ſalt, and pound them together; by which the rice, formerly grey, becomes white. After this purification, it is paſſed through a fine ſieve to part the ſalt from the rice; and then it is ready for ſale." Damieta ſells every year 60,800 ſacks of rice, the greateſt part of which goes to Turkey, ſome to Leghorn, Marſeilles, and Venice.

Rice, according to Dr. Cullen, is preferable to all other kinds of grain, both for largeneſs of produce, quantity of nouriſhment, and goodneſs. This, he ſays, is plain from macerating the different grains in water; for, as the rice ſwells to the largeſt ſize, ſo its parts are more intimately divided. Rice is ſaid to affect the eyes; but this is purely prejudice. Thus it is alleged a particular people of Aſia, who live on this grain, are blind-eyed: but if the ſoil be ſandy, and not much covered with herbage, and as theſe people are much employed in the field, this affection of their eyes may be owing to the ſtrong reflection of the rays of light from this ſandy ſoil; and our author is the more inclined to this opinion, becauſe no ſuch effect is obſerved in Carolina, where rice is very commonly uſed.

Dr. Percival informs us, that as a wholeſome nouriſhment rice is much inferior to ſalep. He digeſted ſeveral alimentary mixtures prepared of mutton and water, beat up with bread, ſea-biſcuit, ſalep, rice flour, ſago powder, potato, old cheeſe, &c. in a heat equal to that of the human body. In 48 hours they had all acquired a vinous ſmell, and were in briſk fermentation, except the mixture with rice, which did not emit many air-bubbles, and was but little changed. The third day ſeveral of the mixtures were ſweet, and continued to ferment; others had loſt their inteſtine motion, and were ſour; but the one which contained the rice was become putrid. From this experiment it appears that rice, as an aliment, is ſlow of fermentation, and a very weak corrector of putrefaction. It is therefore an improper diet for hoſpital patients, but more particularly for ſailors, in long voyages, becauſe it is incapable of preventing, and will not contribute much to check the progreſs of, that fatal diſeaſe the ſea-ſcurvy. Under certain circumſtances, rice ſeems diſpoſed of itſelf, without mixture, to become putrid. For by long keeping it ſometimes acquires an offenſive fœtor. Nor, according to our author, can it be conſidered as a very nutritive food, on account of its difficult ſolubility in the ſtomach. Experience confirms the truth of this concluſion; for it is obſerved by the planters in the Weſt Indies, that the negroes grow thin, and are leſs able to work, whilſt they ſubſiſt upon rice.

ORYZIVERA, called the rice-bird of Cateſby. It is about the ſize of a ſparrow, being ſix inches three quarters long, with the head, and whole under ſide of the body, black; hind part of the neck in ſome pale yellow, in others white; coverts of the wings and primaries black; the laſt edged with white; part of the ſcapulars, leſſer coverts of the wings, and rump, white; back black, edged with dull yellow; tail of the ſame colours, and each feather ſharply pointed: the legs are red. The head, upper part of the neck, and back, of the female is yellowiſh brown, ſpotted with black; under part of a dull yellow; ſides thinly ſtreaked with black. Theſe birds inhabit in vaſt numbers the iſland of Cuba, where they commit great ravages among the early crops of rice, which precede thoſe of Carolina. As ſoon as the crops of that province are to their palate, they quit Cuba, and paſs over the ſea, in numerous flights, directly north, and are very often heard in their paſſage by ſailors frequenting that courſe. Their appearance is in September, while the rice is yet milky; and they commit ſuch devaſtations, that forty acres of that grain have been totally ruined by them in a ſmall time. They arrive very lean, but ſoon grow ſo fat as to fly with difficulty; and when ſhot often burſt with the fall. They continue in Carolina not much above three weeks, and retire by the time the rice begins to harden, going on to other parts, and ſtaying in each only ſo long as the rice continues green. They come into Rhode Iſland and New York at the end of April, or the ſecond week in May, frequenting the borders of fields, and live on inſects, &c. till the maize is fit for their palate, when they begin by pecking holes in the ſides of the huſks, and after ſatiating themſelves go on to another, which leaves room for the rain to get in, and effectually ſpoils the plants. They continue there during the ſummer, and breed, returning as autumn approaches to the ſouthward. The males and females do not arrive together; the females come firſt. They are eſteemed to be the moſt delicate birds of thoſe parts, and the male is ſaid to have a fine note. This ſpecies is known in the country by the names of *Bob Lincoln*, and *Conquedle*; likewiſe called by ſome the *White-backed Maize-thief*.

OSBORN (FRANCIS), an eminent Engliſh writer in the 17th century. He was educated in a private manner; and at ripe years frequented the court, and was maſter of the horſe to William earl of Pembroke. Upon the breaking out of the civil wars, he adhered to the parliament party, and had ſeveral public employments conferred upon him. In the latter part of his life he lived at Oxford, in order to print ſeveral books, and to look after his ſon, for whom, by the favour of parliament, he procured a fellowſhip in Allſouls college. His advice to a ſon, ſo ſoon as it was publiſhed, being complained of to Dr. John Tenant, vice-chancellor of Oxford, as of irreligious tendency, there was a propoſal made to have it publicly burnt; but that taking no effect, it was ordered that no bookſeller or others ſhould ſell it, which only made it ſell the faſter. He wrote alſo Hiſtorical Memoirs of the reigns of queen Elizabeth and king James I.; a Diſcourſe on the greatneſs and corruption of the church of Rome; a Diſcourſe upon Machiavel, &c. He died in 1659.

OSCHOPHORIA, a feſtival obſerved by the Athenians. It receives its name *απο τε φερειν τας οσχας, οσχαι*. Its original inſtitution is thus mentioned by *Plut. in Theſ.* Theſeus, on returning from Crete, forgot to hang out the white ſail, by which his father was to be apprized of his ſucceſs. This neglect proved fatal to Ægeus, for he threw himſelf into the ſea, and periſhed. Theſeus no ſooner reached the land,

than he ſent a herald to inform his father of his ſafe return, and in the mean time he began to make the ſacrifices which he had vowed to make when he firſt ſet ſail to Crete. The herald, on his entrance into the city, found the people in great agitation. Some lamented the king's death, while others, elated at the ſudden news of the victory of Theſeus, crowned the herald with garlands in token of their joy. The herald carried back the garlands on his ſtaff to the ſea ſhore; and, after waiting till Theſeus had finiſhed his ſacrifice, he related the melancholy account of the king's death. Upon this the people ran in crowds to the city, ſhowing their grief by cries and lamentations.—From this circumſtance, therefore, at the feaſt of Oſchophoria, not the herald but his ſtaff is crowned with garlands, and all the people that are preſent always exclaim ελελευ, ιε, ιε, the firſt of which expreſſes haſte, and the others a conſternation or depreſſion of ſpirits. The hiſtorians further mentions, that Theſeus, when he went to Crete, did not take with him the uſual number of virgins, but that in the place of two of them, he took two youths of his acquaintance, whom he cauſed to paſs for women, by diſguiſing their dreſs, and by accuſtoming them to the ointments and perfumes of women, as well as by a long and ſucceſsful imitation of their voice. The impoſition ſucceeded; their ſex was not diſcovered in Crete; and when Theſeus had triumphed over the Minotaur, he with theſe two young men led a proceſſion, with branches in their hands, in the ſame habit, which is ſtill uſed at the celebration of the feſtival. The branches which were carried were in honour of Bacchus and Ariadne, or becauſe they returned in autumn, when the grapes were ripe. Beſides this proceſſion, there was alſo a race, in which young men only whoſe parents were both alive were permitted to engage. It was cuſtomary for them to run from the temple of Bacchus to that of Minerva, which was on the ſea-ſhore. The place were they ſtopped was called οσχοφοριον, becauſe the bows which they carried in their hands were depoſited there. The rewards of the conqueror was a cup called πενταπλοα "five-fold," becauſe it contained a mixture of five different things, wine, honey, cheeſe, meal, and oil.

OSCILLA, ſmall images of wax or clay made in the ſhape of men or women, and conſecrated to Saturn, to render him propitious. The word is ſometimes uſed to ſignify a kind of maſks ſcooped from the bark of trees, and worn by the performers of comedy in the ruder ages of Rome. In this ſenſe we find it in Virg. Geo. ii. 386. It alſo ſignifies little heads or images of Bacchus, which the countrymen of old hung upon trees, that the face might turn every way, out of a notion that the countenance of this god gave felicity to themſelves, and fertility to their vineyards. An alluſion to this opinion and cuſtom is alſo found in Virgil, Geo. ii. 388.

OSENEY-ISLAND, in England, is formed by the river Iſis in the meadows near Oxford, where a magnificent abbey was erected, at the inſtigation of a concubine of King Henry I. to atone for her ſins; and the ſaid king built a palace there, wherein King Richard I. was born, which Edward II. converted into a monaſtery.

OSIRIS, in mythology, one of the gods of ancient Egypt, and very generally believed to have been the ſun, or at leaſt the mind actuating that luminary. The Egyptians derived all things from two principles, an *active* and a *paſſive*. Their active principle, according to the learned Jablonſki, was an infinite and eternal *ſpirit*; and their paſſive principle was *night*. This ſpirit they conſidered ſometimes as a *male*, ſometimes as a *female*, divinity, and occaſionally they attributed to it *both ſexes*; but it does not appear to have been the object of their worſhip. It ſhall be ſhown elſewhere (ſee POLYTHEISM), that the earlieſt objects of pagan adoration were the ſun, moon, and planets; and that the philoſophers and prieſts of ancient Egypt worſhipped the ſun by the name of *Oſiris*, may be proved by numberleſs teſtimonies from the moſt authentic records of antiquity. Diogenes Laertius affirms, that they held the ſun and moon for divinities, and that they called the latter *Iſis*; and Microbius ſays expreſsly. "Nec in occulto eſt, neque aliud eſſe *Oſirin* quam *Solem*, nec *Iſim* aliud eſſe quam *terram*." The ſame writer informs us, that in the hieroglyphic writings of ancient Egypt, "Oſiris was repreſented by a ſceptre and an eye," to denote that this god was the *ſun* looking down from heaven on all things upon earth.

It muſt not, however, be concealed, that ſome of the ancients, and a few of the moſt learned moderns, have contended, that by *Oſiris* the Egyptians underſtood the Nile or ſpirit of the Nile, whilſt others have confounded him with the Grecian Bacchus. Scaliger and Selden have adopted the former of theſe opinions, and Servius on Virgil has given his countenance to the latter. But that they are all miſtaken, has been evinced by Jablonſki in ſuch a manner as to enforce the fulleſt conviction: "When the Egyptains, in their ſacred books, ſometimes give the name of *Oſiris* to the Nile and its wonderful increaſe during the heat of ſummer, they mean nothing more (ſays he) but to attribute to their god Oſiris the gift which fertilizes their country." This they would the more readily do that they believed the Nile to have its ſource in heaven. Hence Euſebius tells us, Οσιρις εστιν ὁ Νειλος, ὁν εξ ὑρανε καταφερεσθαι οιονται, *Oſiris is the Nile, becauſe they think it is ſent down from heaven.*—In one ſenſe Oſiris might be Bacchus, becauſe the original Bacchus was himſelf the ſun; but that the Egyptian god could not be worſhipped as the inventor of wine is indeed undeniable, if, as Jablonſki labours to prove the primitive religion of that country inculcated upon its votaries, that wine was the gift, not of a benevolent god, but of an evil genius, the enemy of the human race. In ſupport of this opinion our learned author quotes a paſſage from Plutarch, from which it appears, that, before the æra of Prommetichus, the Egyptians neither drank wine themſelves nor offered it in libations to the gods, becauſe they believed that the firſt vine ſprung from the earth that was impregnated by the blood of thoſe giants who periſhed in the war with the gods. It is indeed true, that the Greeks, who borrowed their religion as well as the firſt principles of ſcience from Egypt, attributed to their Bacchus many of the actions of Oſiris; but it is likewiſe true, that they gave him other attributes, which the Egyptian god could not poſſeſs conſiſtently with the known ſuperſtitions of that country. Salmaſius, however, attempts to prove, from the import of the name, that the *Oſiris* of Egypt muſt have been the Bacchus of Greece. Σηρι or Σιρι, he ſays, ſignifies a *ſun* in the Egyptian language; and hence he concludes, that the god was by that people called *Oſiris*, for the ſame reaſon that by the Greeks he was called Καρος, and by the Romans *Liber*. But this ſeems all to be a miſtake. *Siris* makes a part of many Egyptian proper names, as *Bu-ſiris*, *Termo-ſiris*, *Tapo-ſiris*, &c. and is in all probability derived from the Hebrew word *Sar*, *Sur*, or *Sir*, which ſignifies a *prince*, *potentate*, or *grandee*. As the name of the god was in Egypt not *Oſiris*, but *Iſiris* or *Yſiris*, it was probably made up of *Sir* or *Siris*, and the Hebrew prefix *I* or *Iſh*, denoting *ſtrength*; ſo that the whole word will ſignify the *ſtrong* or *mighty prince*. If ſo, we cannot doubt, as Diodorus Siculus, Euſebius, Sextus Empiricus, &c. all affirm, that the Egyptians worſhipped the ſun by the name of *Oſiris*, but that by this name they meant the *power* or *governing mind* of the ſun, as the Greeks and Romans ſeem to have done by their *Phœbus* and *Apollo*.

But though the original Oſiris was undoubtedly the ſun, or the intelligence actuating the ſun, yet there is reaſon to believe that there was a *ſecondary Oſiris*, who at a very early period reigned in Egypt, and was deified after his death for the bene-

fits he had rendered to his country (See POLYTHEISM). This is indeed ſo generally admitted, as to have occaſioned great controverſies among the learned reſpecting the time when he flouriſhed, and whether he was the civilizer of rude barbarians or the victorious ſovereign of a poliſhed nation. The illuſtrious Newton it is well known, has adopted the latter opinion; and with much plauſibility endeavoured to prove, that *Oſiris* was the ſame with *Seſoſtris* or *Seſac*: but it muſt be confeſſed, that his concluſion is contrary to all the moſt authentic records of antiquity; and that it would be eaſy, by the ſame mode of arguing to give a ſhow of identity to two perſons univerſally known to have flouriſhed in very diſtant ages *. The annals of Egypt, as may be ſeen in the writings of Herodotus, Diodorus Siculus, Strabo, Plutarch, and others, who copied from thoſe annals, expreſsly aſſerted the diſtinct perſonality of Oſiris and Seſoſtris, and placed them in æras vaſtly diſtant from each other. Oſiris, if any credit be due to thoſe hiſtorians, was the founder of the Egyptian monarchy; and, as was cuſtomary in thoſe days, having either received the name of the ſun, or communicated his own to that luminary, was after his death deified for the benefits which he had rendered to his country: and being at firſt worſhipped only as a demigod, was in proceſs of time advanced to full divinity, and confounded with his heavenly godfather. The Greeks, who, though original in nothing, were always prompted by their vanity to hold themſelves out as the firſt of the nations, claimed this Oſiris as their own, and pretended that he was the ſon of Jupiter and Niobe. He reigned, ſay they, over the Argives; but afterwards delivered his kingdom to his brother Algialeus, and took a voyage into Egypt, of which he made himſelf maſter, and married Io or Iſis. He eſtabliſhed good laws there; and they were both after their deaths worſhipped as gods. That this is a ridiculous fiction needs no proof; ſince every one knows that good laws were eſtabliſhed in Egypt long before the Argives had any king, or indeed exiſted either as a tribe or nation.

OSMUNDA, MOONWORT; a genus of the order of filices, belonging to the cryptogamia claſs of plants. There are ſeveral ſpecies; the moſt remarkable of which is the regalis, oſmund-royal, or flowering fern. This is a native of Britain, growing in putrid marſhes. Its leaf is doubly winged, bearing bunches of flowers at the ends. The root boiled in water is very ſlimy; and is uſed in the north to ſtiffen linen inſtead of ſtarch. Some of the leaves only bear flowers.

OSNABURG, a biſhopric of Germany, in the circle of Weſtphalia, 40 miles long and 30 broad. It is remarkable, that this biſhopric is poſſeſſed by the papiſts and proteſtants alternately, according to the treaty of Weſtphalia. The proteſtant biſhop is always choſen by the houſe of Brunſwick, Lunenburg, and the catholic by the papiſts. The preſent biſhop is Frederic duke of York, ſecond ſon of the king of Great Britain. The inſpection and adminiſtration of eccleſiaſtical affairs, however, belong to the collector of Cologne, as metropolitan.

OSNABURG, a city of Germany, capital of a biſhopric of the ſame name, with a univerſity, and a caſtle. It is remarkable for a treaty of peace, concluded between Germany and Sweden, in 1648, in favour of the proteſtant religion. The proteſtants have two of the churches. The beer of this place is highly eſteemed in Germany. It is ſeated on the Haze, 35 miles NE of Munſter, and 75 W of Hanover. E. lon. 8. 20. N. lat. 52. 24.

OSNABURG *Iſland*, one of the iſlands in the South Sea, diſcovered by Captain Wallis in 1767. It is a high, round iſland, not above a league in circuit; in ſome parts covered with trees, in others a naked rock. S. lat. 22. 48. W. lon. 141. 34.

OSORIUS (JEROM), was born of a noble family at Liſbon, 1500. He was educated at the univerſity of Salamanca, and afterwards ſtudied at Paris and Bologna. On his return to Portugal he gradually roſe to the biſhopric of Sylves, to which he was appointed by Catherine of Auſtria, regent of the kingdom in the minority of Sebaſtian. At the requeſt of cardinal Henry of Portugal, he wrote his Hiſtory of King Emanuel, and the Expedition of Gama; which his great cotemporary Camoens made at the ſame time the ſubject of his immortal Luſiad; a poem which has at length appeared with due luſtre in our language, being tranſlated with great ſpirit and elegance by Mr. Mickle. It is remarkable that the hiſtory of Oſorius, and the epic poem of Camoens, were publiſhed in the ſame year, 157-: but the fate of theſe two great authors were very different, the poet was ſuffered to periſh in poverty, under the reign of that Henry, who patroniſed the hiſtorian: yet allowing for the difference of their profeſſions, they poſſeſſed a ſimiliarity of mind. There appear many traces of that high heroic ſpirit even in the prieſt Oſorius, which animated the ſoldier Camoens: particularly in the pleaſure with which he ſeems to deſcribe the martial manners of his countrymen under the reign of Emanuel. There is one particular in the character of Oſorius, which, conſidering his age and country, deſerves the higheſt encomium; and that is his tolerating ſpirit. In the firſt book of his hiſtory, he ſpeaks of Emanuel's cruel proſecution of the Jews in the following generous and exalted language: "This (ſays he) was authoriſed neither by law nor by religion. Can men be compelled to believe what they reject with abhorrence? Do you take upon you to reſtrain the liberty of the will, or to fetter the underſtanding? Such an attempt muſt be unſucceſsful; and is not acceptable to Chriſt, who expects from man the devotion of the heart, and not that formal worſhip which is the offspring of pains and penalties. He wiſhes them to ſtudy his religion, and adopt it from conviction not from terror: for who does not ſee that forced belief is mere hypocriſy?" Oſorius is ſaid to have uſed many arguments to diſſuade Sebaſtian from his unfortunate expedition into Africa, and to have felt ſo deeply the miſeries which befel the Portugueſe after that fatal event, that his grief was ſuppoſed to accelerate his death. He expired in 1580, happy ſays De Thou (who celebrates him as a model of Chriſtian virtue), that he died juſt before the Spaniſh army entered Portugal, and thus eſcaped being a witneſs to the deſolation of his country.—His various works were publiſhed at Rome in 159-, by his nephew Oſorius, in four volumes folio, with a life of their author. Among theſe are two remarkable productions; the firſt, An Admonition to our Queen Elizabeth, exhorting her to return into the Church of Rome; the ſecond, An Eſſay on Glory, written with ſuch claſſical purity, as to give birth to a report, that it was not the compoſition of Oſorius but the laſt work of Cicero on that ſubject.

OSPREY. See FALCO, ſp. 17.

OSSA, a lofty mountain of Theſſaly near the Peneus, which runs between this mountain and Olympus; famous in the fabulous ſtory of the giants (Homer, Virgil, Horace, Seneca, Ovid.) The bending and unbending of its pines, on the blowing of a ſtrong north wind, formed a claſhing ſound like thunder (Lucan). It was once the reſidence of the Centaurs, and was formerly joined to Mount Olympus; but Hercules, as ſome report, ſeparated them, and made between them the celebrated valley of Tempe. This ſeparation of the two mountains was more probably effected by an earthquake which happened about 1885 years before the Chriſtian era. Its greateſt celebrity ariſes from its being one of thoſe mountains which the giants in their

* This has been in fact done by Warburton; who employs Newton's mode of reaſoning with equal plauſibility, and perhaps ſuperior force, to prove the identity of King Arthur and William the Conqueror. See *Divine Legation of Moſes*, Vol. III. Book iv. Sect. 5.

wars againſt the gods heaped up one on the other to ſcale the heavens with more facility. A town of Macedonia.

OSSAT (Arnauld de), born in the dioceſe of Auch in 1536, of mean parentage, was taken notice of by a gentleman in the dioceſe, who made him ſtudy with his ward the Lord of Caſtlenau de Magnoac. He ſtudied the law at Dijon under Cujace, and applied himſelf to the bar at Paris. He was ſecretary at Rome to M. de Foix, archbiſhop of Tholouſe; to Cardinal Eſte; and afterwards to cardinal de Joyeuſe, by the French king's expreſs command. After riſing to the higheſt dignities both in church and ſtate, in 1599 he was created a cardinal by pope Clement VIII. He died in 1604. An eminent French writer gives him the following character: "He was a man of prodigious penetration; applied himſelf ſo cloſely to affairs, and eſpecially was ſo judicious in forming his reſolutions, that it is almoſt impoſſible to find out one falſe ſtep in the many negociations in which he was concerned." His works, and eſpecially his letters, have been much eſteemed in the learned world.

OSSIAN, the ſon of Fingal, a celebrated Celtic poet, who flouriſhed about the end of the ſecond, and beginning of the third century. Several incidents in his poems point out this as his era: particularly the engagement of Fingal with Caracul, or Caracalla, the ſon of the emperor Severus, ſtyled by Oſſian, *The Son of the King of the World.* M. Tillemont fixes the elevation of Caracalla to a ſhare in the government to the year 198, and the aſſociation of his brother Geta to 208. About which time Gibbon fixes the Caledonian war, and ſpeaks thus upon the ſubject: "This Caledonian war, neither marked by deciſive events, nor attended with any important conſequences, would ill deſerve our attention; but it is ſuppoſed, not without a conſiderable degree of probability, that the invaſion of Severus is connected with the moſt ſhining period of the Britiſh hiſtory or fable. Fingal, whoſe fame, with that of his heroes and bards, has been revived in our language by a recent publication, is ſaid to have commanded the Caledonians in that memorable juncture, to have eluded the power of Severus, and to have obtained a ſignal victory on the banks of the Carun, in which the ſon of *the King of the World*, Caracul fled from his arms along the fields of his pride. Something of a doubtful miſt ſtill hangs over theſe Highland traditions; nor can it be entirely diſpelled by the moſt ingenious reſearches of modern criticiſm: but if we could with ſafety indulge the pleaſing ſuppoſition, that Fingal lived, and that Oſſian ſung, the ſtriking contraſt of the ſituation and manners of the contending nations might amuſe a philoſophic mind. The parallel would be little to the advantage of the more civilized people, if we compared the unrelenting revenge of Severus with the generous clemency of Fingal; the timid and brutal cruelty of Caracalla, with the bravery, the tenderneſs, the elegant genius of Oſſian; the mercenary chiefs who, from motives of fear or intereſt, ſerved under the Imperial ſtandard, with the free-born warriors who ſtarted to arms at the voice of the king of Morven: if, in a word, we contemplated the untutored Caledonians glowing with the warm virtues of nature, and the degenerate Romans polluted with the mean vices of wealth and ſlavery."

The date of this action, if the poems be true, is rather confounding: for the next expedition which is produced to fix the time in which Oſſian flouriſhed, was conducted by Oſcar (againſt the uſurper Carauſius, the Caros of Oſſian), who did not aſſume the purple till ſo late as the year 287. This account indeed correſponds pretty well with the account given by Iriſh hiſtories, which place the death of Fingal in the year 283, and that of Oſcar, who died many years before his father Oſſian) in the year 296. Theſe hints are not thrown out becauſe we think they militate againſt the authenticity of the poems; for diſtant though theſe dates be, it is yet poſſible to reconcile them. Old age was and is very common in thoſe regions: and Oſſian himſelf, we are told, was an inſtance of great longevity. Indeed at ſuch a diſtance of time it cannot be expected that we ſhould give either a very particular or a very exact account of Oſſian and his heroes. Were there no doubts remaining of the truth of the facts, it is ſtill natural to ſuppoſe that they muſt have ſuffered obſcurity through the ruſt of time, and above all through the neglect of the poems, which till lately were unknown.

The firſt expedition on which Oſſian's father ſent him was, to raiſe a ſtone on the banks of Crona, to perpetuate the memory of a victory which the king of Morven had obtained at that place. The Highlanders talk of this as being emblematical of that immortality which heroes were to receive from his future compoſitions. In this expedition he was accompanied by Toſcar, father of the beautiful Malvina, the amiable companion of his grief, after the death of her beloved Oſcar, his ſon. It appears from his poems, that in one of his early expeditions to Ireland, he had fallen in love with and married Evirallin, daughter to Branno, petty king of Lego. "I went in ſuit of the maid of Lego's ſable ſurge; twelve of my people were there, the ſons of ſtreamy Morven. We came to Branno, friend of ſtrangers: Branno of the ſounding mail.—'From whence, (he ſaid) are the arms of ſteel? Not eaſy to win is the maid that has denied the blue-eyed ſons of Erin. But bleſt be thou, O ſon of Fingal! happy is the maid that waits thee. Though twelve daughters were mine, thine were the choice thou ſon of fame.'—Then he opened the hall of the maid; the dark-hair'd Evirallin." This Evirallin was the mother of his ſon Oſcar, whoſe exploits he celebrates in many of his poems, and whoſe death he laments in the firſt book of Temora. Evirallin died ſome time before Oſcar (Fingal, B. iv.), who ſeems to have been her only child; and Oſſian did not marry afterwards: ſo that his poſterity ended in the death of Oſcar; who ſeems to have died as he was about to be married to Malvina, the daughter of Toſcar. Several of her lamentations for her lover are recorded by Oſſian, which paint her grief in the ſtrongeſt and moſt beautiful colours. "It is the voice of my love! few are his viſits to my dreams.—But thou dwelleſt in the ſoul of Malvina, ſon of mighty Oſſian. My ſighs ariſe with the beams of the eaſt; my tears deſcend with the drops of night. I was a lovely tree in thy preſence, Oſcar, with all my branches round me: but thy death came like a blaſt from the deſert, and laid my green head low; the ſpring returned with its ſhowers, but no green leaf of mine aroſe." *Poem of* Croma.

The principal reſidence of Oſſian was in the vale of Cona, now Glenco in Argyleſhire. See Fingal. His poems relate many of his expeditions to Ireland, Scandinavia, Clyde, and Tweed or Teutha. His exploits on theſe occaſions, after making a large allowance for poetical exaggeration, ſhow him to have been no leſs a warrior than a poet: (See Ossian's Works, in the poems *Calthon and Colmal, Lathmon, Berrathon,* &c. By theſe expeditions, which were always undertaken for the relief of the diſtreſſed, the mind of Oſſian ſeems to have been cultivated and enlarged beyond what is uſually to be met with in ſo rude a period of ſociety as that in which he lived. His poems breathe, throughout, ſuch a ſpirit of generoſity and tenderneſs, eſpecially towards the fair ſex, as is ſeldom or never to be met with in the compoſitions of other poets who lived in a more advanced ſtate of civiliſation. He lived to an extreme old age; having ſurvived all his family and friends, many of whom periſhed by a fatal accident, recorded in one of his poems called the *fall of Tura.* Malvina, alone, the love of his ſon Oſcar, remained with him till within a few years of his death, and paid him every attention that could be expected from the tender relation in which ſhe ſtood to him. To her he addreſſes many of his poems, which ſeem to have been compoſed for the moſt part in his old age. Her death is pathetically lamented by him in the poem of *Berrathon:* towards the cloſe of which, he gives the preſages

of his own departure? an event which he often wiſhes for under the blindneſs and other calamities of his declining years. "Roll on, ye dark-brown years, for ye bring no joy on your courſe. Let the tomb open to Oſſian, for his ſtrength has failed. The ſons of the ſong are gone to reſt: my voice remains, like a blaſt, that roars lonely on the ſea ſurrounded rock, after the winds are laid. The dark moſs whiſtles there, and the diſtant mariner ſees the waving trees."—"But Oſſian is a tree that is withered. Its branches are blaſted and bare; no green leaf covers its boughs. From its trunk no young ſhoots are ſeen to ſpring. The breeze whiſtles in its grey moſs: the blaſt ſhakes its head of age.—The ſtorm will ſoon overturn it, and ſtrew all its dry branches with thee, O Dermid! and with all the reſt of the mighty dead, in the green winding vale of Cona."

It is not certain at what age Oſſian died; but from his having been long blind with years, and from the many contraſts between his preſent and paſt ſituations, in poems compoſed, as it would appear at a conſiderable diſtance of time from each other, it is moſt likely he lived to an extreme old age. The current tradition is, that he died in the houſe of a Culdee, called the *Son of Alpin*, with whom he is ſaid to have held ſeveral conferences about the doctrines of Chriſtianity. One of theſe dialogues is ſtill preſerved, and bears the genuine marks of a very remote antiquity: *(Diſſertation* prefixed to *Oſſian's Works)*. Several of Oſſian's poems are addreſſed to this ſon of Alpin, who was probably one of thoſe Chriſtians whom the perſecution under Diocleſian had driven beyond the pale of the Roman empire.

The poems of Oſſian, though always held in eſteem by thoſe who knew them, were allowed to remain in the obſcurity of their original Gaelic, till Mr. Macpherſon, about 30 years ago, tranſlated a collection of them into Engliſh, which immediately attracted the attention of every perſon who had a true taſte for poetry. Dr. Blair, in particular, introduced theſe poems into the world with thoſe critical remarks which do no leſs honour to himſelf than to the poet. According to that eminent critic, the two great characteriſtics of Oſſian's poetry are tenderneſs and ſublimity. Oſſian is, perhaps, the only poet who never relaxes, or lets himſelf down into the light and amuſing ſtrain. He moves perpetually in the high region of the grand and pathetic. The events which he records are all ſerious and grave; the ſcenery wild and romantic. We find not in him an imagination that ſports itſelf, and dreſſes out gay trifles to pleaſe the fancy. His poetry, more perhaps than that of any other, deſerves to be ſtyled the *poetry of the heart*. It awakes the tendereſt ſympathies, and inſpires the moſt generous emotions.

Of theſe poems however, many well informed perſons have been induced to doubt the authenticity. But their genuineneſs has been very anxiouſly defended by Dr. Blair and Lord Kames, and alſo warmly ſupported by the author of the *Gaelic Antiquities*, who has given the public ſome more remains of Oſſian's poetry.

"In every period of ſociety (ſays Dr. Blair), human manners are a curious ſpectacle; and the moſt natural pictures of ancient manners are exhibited in the ancient poems of nations. Theſe make us acquainted with the notions and feelings of our fellow-creatures in the moſt artleſs ages; diſcovering what objects they admired, and what pleaſures they purſued, before thoſe refinements of ſociety had taken place, which enlarge indeed, and diverſify the tranſactions, but diſguiſe the manners of mankind.

"Beſides this, ancient poems have another merit with perſons of taſte. They promiſe ſome of the higheſt beauties of poetical writing. That ſtate, in which human nature ſhoots wild and free, though unfit for other improvements, certainly encourages the high exertions of fancy and paſſion.

"In the infancy of ſocieties the paſſions of men have nothing to reſtrain them: their imagination has nothing to check it. And as their feelings are ſtrong, ſo their language of itſelf aſſumes a poetical turn. Men never have uſed ſo many figures of ſtyle, as in thoſe rude ages, when, beſides a warm imagination to ſuggeſt lively images, the want of proper and preciſe terms for the ideas they would expreſs, obliged them to have recourſe to circumlocution, metaphor, compariſon, and all thoſe ſubſtituted forms of expreſſion, which give a poetical air to language. An American chief, at this day, harangues at the head of his tribe in a more bold metaphorical ſtyle than a modern European would adventure to uſe in an epic poem.

"Poetry has been ſaid to be more ancient than proſe, which, in a qualified ſenſe, is true. Muſic or ſong has been found coæval with ſociety among the moſt barbarous nations; and the only ſubjects which could prompt men, in their firſt rude ſtate, to utter their thoughts in compoſitions of any length, were ſuch as naturally aſſumed the tone of poetry; praiſes of their gods, or of their anceſtors; commemorations of their own warlike exploits; or lamentations over their misfortunes. And before writing was invented, no other compoſitions, except ſongs or poems, could take ſuch hold of the imagination and memory, as to be preſerved by oral tradition, and handed down from one race to another.

"Hence we may expect to find poems among the antiquities of all nations. It is probable, too, that an extenſive ſearch would diſcover a certain degree of reſemblance among all the moſt ancient poetical productions, from whatever country they have proceeded. In a ſimilar ſtate of manners, ſimilar objects and paſſions operating upon the imaginations of men will ſtamp their productions with the ſame general character. Some diverſity, will, no doubt, be occaſioned by climate and genius. But mankind never bear ſuch reſembling features as they do in the beginnings of ſociety. What we call the *oriental vein* of poetry, becauſe the earlieſt poetical productions have come to us from the eaſt, is probably no more *oriental* than *occidental*; it is characteriſtical of an age rather than a country; and belongs, in ſome meaſure, to all nations at a certain period. Of this the works of Oſſian ſeem to furniſh a remarkable proof.

"He appears clearly to have lived in a period which enjoyed all the benefit I have juſt now mentioned of traditionary poetry. The exploits of Trathal, Trenmor, and the other anceſtors of Fingal, are ſpoken of as familiarly known. Ancient bards are frequently alluded to. In one remarkable paſſage, Oſſian deſcribes himſelf as living in a ſort of claſſical age, enlightened by the memorials of former times, conveyed in the ſongs of bards, and points at a period of ignorance which lay beyond the reach of tradition. Oſſian himſelf appears to have been endowed by nature with exquiſite ſenſibility; prone to that tender melancholy which is ſo often an attendant on great genius; and ſuſceptible equally of ſtrong and of ſoft emotions. He was not only a profeſſed bard, but a warrior alſo, and the ſon of the moſt renowned hero and prince of his age. This formed a conjunction of circumſtances, uncommonly favourable towards exalting the imagination of a poet.

"The manners of Oſſian's age were favourable to a poetical genius. Covetouſneſs and effeminacy were unknown. The cares of men were few. The great object purſued by heroic ſpirits, was, 'to receive their fame,' that is, to become worthy of being celebrated in the ſongs of bards; and 'to have their names on the four grey ſtones.' To die unlamented by a bard, was deemed ſo great a misfortune as even to diſturb their ghoſts in another ſtate. In ſuch times as theſe, in a country where poetry had been ſo long cultivated, and ſo highly honoured, is it any wonder that among the race and ſucceſſion of bards, one Homer ſhould ariſe: a man who, endowed with a natural happy genius favoured by peculiar advantages of birth and condition: and meeting in the courſe of his life, with a variety of incidents proper to fire his imagination, and to touch his heart, ſhould

attain a degree of eminence in poetry, worthy to draw the admiration of more refined ages?"

Beſides, his compoſitions, when viewed in themſelves, have, we are told, all the internal marks of antiquity ſo ſtrongly impreſſed upon them, that no reader of taſte and judgment can deny their claim to it. They exhibit ſo lively a picture of cuſtoms which have diſappeared for ages, as could be drawn only from nature and real life. The features are ſo diſtinct, that few portraits of the life continually paſſing before us are found to be drawn with ſo much likeneſs. The manners uniformly relate to a very early ſtage of ſociety; and no hint, no alluſion to the arts, cuſtoms, or manners, of a more advanced period, appears throughout the poems. To that diſtinction of ranks, which is always found in adult ſocieties, the poet appears to have been a perfect ſtranger. The firſt heroes prepare their own repaſts, and indiſcriminately condeſcend to the moſt menial ſervices. Their quarrels ariſe from cauſes generally ſlight, but in ſuch a period extremely natural. A rivalſhip in love, an omiſſion at a feaſt, or an affront at a tournament, are often the foundation of a quarrel among ſingle heroes. And the wars in which whole tribes are engaged, are carried on with a view, not to enlarge their territory, but to revenge perhaps the killing of a few deer on their mountains, or the taking forcibly away one of their women. Their occupation was war and hunting; and their chief ambition was to have their fame in the ſongs of the bards.

The notions of a future ſtate, exhibited in theſe poems, are likewiſe ſtrongly marked with the character of antiquity. A creed ſo uncommon that the imagination of a modern could not be ſuppoſed to graſp ſo ſtrong an idea of it from mere fancy, is uniformly ſupported throughout. This creed is extremely ſimple, but admirably ſuited to the times.

The language too, and the ſtructure, of theſe poems, bear the moſt ſtriking characters of antiquity. The language is bold, animated, and metaphorical, ſuch as it is found to be in all infant ſtates; where the words, as well as the ideas and objects, muſt be few: and where the language, like the imagination, is ſtrong and undiſciplined. No abſtract, and few general, terms appear in the poems of Oſſian. If objects are but introduced in a ſimile, they are always particularized. It is "the young pine of Iniſhuna;" it is "the bow of the ſhowery Lena." This character, ſo conſpicuous in the poems of Oſſian, is a ſtriking feature in the language of all early ſtates; whoſe objects and ideas are few and particular, and whoſe ordinary converſation is of courſe highly figurative and poetical. A picture, therefore, marked with ſuch ſtriking features, could not be drawn without an original.

The whole texture of the compoſition is alſo, like the language, bold, nervous, and conciſe: yet always plain and artleſs; without any thing of that modern refinement, or elaborate decoration, which attend the advancement of literature. No foreign ornaments are hunted after. The wild and grand nature which lay within the poet's view, is the only ſource from which he draws his ornaments. Beyond this circle, his imagination, though quick and rapid, ſeldom made any excurſion. We perceive his language always to be that of a perſon who ſaw and felt what he deſcribes; who bore a part in the expeditions which he celebrates, and who fought in the battles which he ſings. Such is the nature of the internal proof adduced in the preſent caſe, which unqueſtionably has weight, and that not inconſiderable; but unſupported by external proof, or contrary to facts, however forcible it may be in itſelf, when conſidered in this connection, and found wanting, it will neither ſilence the querulous ſceptic, nor, in all probability, will it ever convince thoſe who have truth for their object, and who wiſh to inveſtigate, and, if poſſible, diſcover it on ſurer grounds. Internal proof is of the greateſt ſervice in a variety of excellent cauſes; but it comes in rather as a ſucceedaneum than as direct evidence; and without ſomething more to the purpoſe, it may excite admiration, but will ſeldom enforce belief. Of the cuſtoms and manners of ancient times, we know but little, and of that little we have often but a confuſed notion. There is therefore room for genius and ability to exert itſelf in deceiving; and in proportion to the darkneſs in which the ſubject is involved, the deception will generally be the more complete, and the ſecret windings of error leſs eaſy to be developed.

Deſtitute of external proof, authenticity may appear to be probable, but cannot be certain; and in ſuch circumſtances, on many occaſions, and eſpecially with reſpect to ancient writings, we may, without any offence to truth or to ſound reaſoning, give them up as ſpurious. In the preſent inſtance, therefore, it is juſt and proper to add to what has been already ſaid, the more external and poſitive proofs of the authenticity of the poems in queſtion, by the ſtrength or weakneſs of which the ſubject muſt be finally determined. It is obſerved, therefore,—That there have been in the Highlands of Scotland, for ſome ages back, a vaſt many poems aſcribed to Oſſian: That theſe poems have been held in the higheſt veneration, repeated by almoſt all perſons, and on all occaſions. Theſe are facts ſo well known, that nobody as yet has been hardy enough to deny them. There is not an old man in the Highlands, who will not declare, that he heard ſuch poems repeated by his father and grandfather, as pieces of the moſt remote antiquity. There is not a diſtrict in the Highlands where there are not many places, waters, iſles, caves, and mountains, which from time immemorial are called after the names of Oſſian's heroes.—There is not a lover of ancient tale or poetry, however illiterate, who is not well acquainted with almoſt every ſingle name, character, and incident, mentioned in thoſe tranſlations of Oſſian's poems, which he may have never heard of.—Bards, who are themſelves ſeveral centuries old, quote thoſe poems, imitate them, and refer to them.—The ordinary converſation and compariſons of the Highlanders frequently allude to the cuſtoms and characters mentioned in them;—and many of their moſt common proverbs, eſtabliſhed by the moſt ancient uſe, are lines borrowed from the poems of Oſſian.—The moſt ancient of the clans boaſt of deriving their pedigree, each from ſome one of Oſſian's heroes;—and many of the ſigns armorial aſſumed by them, are drawn from the feats aſcribed to their predeceſſors in thoſe poems.—Manuſcripts are mentioned, in which ſome of thoſe have been preſerved for ſeveral centuries; and a liſt of living names, in different parts of the Highlands, is appealed to, as perſons who ſtill repeat a part of theſe poems.—Whilſt Mr. Macpherſon was engaged in the tranſlation, many reſpectable perſons, gentlemen and clergymen, avowed to the public, that theſe were Oſſian's poems, with which they had long been acquainted, and that the tranſlation was literal. This appears alſo from the large ſpecimens of the originals publiſhed and compared by proper judges. The originals lay a conſiderable time in the hands of the bookſeller, for the inſpection of the curious: they have been afterwards ſhown frequently to many of the beſt judges, and offered for publication if the editor had been favoured with ſubſcriptions. The editor of the pamphlet, in which their authenticity is atteſted by many reſpectable names of undoubted veracity, obſerves, by way of concluſion, "that more teſtimonies might have been produced by a more enlarged correſpondence with the Highland counties: But I apprehend, if any apology is neceſſary, it is for producing ſo many names in a queſtion where the conſenting ſilence of a whole country was, to every unprejudiced perſon, the ſtrongeſt proof that ſpurious compoſitions, in the name of that country, had not been obtruded upon the world." It is likewiſe argued in ſupport of the authenticity of theſe poems, that candid ſceptics, on hearing ſome of them repeated by illiterate perſons, who had never ſeen the tranſlation, cauſed them to give the meaning of what

they repeated, by an extempore tranſlation into Engliſh, and by this means had all their doubts of the authenticity of Oſſian removed. They urge further, that ſuch paſſages of Oſſian's works as are ſtill repeated by ſome old men, are among the moſt beautiful parts of Oſſian's poems; ſuch as the battle of Lora, the moſt affecting parts of Carthon, Berrathon, the death of Oſcar, and Darthula, or the children of Uſnoth, &c.: which gives a credibility to his being equal to the other parts of the collection, none of it being ſuperior to theſe in merit.

To theſe and the like arguments advanced in ſupport of the authenticity of the poems aſcribed to Oſſian, many objections have been urged. Thoſe of Johnſon and his friend Shaw are univerſally known. A later writer, Mr. Pinkerton, objects to them in the following manner: No fragments of Britiſh poetry in Scotland are to be found. Many ſpecimens of Iriſh poetry in Scotland have been publiſhed; but none older than a century or two. Tranſlations have alſo appeared; but, in general, of no fidelity. Thoſe of the poems aſcribed to Oſſian, in particular, have deſervedly drawn much of the public attention; but they will only miſlead any reader who wiſhes to form an idea of Celtic poetry. He that believes Oſſian to have flouriſhed about the year 300, and his writings preſerved by oral tradition for 1460 years, large is his faith, and he might move mountains! Gentlemen of the Highlands of Scotland, with whom our author converſed on the ſubject, aſſured him, that they looked upon nine tenths of Mr. Macpherſon's work as his own; and upon the other tenth, as ſo much changed by him, that all might be regarded as his own compoſition. There are poſitive evidences, he ſays, which convince him that not one of the poems given to Oſſian, and probably not one paſſage of them, is older than the 15th century. The very firſt author we know who mentions Fingal is Barbour, a Scotch poet, who wrote in 1375. Fingal was an Iriſh hero: and one Good, a ſchoolmaſter of Limeric, ſent ſome account of Ireland to Camden, in 1566, in which mention is made of ſome ſtrange fables, that the people amuſe themſelves with, about the "giants *Fin Mac Huyle*, and *Otker Mac Oſhin*." To theſe, and ſuch like objections, it has been anſwered, That poetry has been cultivated with moſt ſucceſs in the earlieſt ſtages of ſociety; that in Greece, Orpheus, Linus, Heſiod, and Homer, wrote their admirable poems ſome ages before any thing had been written in proſe in the Greek language; that the book of Job, written in a very early period of ſociety, is highly poetical; that among the tribes of Lapland and America, there have been found, in the earlieſt ſtate, ſome excellent pieces of poetry. That the Caledonians, in particular, had ſome peculiar inſtitutions, which tended to improve their poetry: their druids were among the moſt learned philoſophers which perhaps any age or country produced; their bards or poets were the diſciples of thoſe druids, and were always a ſtanding order, to which none but the moſt promiſing geniuſes were admitted. This ſtanding college of poets was furniſhed, not only with the fruits of their own long ſtudy and obſervation, but alſo with as much as merited to be preſerved of the compoſitions of their predeceſſors in office, ſince the "light of the ſong" firſt dawned. They had the advantage of one another's converſation; which would excite their emulation, and make them aſpire to eminence: They were always preſent, and generally engaged, in every grand operation that was tranſacted; which could not fail to inſpire their muſe with the trueſt poetic fire.

The caſe of Oſſian was particularly favourable. He lived in an age when manners came to a conſiderable degree of refinement under the care of the bards and druids. Poetry in his day was conſiderably advanced; and the language, though ſtrong and figurative, had undergone ſome degree of cultivation, and learned to flow in regular numbers, adapted to the harp, the favourite inſtrument of the times. As a prince and a warrior, his mind muſt have been expanded and much enlarged by his excurſions to other countries. At home he had Ullin, Alpin, Carril, and Ryno, to converſe with; all of them poets of eminence, who would have advanced him greatly by their example and converſation. All theſe advantages, meeting with a native fire and enthuſiaſm of genius, as in the caſe of Oſſian, may well be ſuppoſed to have produced poems that might challenge the veneration of ages.

But it is not to their merit alone that we owe the preſervation of theſe poems ſo long by oral tradition. Other circumſtances concurred; of which, the inſtitution of the BARDS deſerves particular notice. In a country, the only one perhaps in the world in which there was always, from the earlieſt period almoſt to the preſent age, a ſtanding order of poets, we cannot reaſonably be ſurpriſed, either at finding excellent poems compoſed, or, after being compoſed, carefully preſerved from oblivion. A great part of the buſineſs of this order was to watch over the poems of Oſſian. In every family of diſtinction there was always one principal bard, and a number of diſciples, who vied with each other in having theſe poems in the greateſt perfection. Should the inſtitution of the bards laſt for ever, the poems of Oſſian could never periſh.

Nor were they only the bards of great families who took an intereſt in theſe poems; the vaſſal, equally fond of the ſong with his ſuperior, entertained himſelf in the ſame manner. This, with a life free from care, a ſpirit unbroken by labour, and a ſpace of time unoccupied by any other employment or diverſion, contributed to render the Highlanders a nation of ſingers and poets. From ſuch a people, the ſuperior merit of Oſſian's poems would naturally procure every encouragement, which they always retained as long as the manners of the people remained unchanged.

Many other reaſons conſpired to preſerve the poems of Oſſian. The martial and intrepid ſpirit which they breathed, made it the intereſt of the chieftains to preſerve them: the ſtrain of juſtice, generoſity, and humanity, which runs through them, recommended them to the ſuperintendants of religion, who well knew how much the morals of a people muſt be tinctured with thoſe ſongs which they are continually repeating, and which have all the advantages of poetry and of muſic. In ſuperſtitious ages, the people revered theſe poems, from their being addreſſed generally to ſome, "ſon of the rock," ſuppoſed to be the tutelar ſaint of the place, or the great Iriſh apoſtle St. Patrick. Beſides, every hill and dale which the natives of the Highlands walked over, was claſſic ground. Every mountain, rock, and river, was immortaliſed in the ſong. This ſong would naturally be ſuggeſted by the ſight of theſe objects, and every body would hum it as he walked along. All the proverbs and cuſtoms to which theſe poems gave riſe, would operate in the ſame manner. The ſon would aſk what they meant, and the father would repeat the ſong from which they were taken. The diſtinct and unſubdued ſtate in which the Highlanders remained for ſo long a courſe of ages, every clan, one generation after another, inhabiting the ſame valley, till towards the preſent century, contributed much to preſerve their traditions and their poems; and the conſtant and general cuſtom of repeating theſe in the winter-nights, kept them always alive in their remembrance.

To theſe cauſes and cuſtoms the preſervation of Oſſian's poems, for ſo many ages, has been aſcribed. But theſe cauſes and cuſtoms have ceaſed to exiſt; and the poems of Oſſian, of courſe, have ceaſed to be repeated.—Within a century back, the Highlands of Scotland have undergone a greater revolution than it had done for ten before that period. With a quicker pace the feudal ſyſtem vaniſhed; property fluctuated; new laws and new cuſtoms ſtept in, and ſupplanted the old: and all this, with ſuch ſudden and ſuch violent convulſions, as may well account for the ſhaking of a fabric which had ſtood ſo many

ages, that it ſeemed to have bidden defiance to all the injuries of time. Even ſince Mr. Macpherſon gathered the poems in his collection, the amuſements, employments, and taſte of the Highlanders are much altered. A greater attention to commerce, agriculture, and paſturage, has quite engroſſed that partial attention which was paid, even then, to the ſong of the bard. In twenty years hence, if manners continue to change ſo faſt as they do at preſent, the fainteſt traces will ſcarce be found of thoſe tales and poems. "Oſſian himſelf is the laſt of his race; and he too ſhall ſoon be no more, for his grey branches are already ſtrewed on all the winds."

One cauſe for the neglect of ancient poems and traditions, is the growth of induſtry, which fills up all the blanks of time to more advantage, and eſpecially the increaſe of more uſeful knowledge. But above all, the extinction of the order of the bards haſtened the cataſtrophe of Oſſian's poems. By a happy coincidence Macpherſon overtook the very laſt that remained of this order, (Macvurich, bard to Clanronald), and got his treaſure. This fact (with the *red book* furniſhed by Mr. Macdonald of Croidart, and ſome other MSS.) accounts for Mr. Macpherſon's having found theſe poems in greater number and perfection than they could ever ſince be met with. The fragments, however, which have ſince been gathered, give a credibility to every thing that has been ſaid of the original grandeur of the building.

We cannot diſmiſs this ſubject finally, without obſerving, that Fingal and Oſſian have been claimed by the Iriſh as well as by the Caledonians. On this double claim, as well as on the controverſy concerning the authenticity of the poems, there is much candour and good ſenſe in the remarks of T. F. Hill, publiſhed in the 53d volume of the Gentleman's Magazine; but as our remarks have already extended to too conſiderable a length, we muſt refer the reader for theſe to the original paper.

OSSIFICATION, in the animal œconomy, generally denotes the natural formation of the bones, but more particularly the converſion of parts naturally ſoft to the hardneſs and conſiſtency of bones. A depoſit of boney matter in arteries and other ſoft parts is very often ſeen on diſſection. It occurs frequently in old people in arteries diſtant from the ſource of the circulation, but ſometimes in the veſſels neareſt the heart, producing ſudden death. The cauſe of this is not known, nor the remedy; the only attempt that can rationally be made being that of avoiding thoſe impulſes, whether mental or bodily, which tend to hurry the circulation of the blood and quicken the heart's motion. Some have attempted to prove, that theſe preternatural oſſifications do not deſerve that name; and that theſe hard ſubſtances have ſcarce any other properties of bone except whiteneſs and hardneſs.

OSSIFRAGUM, in botany, a name given by Bartholinus, and ſome other writers, to a kind of graſs which grows in ſome parts of Norway. It comes up early in the ſpring, before any other graſs, and the cattle are tempted to eat it; but it emaciates them, and renders them ſickly: their back bones become protuberant if they feed on it for any time; and their legs ſo weak that they can hardly go. The remedy among the country people, which is a very curious one, is this: They collect the bones of different animals, and break them into ſmall pieces. The cattle greedily devour this ſort of food when offered them in this diſeaſe, and there follows a ſort of drivelling at the mouth for a conſiderable time, after which they become perfectly well. It is poſſible there may be much abſurdity in this ſtory. The kingdom of Norway is full of mines, and the effluvia of theſe may be the occaſion of the cattles illneſs, and the ceaſing of theſe effluvia their cure; for it is not probable that either of theſe effects ſhould be owing to the graſs or the bones.

OSSORY, the weſt diviſion of Queen's-county in Ireland.

OSSUNA, an ancient and conſiderable town of Andaluſia in Spain, with an univerſity, an hoſpital, and the title of a duchy. N. lat. 37. 8. W. lon. 4. 18.

OSTADE (Adrian Van), an eminent Dutch painter born at Lubec in 1610. He was a diſciple of Francis Hals, in whoſe ſchool Brouwer was cotemporary with him, where they contracted an intimate friendſhip. The ſubjects of his pencil were always of a low kind, he having nearly the ſame ideas as Teniers; diverting himſelf with clowns and drunkards in ſtables, ale-houſes, and kitchens. His pictures are ſo tranſparent and highly finiſhed, that they have the poliſh and luſtre of enamel: they have frequently a force ſuperior to Teniers: yet it were to be wiſhed that he had not deſigned his figures ſo ſhort. He is perhaps one of the Dutch maſters who beſt underſtood the *chiaro obſcuro*; and he was often employed to paint figures for the beſt landſcape painters of his countrymen. He died in 1685. His works, eſpecially thoſe of his beſt time and manner, are very ſcarce; ſo that when they are to be purchaſed, no price is thought too much for them. His prints etched by himſelf, large and ſmall, conſiſt of 24 pieces.

OSTALRIC, a town of Spain, in Catalonia. It had a ſtrong caſtle, but was taken by the French and demoliſhed in 1695. It is ſeated on the river Tordera, in E. lon. 2. 45. N. lat. 24. 44.

OSTEND, a ſtrong ſeaport town of Flanders, with a good harbour, which takes its name from its eaſtern ſituation, it is ſurrounded by a great number of forts, ten baſtions, and has four gates. Gobert de Steenlande having taken the habit in the abbey of Bertin, at St. Omer's, in 814, gave Oſtend to that monaſtery, then only a ſmall village, with thirty-eight others. It became a town in 1072, when Robert de Friſe built a church, dedicated to St. Peter. In the year 1372, the fiſhermen and other inhabitants built round it a ſimple paliſſade. In 1445, Philip the Good ſurrounded it with walls, erected gates, enlarged the town, and made the harbour more commodious. In the year 1582, it was regularly fortified by the prince of Orange, after he had taken Ghent and Bruges. The prince of Parma came to attack it the ſame year, but was compelled to retire, without effecting his purpoſe. In the year 1601, the archduke Albert reſolved to beſiege it, as thinking if he was maſter of that city, he could eaſily overawe the trade of Zealand; and made the moſt vigorous efforts for that purpoſe. Sir Francis Vere, with eight companies of Engliſh troops, had been detached from prince Maurice, who was then beſieging Rhinberg, and had thrown himſelf into the town. Little progreſs was made for ſome months, yet the ſiege went on without intermiſſion, neither the inclemency of winter, the diſcontent of the ſoldiers, nor the intrepid behaviour of the garriſon, could oblige the archduke to give up the enterpriſe. Both the army without and the garriſon within, ſuffered extremely by ſickneſs and fatigue, the Engliſh in particular; ſo that the garriſon, which at firſt amounted to 7000 men, was, in the ſpace of a few months, reduced to 3000. The outworks were greatly damaged by the enemy, and the unuſual inundations of the ſea, to repair and defend which required the utmoſt exertion and diligence; at laſt, when the beſieged were quite ſpent with fatigue, ſir Francis Vere was informed that the Archduke had appointed the next day for a general aſſault; to avoid the danger, he ſet on foot a capitulation, by which he gained time to reinforce his garriſon, with four companies of foot. Irritated at the ſtratagem of the Engliſh governor, Albert reſolved upon revenge, by ſtorming a breach; the attack was made on the 17th of January, with the utmoſt vigour, under Mexia, an experienced Spaniſh officer, and ſupported for three hours; but was at laſt repelled by the beſieged, after the Spaniards had loſt 1200 men. After this the archduke was adviſed to raiſe the ſiege, which the ſeverity of the ſeaſon rendered almoſt intolerable to the troops, but to

this he would not aſſent. He ordered barracks to be erected for the accommodation of the ſoldiers; committed the direction of the ſiege to Don Juan de Rivas, and ſet out for Ghent, to concert meaſures for puſhing his operations with ſtill more vigour. The States-General embraced this occaſion to change the garriſon of Oſtend, which was worn out and emaciated with perpetual fatigue and watching. As the enemy had conſiderably relaxed in their diligence, and the communication of the ſea was preſerved open, the ſcheme was executed without difficulty. A freſh garriſon, ſupplied with every neceſſary, accordingly, took charge of the town, under the conduct of colonel Dorp, colonel Edmonds, a Scotchman, and Hertain, a Frenchman. Sir Francis Vere, with the former garriſon, joined the army, under prince Maurice. Rivas practiſed every expedient to prove himſelf worthy of the truſt; but, he was repeatedly baffled by the diligence of Vander Noot, the new governor. At laſt he ſucceeded in reducing three out-forts, which he joined to the quarter commanded by fort Albert, by means of a great platform, mounted with heavy cannon, and ſurrounded with gabions full of earth. The garriſon erected a battery to fruſtrate the effects of this platform, and threw bombs ſo ſucceſsfully as to deſtroy the whole attempt, and coſt the enemy infinite labour and expence. They ſeconded the fire of their battery with a vigourous ſally, in which 700 Spaniards were killed, and an equal number made priſoners. Diſappointed in this deſign, Rivas applied his mind to cutting off the communication between the garriſon and the ſea. Pompey Torgu, the beſt engineer in the ſervice, contrived a kind of floating battery, which would have prevented the entrance of ſhips, provided it could be ſecured from the fury of the waves, by dykes and other defences. To raiſe theſe, above half the army was aſſiduouſly employed for ſeveral days, and when the work was almoſt perfected, Rivas had the mortification to ſee the whole deſtroyed by a ſtorm of wind, and an inceſſant ſhower of bullets poured out from the heavy artillery of the garriſon. Upon the whole, though no officer ever laboured with more diligence than Rivas, he made but little progreſs, a circumſtance which ſo chagrined the archduke, that he reſolved to commit the conduct of the whole to the marquis Spinola. Before the marquis would accept that honour, he deſired leave to examine the ſtate of the ſiege; for which purpoſe he ſent experienced officers to view the works. Some of theſe diſſuaded him from hazarding his reputation in an undertaking which muſt neceſſarily prove unſucceſsful, from the impoſſibility of cutting off the communication of the garriſon with the ſea. Others were of a contrary opinion; they believed the town muſt infallibly ſurrender in time, and that perſeverance would ſurmount every difficulty. The love of glory ſtimulated Spinola to embrace this laſt opinion. In the month of October, he took charge of the army, and ſoon diſtinguiſhed his capacity. Before the ſpring of the ſucceeding year, he advanced his works ſo far, that the States-General plainly perceived that Oſtend could only be ſaved by hazarding a battle, or at leaſt, making ſuch a diverſion as would probably oblige the archduke to withdraw his army. The latter was thought the moſt expedient, and the ſiege of Sluys reſolved on by the ſtates. Spinola was called away on this account, but finding it out of his power to reſiſt the ſucceſs of prince Maurice, he returned to the ſiege, and demonſtrated the poſſibility of reducing the ſtrongeſt ſituations. He blew up mines every where, he made violent aſſaults, and hemmed the beſieged within ſo narrow a circle, as determined the fate of Oſtend. Several governors ſince Noot's departure had been killed, and a multitude of inferior officers either ſlain or grievouſly wounded. Almoſt every ſhot from the enemy's batteries now did execution, as the balls fell within a ſmall compaſs, wholly occupied by the troops. At laſt a ſtrong wind from the ſouth-weſt, at high water, gave the finiſhing blow to the works of the beſieged, which being newly erected in the room of others that were demoliſhed, could not withſtand the fury of the waves. They were all overturned, and it was afterwards in vain for the garriſon to reſiſt; however, they refuſed to ſurrender before the ſentiments of the States and prince Maurice were known. A council was immediately called at Sluys, to deliberate whether the relief of the garriſon was to be attempted, or the place immediately ſurrendered. The latter opinion prevailed, and orders were accordingly diſpatched to the governor. The capitulation, in which the garriſon and inhabitants obtained the moſt honourable terms, was ſigned the 20th day of September, 1604, above three years after the town had been firſt inveſted, and it had coſt the lives of 100,000 brave ſoldiers. Some accounts ſay, that the loſs of the Spaniards, amounted to 80,000, and that of the beſieged to 50,000. In the year 1658, cardinal Mazarin thought to have taken the city by ſtratagem, and for that purpoſe ſent marechal d'Aumont with ſome ſhips of war, but, he himſelf was taken, with his veſſels, and ſeveral hundred men killed and drowned. In the year 1706, it was beſieged by ſome troops of the allied army, under the command of field-marechal Owerkercke, or Overkirk; the trenches were opened the 23d of June, and forty-nine pieces of cannon and twenty-ſix mortars were employed; the fire was ſo terrible, that the marquis de Covarouvias, governor of the place, and the comte de la Motthe Houdencourt, lieutenant-general of France, who commanded in the city, beat the chamade the 6th of July, and on the eighth the garriſon, which conſiſted of ſix battalions of French, two of Spaniards, and one ſquadron of dragoons, ſurrendered on capitulation. The allies, to facilitate the conqueſt of the town, had ſent a fleet, commanded by the Engliſh admiral Fairborn, which conſiſted of twelve ſhips of war, two bomb-gallies, and twenty-eight privateers, with proviſions and ammunition, to beſiege the city by ſea, and to prevent its being relieved. The ſtates put in a garriſon of their own troops, and kept it till the year 1715, when, in conſequence of the barrier treaty, they yielded it up to the troops of the empreſs. In the year 1722, the court of Vienna formed an Eaſt India Company, at Oſtend, upon a ſcheme of an Engliſh merchant, named Colebrook, which was repreſented as ſo detrimental to the Engliſh Eaſt India Company, that the houſe of commons immediately reſolved it to be a high crime and miſdemeanour for any Engliſh ſubject to be any ways concerned therein: in the year 1727, by an article of a treaty made at Paris, it was agreed that the charter ſhould be ſuſpended for ſeven years, and in the year 1731, the company was totally diſſolved. It was taken by the French, in the year 1745, after a ſiege of ten days, and reſtored to the empire at the peace of Aix la-Chapelle. At the latter end of the year 1792, it was taken by the French republic, but evacuated by them on the 30th of March following. During the ſiege in the year 1706, the town-houſe was deſtroyed; and in 1711, the preſent town-houſe, which is a magnificient and handſome ſtructure, was begun and finiſhed in the ſame year. The magiſtracy is compoſed of a bailiff, a burgo-maſter, ſeven echevins, and a treaſurer; the office of bailiff is for life, the others are changed uſually every year, in the month of September. They have no freſh water at Oſtend, but what is brought in boats from Bruges, and preſerved in a great reſervoir near the harbour. Oſtend was evacuated by the troops of the allies, in the month of July, 1794; nine poſts and a half NNW. Lille, and five and a half N. Ypres. E. long. 30. 29. Ferro. N. lat. 51. 13.

OSTEOCOLLA, *οστεοκολλα*, in natural hiſtory, a white or aſh coloured ſparry ſubſtance, in ſhape like a bone, and by ſome ſuppoſed to have the quality of uniting broken bones, on which account it is ordered in ſome plaſters; a ſuppoſition we fear which is not warranted by experience. It is found in long, thick, and irregularly cylindric pieces, which are in general

hollow, but are ſometimes filled up with a marly earth, and ſometimes contain within them the remains of a ſtick, round which the oſteocolla had been formed; but though it is plain from thence that many pieces of oſteocolla have been formed by incruſtations round ſticks, yet the greater number are not ſo, but are irregularly tubular, and appear to be formed of a flat cake, rolled up in a cylindric ſhape. The cruſts of which theſe are compoſed do not form regular concentric circles round the internal cavity, as muſt have been the caſe had they been formed by incruſtation. On the other hand, they plainly ſhow that they were once ſo many thin ſtrata, compoſing a flat ſurface, which has afterwards been rolled up, as one might do a paper three or four times doubled, into two, three, or more ſpiral lines; in which caſe, each ſingle edge of the paper would be everywhere a regular point of a continued ſpiral line drawn from a given point; but they would by no means be ſo many detached concentric circles. The oſteocolla is found of different ſizes, from that of a crow-quill to the thickneſs of a man's arm. It is compoſed of ſand and earth, which may be ſeparated by waſhing the powdered oſteocolla with water, and is found, both in digging and in ſeveral brooks, in many parts of Germany, and elſewhere. It is called hammoſteus in many parts of Germany. It has this name in theſe places from its always growing in ſand, never in clay, or any ſolid ſoil, nor even in gravel. Where a piece of it any where appears on the ſurface, they dig down for it, and find the branches run ten or twelve feet deep. They uſually run ſtraight down, but ſometimes they are found ſpreading into many parts near the ſurface, as if it were a ſubterraneous tree, whoſe main ſtem began at 12 feet depth, and thence grew up in a branched manner till met by the open air. The main trunk is uſually as thick as a man's leg, and the branches that grow out from it are thickeſt near the trunk, and thinner as they ſeparate from it. The thinneſt are about the ſize of a man's finger. The people employed to collect it, when they cannot find any mark of it on the ſurface, ſearch after the ſpecks of white or little lumps of whitiſh ſoft matter, which they find lying in various parts on the top of the ſand. Theſe always lead them either to a bed of perfect oſteocolla, or to ſome in the formation. If they miſs of it, they ſtill find a ſubſtance like rotten wood; which, when traced in its courſe, is found to proceed from a main trunk, at the depth of that of the oſteocolla, and to ſpread itſelf into branches in the ſame manner. The diggers call this ſubſtance the flower of oſteocolla or hammoſteus.

The oſteocolla found in the earth is at firſt ſoft and ductile; but in half an hour's time, if expoſed to the air, it becomes as hard as we find it in the ſhops. The method to take up a perfect piece for a ſpecimen is to open the ground, clear away the ſand, and leave it ſo for an hour or thereabouts: in this time it will harden, and may be taken out whole. It is certain, that the oſteocolla is produced at this time; for if a pit be cleared of it, there will more grow there in a year or two, only it will be ſofter, and will not harden ſo eaſily in the air as the other. What the rotten ſubſtance reſembling the decayed branches of trees is, we cannot determine, unleſs it really be ſuch; but the opinion of the common people, that it is the root of ſomething, is abſurd, becauſe its thickeſt part always lies at the greateſt depth, and the branches all run upwards. The oſteocolla is a marly ſpar, which concretes round this matter; but what it is that determines it to concrete nowhere on the ſame ground but about theſe branches, it is difficult to ſay. The rottenneſs of this ſubſtance, which forms the baſis of the oſteocolla, renders it very liable to moulder and fall away; and hence it is that we uſually ſee the oſteocolla hollow. Sometimes it is found ſolid; but in this caſe there will be found to have been a vegetable matter ſerving as its baſis, and inſtead of one branch, it will be found in this caſe to have concreted about a number of fibres, the remains of which will be found in it on a cloſe examination. See Philoſ. Tranſ. No. 39.

OSTEOLOGY, that part of anatomy which treats of the bones. See ANATOMY.

OSTERVALD (JOHN FREDERICK), a famous Proteſtant divine, was born at Neufchattel in 1663; and made ſuch rapid progreſs in his ſtudies, that he became maſter of arts at Saumur before he was 16 years of age. He afterwards ſtudied at Orleans and at Paris. At his return to Neufchattel in 1699, he became paſtor of the church there; and contracted a ſtrict friendſhip with the celebrated John Alphonſus Turretin of Geneva, and the illuſtrious Samuel Werenfels of Baſil. The union of theſe three divines, which was called the *Triumvirate of the divines of Switzerland*, laſted till his death. Mr. Oſtervald acquired the higheſt reputation by his virtues, his zeal in inſtructing his diſciples, and reſtoring eccleſiaſtical diſcipline. He wrote many books in French; the principal of which are, 1. A Treatiſe concerning the Sources of Corruption, which is a good moral piece. 2. A Catechiſm, or Inſtruction in the Chriſtian Religion; which has been tranſlated into German, Dutch, and Engliſh; and the Abridgment of the Sacred Hiſtory, which he prefixed to it, was tranſlated and printed in Arabic, in order to be ſent to the Eaſt Indies, by the care of the Society for the Propagation of the Goſpel; and that Society, eſtabliſhed in London, paid him a high compliment, by admitting him an honorary member. 3. A treatiſe againſt Impurity. 4. An edition of the French Bible of Geneva, with Arguments and Reflections, in folio. 5. *Ethica Chriſtiana*. 6. *Theologiæ Compendium*, &c. He died in 1747, regretted by all who knew him.

OSTIA is a borough ſituated at the mouth of the Tiber, about 12 miles to the weſtward of Rome. It was built by Ancus Martius, the fourth king of Rome, and was called *Oſtia Tiberina*, in the plural number, *i. e.* the two mouths of the Tiber, which were ſeparated by the Holy Iſland, an equilateral triangle, whoſe ſides were each of them computed at about two miles. The colony of Oſtia was founded immediately beyond the left or ſouthern, and the port immediately beyond the right or northern, branch of the river; and the diſtance between their remains meaſures ſomething more than two miles on Cingolani's map. In the time of Strabo, the ſand and mud depoſited by the Tiber had choaked the harbour of Oſtia; the progreſs of the ſame cauſe has added much to the ſize of the Holy Iſland, and gradually left both Oſtia and the port at a conſiderable diſtance from the ſhore. The dry channels (*fiumi morti*), and the large eſtuaries (*ſtagno di Ponente, de Levante*), mark the changes of the river, and the efforts of the ſea. Its port was one of the moſt ſtupendous works of Roman magnificence, and it was a long time one of the beſt towns on the coaſt; but having been deſtroyed by the Saracens, and the harbour choaked up, as mentioned above, it has not been able ſince to recover itſelf. Though it be an inconſiderable place, and but poorly inhabited by reaſon of the badneſs of the air, yet it is the ſee of a biſhop, who is always deacon of the cardinals, and crowns the Pope. The old Oſtia, where you ſee the ruins of the ancient harbour, is beyond New Oſtia, towards the ſea; the latter is but a little cluſter of houſes, with a ſmall caſtle. It is 12 miles S. W. of Rome. E. lon. 12. 24 N. lat. 41. 44. There were ſalt-works in Oſtia, called *Salinæ Oſtienſes*, as early as the times of Ancus Martius (Livy); from which the *Via Salaria*, which led to the Sabines, took its name, (Varro). It gave name to one of the gates of Rome, which was called *Oſtienſis* (Ammian).

OSTIACKS, a people of Siberia in Aſia. They live upon the banks of the rivers Oby and Jeniſay, and on thoſe of ſome other rivers which fall into theſe. Theſe people are very poor, and very lazy, and in the ſummer-time live moſtly upon fiſh,

They are of a middle ſize, with broad faces and noſes, and yelloviſh or red hair. All their garments from top to toe are made of fiſh ſkins, for they have neither linen nor woollen; and indeed they might almoſt as well go naked. Their greateſt diverſion is hunting; and they go together in crowds, with a weapon like a large knife faſtened in a ſtick. In ſummer they take and dry the fiſh which ſerves them in winter; and when that ſeaſon begins, they go into the woods with their bows and arrows, their dogs and nets, to kill ſables, ermines, bears, reindeer, elks, martens, and foxes. Part of the furs of theſe is paid as a tax to the emperor of Ruſſia, and the reſt are ſold at a ſtated price to the Ruſſian governors, but ſometimes they are allowed to diſpoſe of them to private perſons.

They chiefly live upon veniſon, wild-fowl, fiſh, and roots, for they have neither rice nor bread. They drink for the moſt part water, and it is ſaid they can very well reliſh a draught of train oil. They are immoderately fond of tobacco, and of ſwallowing the ſmoke, which ſoon intoxicates them. In the winter they build their huts in woods and foreſts, where they find the greateſt plenty of game, and dig deep in the earth to ſecure themſelves from the cold, laying a roof of bark or ruſhes over their huts, which are ſoon covered with ſnow. In ſummer they build above ground on the banks of the rivers, to enjoy the convenience of fiſhing, and make no difficulty of forſaking their habitations. They have a ſort of princes among them, in one of whoſe houſes ſome European travellers found four wives. One of theſe had a red cloth coat on, and was ſet off with all ſorts of glaſs beads. There was no other furniture than cradles and cheſts, made of the bark of trees ſewed together. Their beds conſiſted of wood-ſhavings, almoſt as ſoft as feathers, and their children lie naked upon them in cradles. They can neither read nor write, nor do they cultivate the land; and ſeem totally ignorant of times paſt. They have neither temples nor prieſts; and their boats are only made of the bark of trees ſewed together. Their religion is Pagan; and they have ſome little brazen idols, tolerably well caſt, repreſenting men and animals, made of wood and earth, all of which are dreſſed in ſilks, in the manner of Ruſſian ladies. In general, however, they are ill made, every man being his own carver. They place them on the tops of hills, in groves, and in the pleaſanteſt places their country affords, and ſometimes before their huts: yet they have no ſet time for performing religious worſhip, but apply to their gods for ſucceſs in all their undertakings. As they have no regular prieſts, every old man may devote himſelf to that ſervice, and the office is frequently performed by the maſters and heads of families. Strahlenberg ſays, that when he was among them he ſaw one of their temples, which was built of wood in an oblong form like a great barn, covered at the top with birch bark. At the end of the wall ſupporting the gable was a kind of altar, made of timber, on which were placed two idols, repreſenting a man and woman dreſſed in all ſorts of rags; and round theſe were other ſmall figures, as deer, foxes, and hares, all which were roughly carved in wood, and alſo clothed in rags. They did not appear to have much devotion, nor any great reverence for their idols. When they offer ſacrifices, they preſent the beaſt to the idol; and having bound it, an old man puts up the petitions of thoſe who brought the offering; he then lets fly an arrow at the beaſt, and the people aſſiſt in killing it. It is then drawn three times round the idol; and the blood being received into a veſſel, they ſprinkle it on their houſes; they afterwards dreſs the fleſh and eat it, rejoicing and ſinging their country ſongs: they alſo beſmear the idol with the blood of the ſacrifice, and greaſe their mouths with the fat. What they cannot eat they carry home to their families, and make preſents of it to their neighbours; they as often ſacrifice a fiſh as a beaſt. At the concluſion of the feaſt they ſhout, to ſhow their gratitude to the idol for his attending and accepting their devotions; for they are perſuaded that the ſaint or hero repreſented by the image always attends their ſacrifices, which when over he returns to his abode in the air. There is nothing more ſurpriſing, nor, if properly improved, is there any thing more inſtructing, than the hiſtory of ſuperſtition. It is with this view that we have given ſo enlarged a view of the Oſtiacks, longer, ſome may imagine, than their importance demands. It would, however, in our opinion, be improper to let ſuch an opportunity ſlip of exhibiting the extreme weakneſs of unaſſiſted reaſon, and the conſequent neceſſity of a divine revelation. That the religion of theſe ignorant and miſguided Pagans is the corruption of a primitive revelation, we think at leaſt probable; nor do we ſee any way of ſo ſatisfactorily accounting for the univerſal uſe of ſacrifices. The Oſtiacks are obliged to take an oath of fidelity to the Ruſſian government; and on theſe occaſions they uſe the following ceremony. After laying down a bear ſkin and an axe, and holding over it a piece of bread on a knife, they ſay, "In caſe I do not to my life's end prove true and faithful to the ſupreme government of the country, or if I knowingly and willingly break through my allegiance, or be wanting in the duty I owe to the ſaid ſupreme government, may the bear tear me to pieces in the wood; may the bread I eat ſtick in my throat, and choak me; may the knife ſtab me, and the axe cut off my head." The like ceremony is uſed among them in the depoſition of a witneſs.

OSTRACION, in zoology, a genus of the amphibia nantes claſs. It has ten long cylindrical obtuſe teeth in each jaw; the aperture is linear; the body is covered with a bony ſubſtance, and it has no belly-fins. There are nine ſpecies; principally diſtinguiſhed by the angles of their bodies, and number of fins near their tail.

OSTRACISM, in Grecian antiquity, denotes the baniſhment of ſuch perſons whoſe merit and influence gave umbrage to the people of Athens, leſt they ſhould attempt any thing againſt the public liberty. This puniſhment was called *oſtraciſm*, from the Greek word ὀστρακον, which properly ſignifies a "ſhell;" but when applied to this object, it is uſed for the billet on which the Athenians wrote the names of the citizens whom they intended to baniſh. The learned are divided with regard to the ſubſtance of which this billet was formed: ſome inſiſt that it was a ſmall ſtone, or a piece of brick; ſome that it was a piece of bark; and others aſſert that it was a ſhell. The word admits moſt of theſe interpretations. But what determines its true ſenſe, is the epithet given it by ancient authors, of *ceramiæ maſtix*; which words ſignify, "The puniſhment of potter's clay;" and this expreſſion ſeems to us a proof, that the word ὀστρακον, when applied on this occaſion, ſignifies a "piece of baked earth in the form of a ſhell;" and undoubtedly the Latin authors had this idea of the word here, for they tranſlated it by *teſtula*.

The ancients are likewiſe divided with regard to the time when oſtraciſm was inſtituted. But they all agree, that the perſon who moved the law was its firſt victim. But as to the name of its patron, and the time of its eſtabliſhment, they differ extremely. Many are of opinion, that oſtraciſm owes its origin to very remote times.

However that be, the puniſhment of oſtraciſm was inflicted by the Athenians when their liberty was in danger. If, for inſtance, jealouſy or ambition had ſowed diſcord among the chiefs of the republic; and if different parties were formed, which threatened ſome revolution in the ſtate; the people aſſembled to propoſe meaſures proper to be taken in order to prevent the conſequences of a diviſion which in the end might be fatal to freedom. Oſtraciſm was the remedy to which they uſually had recourſe on theſe occaſions; and the conſultations of the people generally terminated with a decree, in which a

day was fixed for a particular aſſembly, when they were to proceed to the ſentence of oſtraciſm. Then they who were threatened with baniſhment omitted no aſſiduity or art which might gain them the favour of the people. They made harangues to evince their innocence, and the great injuſtice that would be done them if they were baniſhed. They ſolicited, in perſon, the intereſt of every citizen; all their party exerted themſelves in their behalf; they procured informers to vilify the chiefs of the oppoſite faction. Some time before the meeting of the aſſembly, a wooden incloſure was raiſed in the forum, with ten doors, *i. e.* with as many as there were tribes in the republic; and when the appointed day was come, the citizens of each tribe entered at their reſpective door, and threw into the middle of the incloſure the ſmall brick on which the citizen's name was written whoſe baniſhment they voted. The archons and the ſenate preſided at this aſſembly, and counted the billets. He who was condemned by 6000 of his fellow-citizens, was obliged to quit the city within ten days; for 6000 voices, at leaſt, were requiſite to baniſh an Athenian by oſtraciſm.

The Athenians, without doubt, foreſaw the inconveniences to which this law was ſubject; but they choſe rather, as Cornelius Nepos hath remarked, ſometimes to expoſe the innocent to an unjuſt cenſure, than to live in continual alarms. Yet as they were ſenſible that the injuſtice of confounding virtue and vice would have been too flagrant, they ſoftened, as much as they could, the rigour of oſtraciſm. It was not aggravated with the circumſtances which were moſt diſhonorable and ſhocking in the ordinary mode of exile. They did not confiſcate the goods of thoſe who were baniſhed by oſtraciſm. They enjoyed the produce of their effects in the places into which they were baniſhed; and they were baniſhed only for a certain time. But in the common baniſhment, the goods of the exiles were always confiſcated, and no hopes were given them of ever returning to Athens.

The ſcholiaſt of Ariſtophanes informs us of a third difference betwixt oſtraciſm and the common baniſhment. He ſays, that a particular place of retirement was aſſigned to thoſe who were baniſhed by oſtraciſm, which was not appointed to the other exiles. We ſuſpect, however, the truth of this obſervation; for Themiſtocles was certainly not limited in his baniſhment. That great man, as we are told by Thucydides, though his chief reſidence was at Argi, travelled over all the Peloponneſus.

This puniſhment, far from conveying the idea of infamy, became, at Athens, a proof of merit, by the objects on which it was inflicted; as Ariſtides the ſophiſt juſtly obſerves, in his ſecond declamation againſt the Gorgias of Plato, where he ſays, that oſtraciſm was not an effect of the vindictive ſpirit of the people againſt thoſe whom it condemned; that the law, whether good or bad (for he enters not into an examination of the queſtion), was only meant to prune the luxuriant growth of tranſcendent merit; that it condemned to an exile of ten years, only thoſe illuſtrious men who were accuſed of being exalted far above other citizens by their conſpicuous virtue; and that none of that public indignation was ſhown to the exiles by oſtraciſm, which commonly breaks out againſt criminals.

Such were the mitigations with which this law was introduced among the Athenians: and by them we ſee that they were ſenſible of all the inconveniences to which it was ſubject. They were indeed too enlightened a people, not to foreſee the many inſtances of injuſtice which it might produce; that if in ſome reſpects it would be favourable to liberty, in others it would be its enemy, by condemning citizens without allowing them a previous defence, and by making a capricious and envious people arbiters of the fate of great men; that it might even become pernicious to the ſtate, by depriving it of its beſt ſubjects, and by rendering the adminiſtration of public affairs an odious employment to men of capital talents and virtue.

However great the inconveniences of oſtraciſm were, it would not have been impoſſible to avoid them; and we may add, that this law would have been of ſervice to the ſtate, if the people by whom it was inſtituted had always had diſcernment enough only to give it force on ſuch occaſions as endangered liberty. But its fate was like that of almoſt all other laws which the wiſeſt legiſlators have planned for the good of communities. Deſtined by their inſtitution to maintain order, to repreſs injuſtice, and to protect innocence, men have found ways to pervert their application, and have made them inſtruments to gratify their private paſſions. Thus oſtraciſm was eſtabliſhed to prevent the dangerous enterpriſes of the great, and to preſerve the vigour of the democracy; but the people of Athens, naturally jealous and envious, exerted that law, to remove men of eminent merit from the ſtate, by whoſe preſence they were reproved and intimidated. The fear of tyranny was commonly but a ſpecious pretext with which they veiled their malignity. The repeated victories which they had gained over the Perſians, had rendered them, ſays Plutarch, proud and inſolent. Intoxicated with their proſperity, they arrogated all its glory to themſelves; they were jealous of thoſe citizens whoſe political and military talents were the ſubjects of public eulogium. They thought the glory acquired by great men diminiſhed their own reputation. An Athenian no ſooner diſtinguiſhed himſelf by a ſplendid action, than he was marked out as a victim by public envy. His reputation was a ſufficient reaſon for his baniſhment.

OSTRACITES, in natural hiſtory, a name uſed for the foſſile oyſters, common in many parts of England. They are of various ſhapes and kinds; and the name is by ſome authors made to ſignify the ſhell itſelf, when preſerved in its native ſtate and condition; as is the caſe with thoſe about Woolwich and Blackheath; and by others, the ſtones caſt or formed in thoſe ſhells, or in cavities from whence they have been waſhed away and diſſolved: in both theſe caſes the ſtone carries the exact reſemblance of the ſhell, even in its niceſt lineaments; in the firſt caſe, bearing every mark of the inſide, in the other of the outer ſurface. We have this ſtone in great plenty in many parts of England; and it is very famous, in ſome places, for its virtues in caſes of the gravel, and the like complaints.

OSTREA, the OYSTER, in zoology, a genus belonging to the order of vermes teſtacea. The ſhell has two unequal valves; the cardo has no teeth, but a ſmall hollowed one with tranſverſe lateral ſtreaks. (See pl. 19.) There are 31 ſpecies, principally diſtinguiſhed by peculiarities in their ſhells. The common oyſter is reckoned an excellent food; and is eaten both raw and variouſly prepared. The character of the genus, in the words of Barbut, is, "The animal a tethys; the ſhell bivalve, unequivalve, with ſomething like ears; the hinge void of teeth with a deep oval hole, and tranſverſe ſtreaks on the ſides. There is no womb nor anus." The genus is divided into four families, of which oſtrea is the laſt. See PECTENS. The ſame author gives us the following enlarged account of the oyſter.

"This ſea-fiſh occupies in the ſcale of nature one of the degrees the moſt remote from perfection; deſtitute of defenſive weapons and progreſſive motion, without art or induſtry, it is reduced to mere vegetation in perpetual impriſonment, though it every day opens regularly to enjoy the element neceſſary to its preſervation. The animal figure, and the ſprings of its organization, are ſcarce diſcernible through the coarſe and ſhapeleſs maſs; a ligament placed at the ſummit of the ſhell ſerves as an arm to its operations. Oyſters are reputed to be hermaphrodites; the ſpawn which they caſt in May adheres to the rocks and other matters at the bottom of the ſea; and in the ſpace of 24 hours is provided with ſhells, in which are contained other oyſters, that never leave the ſpot on which they were fixed, till the greedy fiſherman tears them from the element. The green oyſters eaten at Paris are commonly brought

from Dieppe. Their colour is owing to the care taken to bed them in creeks, encompaſſed with verdure, whence they acquire their delicacy. Common oyſters ſhould be freſh, tender, and moiſt. The moſt eſteemed are thoſe caught at the mouth of rivers, and in clear water. Great account is made of oyſters from Brittany, but ſtill greater of thoſe that come from Marennes in Saintonge. Preference is given to thoſe that are edged with ſmall brown fringe, or beard, which epicures call fecundated oyſters; but that thoſe are females is a miſtake. The want of freſh water renders oyſters hard, bitter, and unpalatable. Mud and ſea-weeds deſtroy them in their very birth; galangal root, muſcles, ſcollops, ſea-ſtars, and crabs, are formidable enemies to the oyſter. There are found in Spain red and ruſſet coloured oyſters; in Illyria, brown coloured, with the fleſh black; and in the Red Sea, of the colour of the Iris. Oyſters of the mangle-tree are of two ſorts; thoſe of St. Domingo are delicate, adhering to the ſtumps of the trees that dip in the water. The negro divers cut them off with a bill, and they are ſerved upon table with the roots."

Britain has been noted for oyſters from the time of Juvenal, who, ſatyrizing Montanus an epicure, ſays,

Circæis nata forent, an
Lucrinum ad ſaxum, Rutupinove edita fundo,
Oſtrea, callebat primo deprendere morſu.

He, whether Circe's rock his oyſters bore,
Or Lucrine lake, or diſtant Richborough's ſhore,
Knew at firſt taſte.

According to Mr. Pennant, the luxurious Romans were very fond of this fiſh, and had their layers or ſtews for oyſters as we have at preſent. Sergius Orata was the firſt inventor, as early as the time of L. Craſſus the orator. He did not make them for the ſake of indulging his appetite, but through avarice, and made great profits from them. Orata got great credit for his Lucrine oyſters; for, ſays Pliny, the Britiſh were not then known.

The ancients eat them raw, having them carried up unopened, and generally eating them at the beginning of the entertainment, but ſometimes roaſted. They had alſo a cuſtom of ſtewing them with mallows and ducks, or with fiſh, and eſteemed them very nouriſhing.

Britain ſtill keeps its ſuperiority in oyſters over other countries. Moſt of our coaſts produce them naturally; and in ſuch places they are taken by dredging, and are become an article of commerce, both raw and pickled. The very ſhells, calcined, become an uſeful medicine as an abſorbent. In common with other ſhells, they prove an excellent manure.

Stews or layers of oyſters are formed in places which nature never allotted as habitations for them. Thoſe near Colcheſter have been long famous; at preſent there are others that at leaſt rival the former, near the mouth of the Thames. The oyſters, or their ſpats, are brought to convenient places, where they improve in taſte and ſize. It is an error to ſuppoſe, that the fine green obſerved in oyſters taken from artificial beds, is owing to copperas; it being notorious how deſtructive the ſubſtance or the ſolution of it is to all fiſh. We cannot give a better account of the cauſe, or of the whole treatment of oyſters, than what is preſerved in the learned biſhop Sprat's hiſtory of the Royal Society, from p. 307 to 309.

" In the month of May, the oyſters caſt their ſpawn, (which the dredgers call their *ſpats*); it is like to a drop of candle, and about the bigneſs of a halfpenny. The ſpat cleaves to ſtones, old oyſter-ſhells, pieces of wood, and ſuch like things, at the bottom of the ſea, which they call *clutch*. It is probably conjectured, that the ſpat in 24 hours begins to have a ſhell. In the month of May, the dredgers (by the law of the admiralty court) have liberty to catch all manner of oyſters, of what ſize ſoever. When they have taken them, with a knife they gently raiſe the ſmall brood from the clutch, and then they throw the clutch in again, to preſerve the ground for the future, unleſs they be ſo newly ſpat, that they cannot be ſafely ſevered from the clutch; in that caſe they are permitted to take the ſtone or ſhell, &c. that the ſpat is upon, one ſhell having many times 20 ſpats. After the month of May, it is felony to carry away the clutch, and puniſhable to take any other oyſters, unleſs it be thoſe of ſize, (that is to ſay) about the bigneſs of an half-crown piece, or when, the two ſhells being ſhut, a fair ſhilling will rattle between them.

" The places where theſe oyſters are chiefly catched, are called the *Pent Burnham*, *Malden*, and *Colne-waters*; the latter taking its name from the river of Colne, which paſſeth by Colcheſter, gives name to that town, and runs into a creek of the ſea, at a place called the *Hythe*, being the ſuburbs of the town. This brood and other oyſters they carry to the creeks of the ſea, at Brickelſea, Melſy, Langno, Fingrego, Wivenho, Toleſbury, and Saltcoaſe, and there throw them into the channel, which they call their *beds* or *layers*, where they grow and fatten; and in two or three years the ſmalleſt brood will be oyſters of the ſize aforeſaid. Thoſe oyſters which they would have green, they put into pits about three feet deep in the ſalt marſhes, which are overflowed only at ſpring-tides, to which they have ſluices, and let out the ſalt-water until it is about a foot and half deep. Theſe pits, from ſome quality in the ſoil co-operating with the heat of the ſun, will become green, and communicate their colour to the oyſters that are put into them in four or five days, though they commonly let them continue there ſix weeks or two months, in which time they will be of a dark green. To prove that the ſun operates in the greening, Toleſbury pits will green only in ſummer; but that the earth hath the greater power, Brickelſea pits green both winter and ſummer: and for a further proof, a pit within a foot of a greening-pit will not green; and thoſe that did green very well, will in time loſe their quality. The oyſters, when the tide comes in, lie with their hollow ſhell downwards; and when it goes out, they turn on the other ſide: they remove not from their place, unleſs in cold weather, to cover themſelves in the ouſe. The reaſon of the ſcarcity of oyſters, and conſequently of their dearneſs, is, becauſe they are of late years bought up by the Dutch.

" There are great penalties by the admiralty court laid upon thoſe that fiſh out of thoſe grounds which the court appoints, or that deſtroy the clutch, or that take any oyſters that are not of ſize, or that do not tread under their feet, or throw upon the ſhore, a fiſh which they call a *five finger*, reſembling a ſpur-rowl, becauſe that fiſh gets into the oyſters when they gape, and ſucks them out.

" The reaſon that ſuch a penalty is ſet upon any that ſhall deſtroy the clutch, is, becauſe they find that if that be taken away, the ouſe will increaſe, and the muſcles and cockles will breed there, and deſtroy the oyſters, they having not whereon to ſtick their ſpat.

" The oyſters are ſick after they have ſpat; but in June and July they begin to mend, and in Auguſt they are perfectly well: the male oyſter is black ſick, having a black ſubſtance in the fin; the female white ſick (as they term it), having a milky ſubſtance in the fin. They are ſalt in the pits, ſalter in the layers, but ſalteſt at ſea."

The oyſter affords the curious in microſcopic obſervations a very pleaſing entertainment. In the clear liquor many little round living animalcules have been found, whoſe bodies being conjoined, form ſperical figures, with tails, not changing their place otherwiſe then by ſinking to the bottom, as being heavier than the fluid; theſe have been ſeen frequently ſeparating and

then coming together again. In other oyſters, animalcules of the ſame kind were found, not conjoined, but ſwimming by one another, whence they ſeemed in a more perfect ſtate, and were judged by Mr. Leeuwenhoek to be the animacules in the roe or ſemen of the oyſter.

A female oyſter being opened, incredible multitudes of ſmall embryo oyſters were ſeen, covered with little ſhells, perfectly tranſparent, and ſwimming along ſlowly in the liquor; and in another female, the young ones were found of a browner colour, and without any appearance of life or motion.

Monſieur Joblot alſo kept the water running from oyſters three days, and it appeared full of young oyſters ſwimming about nimbly in it; theſe increaſed in ſize daily; but a mixture of wine, or the vapour of vinegar, killed them.

In the month of Auguſt oyſters are ſuppoſed to breed, becauſe young ones are then found in them. Mr. Leeuwenhoek, on the 4th of Auguſt, opened an oyſter, and took out of it a prodigious number of minute oyſters, all alive, and ſwimming nimbly about in the liquor, by means of certain exceeding ſmall organs, extending a little way beyond their ſhells; and theſe he calls their beards. In theſe little oyſters, he could diſcover the joinings of the ſhells; and perceived that there were ſome dead ones with their ſhells gaping. Theſe, though ſo extremely minute, are ſeen to be as like the large oyſters in form, as one egg is to another.

As to the ſize of them, he computes, that 120 of them in a row would extend an inch; and conſequently, that a globular body, whoſe diameter is an inch, would, if they were alſo round, be equal to 1,728,000 of them. He reckons 3000 or 4000 are in one oyſter, and found many of the embryo oyſters among the bairds; ſome faſtened thereto by ſlender filaments, and others lying looſe: he likewiſe found animalcules in the liquor 500 times leſs than the embryo oyſters.

It is not very uncommon to ſee on oyſter-ſhells, when in a dark place, a ſhining matter or bluiſh light, like a flame of brimſtone, which ſticks to the fingers when touched, and continues ſhining and giving light for a conſiderable time, though without any ſenſible heat. This ſhining matter being examined with a microſcope, was found to conſiſt of three ſorts of animalcules; the firſt whitiſh, and having 24 or 25 legs on a ſide, forked, a black ſpeck on one part of the head, the back like an eel with the ſkin ſtripped off. The ſecond ſort, red, reſembling the common glow-worm, with folds on its back, but legs like the former; a noſe like a dog's, and one eye in the head. The third ſort, ſpeckled, with a head like a ſole, with many tufts of whitiſh hairs on the ſides of it. Some much larger and greyiſh might be ſeen, having great heads, two horns like a ſnail's, and ſix or eight whitiſh feet; but theſe did not ſeem to ſhine.

OSTRICH, in zoology. See STRUTHIO.

OSTROVIZZA, in Dalmatia, (ſee DALMATIA), which ſome would have the ſame as Arauzona, and others the Stlupi of the ancients, though probably it has no connection with either the one or the other. It was purchaſed in 1410 by the republic of Venice, for 5,00 ducats, and ſome pieces of land beſides. Its fortreſs, which was ſeated on a rock, perpendicularly cut all round, and deſervedly reckoned impregnable before the uſe of artillery, was taken by Soliman in 1524, but ſoon after returned under the dominion of Venice. At preſent, no traces of its fortification remain, and it is only a bare and iſolated maſs. There are ſome natural curioſities about the place.

OSTUNI, a town of Italy, in the kingdom of Naples, and in the Terra di Otranto, with a biſhop's ſee. Its territory is well cultivated, and abounds with olives and almonds. It is ſeated on a mountain near the Gulph of Venice, in E. lon. 17. 49. N. lat. 49. 59.

OSWEGO, a fort of North America, ſeated on the ſouth ſide of the lake Ontario, in W. lon. 70. 35. N. lat. 45. 15.

OSWEIZEN, a town in Poland, in the palatinate of Cracovia, with the title of a duchy. It carries on a great trade in ſalt, and is ſeated on the river Viſtula. E. lon. 19. 47. N. lat. 50. 1.

OSWESTRY, in the county of Salop, in England, 172 miles from London, is a very old town, with a caſtle, a wall, and a ditch, and was anciently a borough. It is a place celebrated in Saxon hiſtory and legendary piety. On this ſpot, Auguſt 5, 642, was fought the battle between the Chriſtian Oſwald king of the Northumbrians and the pagan Penda king of the Mercians, in which Oſwald was defeated, and loſt his life. The barbarian victor cut the body of the ſlain prince in pieces, and ſtuck them on ſtakes diſperſed over the field as ſo many trophies; but, according to others, his head and hands only were thus expoſed. A prince ſo dear to the church as Oſwald, and ſo attached to the profeſſors of the monaſtic life, received every poſthumous honour they could beſtow. He was raiſed to the rank of a ſaint, and his ſanctity confirmed by numberleſs miracles, which are too numerous and too trifling to admit of particular deſcription. Its church, which is of no great antiquity, was formerly a monaſtery, and was called Blancminſter. It is, however, ſpacious, and has a handſome plain tower. In the years 1542 and 1567, this town ſuffered much by fire. It is governed by two bailiffs, burgeſſes, &c. and once drove a great trade in Welch cottons and flannels, which is now very much decayed. There is now ſcarce a tolerable houſe for travellers. But beſides a good grammar ſchool, it is noted for an excellent charity-ſchool for 40 boys, beſides girls, which has the beſt methods for exciting the emulation of the children in their learning; for 20 of the boys are ſet to ſtrive againſt 20 others for ſhoes, and the 20 who perform their taſk beſt have ſhoes firſt; then 10 of the boys are ſet againſt 10 others for the like premium, and ſo on till they are all ſhod; ſo in the girls ſchool a ſhift is put up for the beſt ſpinner, a head-dreſs for the beſt ſempſtreſs, a pair of ſtockings for the beſt knitter, a bible for the beſt reader, and a copy-book for the beſt writer. In the wall with which the town was fortified there were four gates. That called the *Block-gate* is demoliſhed; the New-gate, Willow-gate, and the Beatrice-gate, ſtill remain. The laſt is a handſome building, with a guard-room on both ſides. There are only two fragments of the caſtle remaining. It ſtood on an artificial mount, ſurrounded by a foſſe, extending to the Willow-gate.

OSYMANDES, a famous king of Egypt, was, according to ſome authors, the firſt monarch who collected a great number of books for the purpoſe of forming a library. To this curious collection he gave the title of *Pharmacy of the Soul*. Of all the monuments of the kings of Thebes, that of Oſymandes is one of the moſt magnificent. We cannot without aſtoniſhment read the account which Diodorus Siculus gives of the almoſt incredible magnificence of this prince, and of the immenſe ſums which he ſpent upon thoſe grand works. Amongſt a variety of other ſurpriſing curioſities, was to be ſeen a ſtatue in the attitude of ſitting, which was the largeſt in all Egypt, the length of one of the feet being ſeven cubits. Not only the art of the ſculptor, but alſo the beauty of the ſtone which was perfect in its kind, contributed to render this a maſter-piece of ſculpture. It bore the following inſcription: *I am OSYMANDES, king of kings; whoever will diſpute with me this title, let him ſurpaſs me in any of my works.*

The palace or mauſoleum of this accompliſhed prince muſt give us a ſtriking aſſurance of the progreſs which had been made in the arts at that time; whether he lived, as ſome have thought, the immediate ſucceſſor of the firſt Buſiris, which was ſomewhat later than the period of Semiramis; or, as others

have conceived, ſubſequent to Seſoſtris, which would be 400 years later. Diodorus Siculus, who deſcribes that edifice, ſays nothing of the age in which Oſymandes lived; every opinion therefore on that point muſt be conjecture. There is nothing in the works of art in that edifice which ſhould appear too much for the earlieſt age in which that monarch has been placed, when we look back to what was done of thoſe works in a period full as early by Semiramis in Aſſyria.

OTACOUSTIC INSTRUMENT, or *Auricular Tube*, an inſtrument to facilitate the hearing. See ACOUSTICS.

OTAHEITE, or *King George the Third's Iſland*, an iſland in the South Pacific Ocean, about thirty leagues in circumference, ſuppoſed to have been firſt ſeen by Quiros, in the year 1606, and by him called *Sagittaria*. Captain Wallis was the firſt Engliſhman who diſcovered it in the year 1767. The year following it was viſited by Monſieur Bougainville, a French commander: and again by Captain Cook, in the years 1769, 1773, and 1774, from whom, as drawn up by Dr. Hawkeſworth, the following account is taken: "The iſland is ſurrounded by a reef of coral rock, which forms ſeveral excellent bays and harbours, where there is room and depth of water for any number of the largeſt ſhips. The face of the country, except that part of it which borders upon the ſea, is very uneven; it riſes in ridges that run up into the middle of the iſland, and there form mountains, which may be ſeen at the diſtance of ſixty miles: between the foot of theſe ridges and the ſea, is a border of low land, ſurrounding the whole iſland, except in a few places where the ridges riſe directly from the ſea: the border of low land is in different parts of different breadths, but no where more than a mile and a half. The ſoil, except on the very tops of the ridges, is extremely rich and fertile, watered by a great number of rivulets of excellent water, and covered with fruit-trees of various kinds. The low land that lies between the foot of the ridges and the ſea, and ſome of the vallies, are the only parts of the iſland that are inhabited, and here it is populous: the houſes do not form villages or towns, but are ranged along the whole border, at the diſtance of about fifty yards from each other, with little plantations of plantains, the tree which furniſhes them with cloth. The whole iſland, according to the beſt information could furniſh 6780 fighting men, from which, the number of inhabitants may eaſily be computed. The produce of this iſland is bread-fruit, cocoa-nuts, bannanas of thirteen ſorts, plantains, a fruit not unlike an apple, which, when ripe, is very pleaſant; ſweet potatoes, yams, cocoas, a kind of arum; a fruit known here by the name of jambu, and reckoned moſt delicious; a ſugar-cane, which the inhabitants eat raw; a root of the ſalop kind, which the inhabitants call pea; a plant called ethee of which the root only is eaten; a fruit that grows in a pod, like that of a large kidney bean, which, when it is roaſted, eats very much like a cheſtnut, by the natives called ahea; a tree called wharra, called in the Eaſt Indies pandanes, which produces fruit ſomething like the pine-apple; a ſhrub called nono; the morinda, which alſo produces fruit; a ſpecies of fern, of which the root is eaten, and ſometimes the leaves; and a plant called theve, of which the root alſo is eaten: but the fruits of the nono, the fern, and the theve, are eaten only by the inferior people, and in times of ſcarcity. All theſe, which ſerve the inhabitants for food, the earth produces ſpontaneouſly, or with little culture. They had no European fruit, garden-ſtuff, pulſe, or legumes, nor grain of any kind. Of tame animals, they have only hogs, dogs, and poultry; neither is there a wild animal in the iſland, except ducks, pigeons, parroquets, with a few other birds, and rats, there being no other quadruped, nor any ſerpent. But the ſea ſupplies them with great variety of moſt excellent fiſh to eat, which is their chief luxury, and to catch it their principal labour. As to the people, they are of the largeſt ſize of Europeans. The men are tall, ſtrong, well limbed, and finely ſhaped. The women of the ſuperior rank, are alſo, in general, above our middle ſtature, but thoſe of the inferior claſs are rather below it, and ſome of them are very ſmall. This defect in ſize probably proceeds from their early commerce with men, the only thing in which they differ from their ſuperiors, that could poſſibly affect their growth. Their natural complexion is that kind of clear olive or brunette, which many people in Europe prefer to the fineſt white and red. The hair is almoſt univerſally black, and rather coarſe. The men have beards, which they wear in many faſhions, always however, plucking out great part of them, and keeping the reſt perfectly clean and neat. In their motions there is at once vigour and eaſe; their walk is graceful, their deportment liberal, and their behaviour to ſtrangers and to each other, affable and courteous. In their diſpoſitions, alſo, they ſeemed to be brave, open, and candid, without either ſuſpicion or treachery, cruelty or revenge. They were, however, all thieves; and when that is allowed, they need not much fear a competition with the people of any other nation upon earth. The women always cut their hair ſhort round their ears, and the men, except the fiſhers, who are almoſt continually in the water, ſuffer it to flow in large waves over their ſhoulders, or tie it up in a bunch on the top of their heads. They have a cuſtom alſo of anointing their heads, with what they call monoe, an oil expreſſed from the cocoa-nut, in which ſome ſweet herbs or flowers have been infuſed: as the oil is generally rancid, the ſmell is at firſt very diſagreeable to an European; and as they live in a hot country, and have no ſuch thing as a comb, they are not able to keep their heads free from lice, which the children and common people ſometimes pick out and eat; a hateful cuſtom, wholly different from their manners in every other particular, for they are delicate and cleanly almoſt without example; and thoſe to whom captain Cook diſtributed combs, ſoon delivered themſelves from vermin with a diligence which ſhowed that they were not more odious to us than to them. They have a cuſtom of ſtaining their bodies, nearly in the ſame manner as is practiſed in many other parts of the world, which they call tatowing. They prick the ſkin ſo as juſt not to fetch blood, with a ſmall inſtrument, ſomething in the form of a hoe; that part which anſwers to the blade is made of a bone or ſhell, ſcraped very thin, and is from a quarter of an inch, to an inch and a half wide; the edge is cut into ſharp teeth, as points, from the number of three to twenty, according to its ſize: when this is to be uſed, they dip the teeth into a mixture of a kind of lamp-black; formed of the ſmoke that ariſes from an oily nut, which they burn inſtead of candles, and water: the teeth, thus prepared, are placed upon the ſkin, and the handle to which they are faſtened being ſtruck, by quick ſmart blows, with a ſtick fitted to the purpoſe, they pierce it, and at the ſame time carry in to the puncture the black compoſition, which leaves an indelible ſtain. The operation is painful, and it is ſome days before the wounds are healed. It is performed upon the youth of both ſexes, when they are about twelve or fourteen years of age, on ſeveral parts of the body, and in various figures, according to the fancy of the parent, or perhaps the rank of the party. The women are generally marked with this ſtain, in the form of a Z, on every joint of their fingers and toes, and frequently round the outſide of their feet; the men are alſo marked with the ſame figure, and both men and women have ſquares, circles, and creſcents, and ill deſigned repreſentations of men, birds or dogs, and various other devices, impreſſed upon their legs and arms, ſome of which we were told had ſignifications, though we never could learn what they were. But the part on which theſe ornaments are laviſhed with the greateſt profuſion, is the breech: this, in both ſexes, is covered with a deep black; above which, arches are drawn one over another as high as the

ſhort ribs. Their clothing conſiſts of cloth or matting of different kinds. The cloth, which will not bear wetting, they wear in dry weather, and the matting when it rains; they are put on in many different ways, juſt as their fancy leads them; for in their garments nothing is cut into ſhapes, nor any two pieces ſewed together. The dreſs of the better ſort of women conſiſts of three or four pieces; one piece, about two yards wide, and eleven yards long, they wrap ſeveral times round their waiſt, ſo as to hang down like a petticoat, as low as the middle of the leg, and this they call parou: two or three other pieces, about two yards and a half long, and one wide, each having a hole cut in the middle, they place one upon another, and then putting the head through the holes, they bring the long ends down before and behind; the others remain open at the ſides, and give liberty to the arms: this, which they call the tebuta, is gathered round the waiſt, and confined with a girdle or ſaſh, of thinner cloth, which is long enough to go many times round them, and exactly reſembles the garment worn by the inhabitants of Peru and Chili, which the Spaniards call poncho. The dreſs of the men is the ſame, except that inſtead of ſuffering the cloth that is wound about the hips to hang down like a petticoat, they bring it between their legs, ſo as to have ſome reſemblance to breeches, and it is then called maro. Upon their legs and feet they wear no covering, but they ſhade their faces from the ſun with little bonnets, either of matting or of cocoa-nut leaves, which they make occaſionally in a few minutes. This, however, is not all their head-dreſs; the women ſometimes wear little turbans, and ſometimes a dreſs which they value much more, and which, indeed, is much more becoming, called tomou: the tomou conſiſts of human hair, plaited in threads, ſcarcely thicker than ſowing ſilk. Sir Joſeph Banks has pieces of it above a mile in length, without a knot. Their perſonal ornaments, beſides flowers, are few; both ſexes wear ear-rings, but they are placed only on one ſide: when we came, they conſiſted of ſmall pieces of ſhell, ſtones, berries, red peas, or ſome ſmall pearls, three in a ſtring; but the beads brought by captain Cook very ſoon ſupplanted them all. The children go quite naked; the girls till they are three or four years old, and the boys till they are ſix or ſeven. The houſes, or rather dwellings of theſe people are all built in the woods, between the ſea and the mountains, and no more ground is cleared for each houſe, than juſt ſufficient to prevent the dropping of the branches from rotting the thatch with which they are covered; from the houſe, therefore, the inhabitants ſtep immediately under the ſhade, which is the moſt delightful that can be imagined. It conſiſts of groves of bread-fruit and cocoa-nuts, without underwood, which are interſected, in all directions, by the paths that lead from one houſe to the other. The ground on which the houſe is built is an oblong ſquare, twenty-four feet long, and eleven wide; over this a roof is raiſed, upon three rows of pillars or poſts, parallel to each other, one on each ſide, and the other in the middle. The utmoſt height within is about nine feet, and the eaves on each ſide reach to within about three feet and a half of the ground: below this, and through the whole height at each end, it is open, no part of it being incloſed with a wall. The roof is thatched with palm-leaves, and the floor is covered ſome inches deep with ſoft hay, over this are laid mats, ſo that the whole is one cuſhion, upon which they ſit in the day, and ſleep in the night. In ſome houſes, however, there is one ſtool, which is wholly appropriated to the maſter of the family; beſides this, they have no furniture, except a few little blocks of wood, the upper ſide of which is hollowed into a curve, and which ſerve them for pillows. The houſe is, indeed, principally uſed as a dormitory; for, except it rains, they eat in the open air, under the ſhade of the next tree. The clothes that they wear in the day, ſerve them for covering in the night; the floor is the common bed of the whole houſehold, and is not divided by any partition. The maſter of the houſe and his wife ſleep in the middle, next to them the married people, next to them the unmarried women, and next to them, at a little diſtance, the unmarried men; the ſervants, or toutous, as they are called, ſleep in the open air, except it rains, and in that caſe they come juſt within the ſhed. There are, however, houſes of another kind belonging to the chiefs, in which there is ſome degree of privacy. Theſe are much ſmaller, and ſo conſtructed, as to be carried about from place to place, and ſet up occaſionally, like a tent; they are incloſed on the ſides with cocoa-nut leaves, but not ſo cloſe as to exclude the air, and the chief and his wife ſleep in them alone. There are houſes alſo of a much larger ſize, not built either for the accommodation of a ſingle chief, or a ſingle family; but as common receptacles for all the people of a diſtrict. Some of them are 200 feet long, thirty broad, and under the ridge, twenty feet high; theſe are built and maintained at the common expence of the diſtrict, for the accomodation of which they are intended. Of the food eaten here, the greater part is vegetable. Of the only animals, hogs, dogs, and poultry, there are by no means plenty. When a chief kills a hog, it is almoſt equally divided among his dependants; and as they are very numerous, the ſhare of each individual at theſe feaſts, which are not frequent, muſt neceſſarily be ſmall. Dogs and fowl fall ſomewhat more frequently to the ſhare of the common people. Captain Cook could not much commend the flavour of their fowls, but thought a South Sea dog was little inferior to an Engliſh lamb; their excellence is probably owing to their being kept up, and fed wholly upon vegetables. The ſea affords them a great variety of fiſh. The ſmaller fiſh, when they catch any, are generally eaten raw, as we eat oyſters; and nothing that the ſea produces comes amiſs to them: they are fond of lobſters, crabs, and other ſhell fiſh, which are found upon the coaſt; and they will eat not only ſea inſects, but what the ſeamen call blubbers, though ſome of them are ſo tough, that they are obliged to ſuffer them to become putrid, before they can be chewed. Of their vegetables, the principal is the bread-fruit, to procure which coſts them no trouble or labour but climbing a tree: the tree which produces it does not, indeed, ſhoot up ſpontaneouſly; but if a man plant ten of them in his lifetime, which he may do in about an hour, he will as completely fulfil his duty to his own and future generations, as the native of our leſs temperate climate can do by ploughing in the cold of winter, and reaping in the ſummer's heat, as often as theſe ſeaſons return; even if, after he has procured bread for his preſent houſehold, he ſhould convert a ſurplus into money, and lay it up for his children. It is true, indeed, that the bread-fruit is not always in ſeaſon; but cocoa-nuts, bananas, plantains, and a great variety of other fruits, ſupply the deficiency. Salt water is the univerſal ſauce, no meal being eaten without it: thoſe who live near the ſea have it fetched as it is wanted; thoſe who live at ſome diſtance keep it in large bamboos, which are ſet up in their houſes for uſe. For drink they have in general nothing but water, or the juice of the cocoa-nut; the art of producing liquors that intoxicate, by fermentation, being happily unknown by them; neither have they any narcotic which they chew, as the natives of ſome other countries do opium, beetle root, and tobacco. Their only muſical inſtruments are flutes and drums; the flutes are made of a hollow bamboo, about a foot long, and have only two ſtops, and conſequently but four notes. The drum is made of a hollow block of wood, of a cylindrical form, ſolid at one end, and covered at the other with ſhark's ſkin: theſe they beat not with ſticks, but their hands; and they know how to tune two drums of different notes into concord. Among other diverſions, there is a dance, called timorodee, which is performed by young girls, whenever eight or ten of them can be collected together, conſiſting of motions and geſtures beyond imagination wanton, in the practice of which they are brought up from their earlieſt childhood, accompanied by words, which, if it were poſſible, would more explicitly convey the ſame ideas. In theſe dances

they keep time with an exactneſs which is ſcarcely excelled by the beſt performers upon the ſtages of Europe. But the practice which is allowed to the virgin, is prohibited to the married woman. Their principal manufacture is their cloth, which is of three kinds; and it is made of the bark of three different trees: the Chineſe paper-mulberry, the bread-fruit-tree, and the tree which reſembles the wild fig-tree of the Weſt Indies. The colours with which they dye this cloth are principally red and yellow. The red is exceedingly beautiful, and of a brighter and more delicate colour than any we have in Europe. Another conſiderable manufacture is matting of various kinds; ſome of which is finer, and better in every reſpect, than any we have in Europe: the coarſer ſort ſerves them to ſleep upon, and the finer to wear in wet weather. They are alſo very dexterous in making baſket and wicker work; their baſkets are of a thouſand different patterns, many of them exceedingly neat; and the making them is an art that every one practiſes, both men and women. The women make little bonnets of the cocoa-nut leaf, to ſhade their faces, at ſo ſmall an expence of time and trouble, that, when the ſun is again low in the evening, they throw them away. Theſe bonnets, however, do not cover the head, but conſiſt only of a band that goes round it, and a ſhade that projects from the forehead. Of the bark of a tree, called poerou, they make ropes and lines, from the thickneſs of an inch to the ſize of a ſmall packthread; with theſe they make nets for fiſhing: of the fibres of the cocoa-nut they make thread, for faſtening together the ſeveral parts of their canoes, and belts, either round or flat, twiſted or plaited; and of the bark of the erowa, a kind of nettle, which grows in the mountains, and is, therefore, rather ſcarce, they make the beſt fiſhing-lines in the world; with theſe they hold the ſtrongeſt and moſt active fiſh, ſuch as bonetas and albicores, which would ſnap our ſtrongeſt ſilk lines in a minute, though they are twice as thick. They make alſo a kind of ſeine, of a coarſe broad graſs, the blades of which are like flags; theſe they twiſt and tie together in a looſe manner, till the net, which is about as wide as a large ſack, is from ſixty to eighty fathom long: this they haul in ſhoal ſmooth water, and its own weight keeps it ſo cloſe to the ground that ſcarcely a ſingle fiſh can eſcape. In every expedient, indeed, for taking fiſh, they are exceedingly ingenious; they make harpoons of cane, and point them with hard wood, which in their hands ſtrike fiſh more effectually than thoſe which are headed with iron can do in our's, ſetting aſide the advantage of our's being faſtened to a line, ſo that the fiſh is ſecured if the hook takes place, though it does not mortally wound him. They have an adze of ſtone; a chiſſel, or gouge, of hone, generally that of a man's arm between the wriſt and elbow, a raſp of coral, and the ſkin of a ſting-ray, with coral ſand, as a file or poliſher. This is a complete catalogue of their tools, and with theſe they build houſes, conſtruct canoes, hew ſtone, and ſell, cleave, carve, and poliſh timber. The canoes, or boats, which are uſed by the inhabitants of this and the neighbouring iſlands may be divided into two general claſſes; one of which they call ivahahs, the other pahies. The ivahah is uſed for ſhort excurſions to ſea, and is well ſided and flat bottomed; the pahie for longer voyages, and is bow-ſided, and ſharp bottomed. The ivahahs are all of the ſame figure, but of different ſizes, and uſed for different purpoſes; their length is from ſeventy-two feet to ten, but the breadth is by no means in proportion; for thoſe of ten feet are about a foot wide, and thoſe of more than ſeventy are ſcarcely two. The pahie is alſo of different ſizes, from ſixty to thirty feet long, and, like the ivahah, is very narrow. Their language is ſoft and melodious; it abounds with vowels, and captain Cook's company eaſily learnt to pronounce it: but found it exceedingly difficult to teach them to pronounce a ſingle word of Engliſh; probably not only from its abounding in conſonants, but from ſome peculiarity in its ſtructure; for Spaniſh and Italian words, if ending in a vowel, they pronounced with great facility. As to their religion, they believe the immortality of the ſoul, at leaſt its exiſtence in a ſeparate ſtate, and that there are two ſituations of different degrees of happineſs, ſomewhat analogous to our heaven and hell: the ſuperior ſituation they call *tavirua l'erai*, the other *tiaboboo*. They do not, however, conſider them as places of reward and puniſhment, but as receptacles for different claſſes; the firſt, for their chiefs and principal people; the other for thoſe of inferior rank, for they do not ſuppoſe that their actions here in the leaſt influence their future ſtate, or indeed that they come under the cognizance of their deities at all. The character of the prieſt, or tahowa, is hereditary: the claſs is numerous, and conſiſts of all ranks of people; the chief, however, is generally the younger brother of a good family, and is reſpected in a degree next to their kings. Marriage in this iſland, as appeared to us, is nothing more than an agreement between the man and woman, with which the prieſt has no concern. Where it is contracted, it appears to be pretty well kept, though ſometimes the parties ſeparate by mutual conſent, and in that caſe a divorce takes place with as little trouble as the marriage. The morai is at once a burying-ground and place of worſhip. Their weapons are ſlings, which they uſe with great dexterity, pikes headed with the ſtings of the ſting rays, and clubs, of about ſix or ſeven feet long, made of a very hard heavy wood. Though this, and the neighbouring iſlands lie within the tropic of capricorn, yet the heat is not troubleſome, nor did the winds blow conſtantly from the eaſt. The tides about theſe iſland are, perhaps, as inconſiderable as in any part of the world. A ſouth or ſouth-by-weſt moon, makes high water in the Bay of Matavai, at Otaheite; but the water very ſeldom riſes perpendicularly above ten or twelve inches." W. lon. 149. 15. to 150. Greenwich. S. lat. 17. 30. to 17. 48.

OTALGIA, the Ear-ach, in medicine, a painful affection of the ear, commonly ariſing from cold. It is generally to be relieved by dropping a few drops of ſome ſtimulating liquid, ſuch as camphorated oil, into the ear; or by blowing in the ſteam of warm water. Sometimes laudanum and oil is a uſeful application.

OTELANDS, or Oatlands, in England, in the county of Surry, near Weybridge, was formerly a royal palace, wherein Henry duke of Glouceſter, third ſon to king Charles I. was born; and had a deer-park, which in the late civil wars was by the parliamentarians laid open, and the houſe demoliſhed. In 1673 there was a brick-wall remaining, which encompaſſed ten acres; but there were then ſmall traces of the chief pile, beſides the gardener's lodge, wherein was the ſilk-worm room raiſed by King James I.'s queen. It is now a moſt magnificent building, and commands a moſt extenſive proſpect, which words cannot deſcribe. In the park there was a paddock, where Queen Elizabeth uſed to ſhoot with a croſs bow. It is now the property of his royal hignefs the Duke of York, who purchaſed it for 43,000l. of the duke of Newcaſtle, 1789.

OTFORD, in England, in the county of Kent, by the Darent, at the bottom of a hill. In 793 there was a battle at this place between the two Saxon kings, Offa of Mercia and Alrick of Kent, who was killed by Offa; and another in 1016, wherein the Daniſh king Canute was routed by King Edmund Ironſide. The ſaid Offa, to atone for the blood he had ſhed in that battle, firſt gave this place to Chriſt-church, Canterbury (as the deed ſays), *in paſcua porcorum*, "for the ſupport of the archbiſhop's hogs;" and ſo it remained in the archbiſhop's liberty, till exchanged with King Henry VIII. for other lands. There was a chantry founded at the Ryehouſe in this pariſh. The church was once a chapel to Shoreham.

OTHNIEL, in ſacred hiſtory, the ſon of Kenaz, of the tribe of Judah. We are told (Joſh. xv. 17), that Othniel was brother to Caleb: and (Judges i. 13), it is expreſsly ſaid, that

he was Caleb's younger brother. There are, however, ſome difficulties in this: for if Caleb and Othniel had been brothers, the latter could not have married his niece Achſah the daughter of Caleb. Secondly, the ſcripture never aſſigns to Caleb and Othniel the ſame father: it always names Kenaz as father to Othniel, and Jephunneh as the father of Caleb. Laſtly, Caleb muſt be much older than Othniel, ſince he gave Othniel his daughter Achſah in marriage. Thus it ſeems much better to ſuppoſe Kenaz and Jephunneh to be two brothers, and that Othniel and Caleb were couſin-germans, and in this ſenſe to be nearly related, or brothers according to the language of ſcripture. Thus Achſah being but ſecond couſin in reſpect of Othniel, he might marry her without doing any thing contrary to the letter of the law.

Caleb having received his portion in the mountains of Judah, in the midſt of a country that was poſſeſſed by giants of the race of Anak, after he had taken the city of Hebron, he advances towards Debir, otherwiſe called *Kirjath-ſepher*, and declares that he would give his daughter Achſah in marriage to him that ſhould take Kirjath-ſepher. Othniel took it, and had Achſah to wife.

After the death of Joſhua, the Iſraelites not giving themſelves the trouble to exterminate the Canaanites that were then in the land, and not having continued in their fidelity to the Lord, he delivered them over to Chuſhan-ruſhathaim king of Meſopotamia (Judges iii. 4. &c.), to whom they continued in ſubjection for eight years. Then they cried to the Lord, who raiſed them up a deliverer in the perſon of Othniel the ſon of Kenaz, who was filled with the ſpirit of God, and judged Iſrael. He came into the field, and gave battle to Chuſhan-ruſhathaim, beat him, and delivered Iſrael in the year of the world 2599; and the country was at reſt for 40 years. After this Othniel died; but the preciſe year of his death is not known.

OTHO (M. Salvius), a Roman emperor, born A. D. 32, of a family deſcended from the ancient kings of Etruria. He was among the number of Nero's favourites, and accordingly was raiſed to the higheſt offices of the ſtate, and made governor of Pannonia by the intereſt of Seneca, who wiſhed to remove him from Rome, leſt Nero's love for Poppæa ſhould prove his ruin. After Nero's death Otho conciliated the favour of Galba the new emperor; but when he did not gain his point, and when Galba refuſed to adopt him as his ſucceſſor, he reſolved to make himſelf abſolute, without any regard to the age or dignity of his friend. The great debts which he had contracted encouraged his avarice; and he procured the aſſaſſination of Galba, and made himſelf emperor. He was acknowledged by the ſenate and the Roman people; but the ſudden revolt of Vitellius in Germany rendered his ſituation very precarious, and it was mutually reſolved that their reſpective right to the empire ſhould be decided by arms. Otho obtained three victories, but in a general engagement near Brixellum his forces were defeated, and he ſtabbed himſelf when all hopes of ſucceſs had vaniſhed. This happened about the 37th year of his age, after a reign of about three months. It has been juſtly obſerved, that the laſt moments of Otho's life were thoſe of a philoſopher. He comforted his ſoldiers who lamented his misfortune, and he expreſſed his concern for their ſafety when they earneſtly ſolicited to pay him the laſt friendly offices before he ſtabbed himſelf; and he obſerved, that it was better that one man ſhould die than that all ſhould be involved in ruin on account of his obſtinacy. His nephew was much affected, and feared exceedingly the anger and haughtineſs of the conqueror; but Otho comforted him, and obſerved, that Vitellius would be kind and affectionate to the friends and relations of Otho, ſince Otho was not aſhamed to ſay, that in the time of their greateſt enmity the mother of Vitellius had received every friendly treatment from his hands. He alſo burnt the letters which, by falling into the hands of Vitellius, might provoke his reſentment againſt thoſe who had favoured the cauſe of an unfortunate general. Theſe noble and humane ſentiments in a man who was the aſſociate of Nero's ſhameful pleaſures, and who had ſtained his hand in the blood of his maſter, have appeared to ſome wonderful, and have paſſed for the features of policy, and not of a naturally virtuous and benevolent heart. His father was a favourite of Claudius.

Otho, a tribune of the people, who, in Cicero's conſulſhip, made a regulation to permit the Roman knights at public ſpectacles to have the 14 firſt rows after the ſeats of the ſenators. This was oppoſed with virulence by ſome, but Cicero ably defended it, &c.

Otho (Venius), a very celebrated Dutch painter. He was deſcended of a conſiderable family in Leyden, and was born in 1556. He was carefully educated by his parents in the belles lettres, and at the ſame time learned to deſign of Iſaac Nicholas. He was but 15 when the civil wars obliged him to leave his country. He retired to Liege, finiſhed his ſtudies, and there gave the firſt proofs of the excellence of his mind. He was well known to Cardinal Grooſbeck, who gave him letters of recommendation when he went to Rome, where he was entertained by Cardinal Maduccio. His genius was ſo active that he applied himſelf to philoſophy, poetry, mathematics, and painting, all at once. He became a great proficient in deſigning under Frederico Zuchero. He acquired an excellence in all the parts of painting, eſpecially in the knowledge of the clara obſcuro; by which means he came to be accounted one of the moſt ingenious men of his age. He lived at Rome ſeven years, during which time he performed ſeveral rare pieces; and then paſſing into Germany, was received into the ſervice of the emperor. After this the duke of Bavaria and the elector of Cologne employed him; but all the advantages he got from the courts of foreign princes could not detain him there. He had a deſire to return into the Low Countries, of which Alexander Farneſe, prince of Parma, was then governor. He drew the prince's picture, armed cap-a-pée, which confirmed his reputation in the Netherlands. After the death of that prince, Venius returned to Antwerp, where he adorned the principal churches with his paintings. The archduke Albert, who ſucceeded the prince of Parma in the government of the Low Countries, ſent for him to Bruſſels, and made him maſter of the mint; a place which occupied much of his time, yet he found ſome time for the exerciſe of his profeſſion. He drew the archduke and the infanta Iſabella's portraits at large, which were ſent to James I. of Great Britain: and, to ſhow his knowledge of polite learning likewiſe, he publiſhed ſeveral treatiſes, which he embelliſhed with cuts of his own deſigning. Louis III. made him very great offers to tempt him into his ſervice; but he would never leave his own country, ſatisfying himſelf with the character and employments he held there. He was the firſt, after Polydore Caravaggio, who reduced the claro-obſcura to a principle of the art of painting. Rubens perfected what he began, and the whole Flemiſh ſchool learned it of him. Venius died at Bruſſels, 1634, in his 78th year. He had two brothers, Gilbert, who was a graver, and Peter a painter. He had alſo the honour of breeding up the famous Rubens in his art.

OTHONNA, in botany: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked; there is almoſt no pappus; the calyx is monophyllous, multifid, and nearly cylindrical.

OTHRYADES, one of the 300 Spartans who fought againſt 300 Argives, when thoſe two nations diſputed their reſpective right to Thyreata. Two Argives, Alcinor and Cronius, and Othryades, ſurvived the battle. The Argives went home to carry the news of their victory; but Othryades, who had been rec-

koned among the number of the ſlain on account of his wounds, recovered himſelf, and carried ſome of the ſpoils of which he had ſtripped the Argives into the camp of his countrymen; and after he had raiſed a trophy, and had written with his own blood the word *vici* on his ſhield, he killed himſelf, unable or unwilling to ſurvive the death of his countrymen.

OTIS, in ornithology, a genus of birds belonging to the order of grallæ. There are four ſpecies, principally diſtinguiſhed by their colour. One of the ſpecies, the tarda, or buſtard, (See pl. 27.) is the largeſt of the Britiſh land fowl; the male at a medium weighing 25 pounds; there are inſtances of ſome very old ones weighing 27; The breadth nine feet; the length near four. Beſides the ſize and difference of colour, the male is diſtinguiſhed from the female by a tuft of feathers about five inches long on each ſide of the lower mandible. Its head and neck are aſh-coloured: the back is barred tranſverſely with black and bright ruſt colour: the greater quill-feathers are black: the belly white: the tail is marked with broad red and black bars, and conſiſts of twenty feathers: the legs duſky.

The female is about half the ſize of the male: the crown of the head is of a deep orange, traverſed with black lines; the reſt of the head is brown. The lower part of the fore-ſide of the neck is aſh-coloured: in other reſpects it reſembles the male, only the colours of the back and wings are far more dull.

Theſe birds inhabit moſt of the open countries of the ſouth and eaſt parts of this iſland, from Dorſetſhire, as far as the Wolds in Yorkſhire. They are exceeding ſhy, and difficult to be ſhot; run very faſt, and when on the wing can fly, though ſlowly, many miles without reſting. It is ſaid, that they take flight with difficulty, and are ſometimes run down with greyhounds. They keep near their old haunts, ſeldom wandering above 20 or 30 miles. Their food is corn and other vegetables, and thoſe large earth-worms that appear in great quantities on the downs before ſun-riſing in the ſummer. Theſe are replete with moiſture, anſwer the purpoſe of liquids, and enable them to live long without drinking on thoſe extenſive and dry tracts. Beſides this, nature hath given the males an admirable magazine for their ſecurity againſt drought, being a pouch whoſe entrance lies immediately under the tongue, and which is capable of holding near ſeven quarts; and this they probably fill with water, to ſupply the hen when ſitting, or the young before they can fly. Buſtards lay only two eggs of the ſize of thoſe of a gooſe, of a pale olive-brown, marked with ſpots of a dark colour; they make no neſt, only ſcrape a hole in the ground. In autumn they are (in Wiltſhire) generally found in large turnip-fields near the Downs, and in flocks of 50 or more.

OTLEY, a town of England, in the Weſt Riding of Yorkſhire, under a cliff called *Chevin*, on the ſouth ſide of the river Wherfe. The adjacent parts are reckoned the moſt delightful in England. Its church has lately been elegantly fitted up, in which are ſeveral good old monuments. The adjacent country is much improved, and from the Chevin is a moſt beautiful view of an extenſive ſcope of undeſcribed manſions. This manor was given by Athelſtan to the ſee of York, whoſe archbiſhop had a palace here, with ſeveral extenſive privileges. There is a free grammar-ſchool in this place, founded by Mr. Cave, 1611, called *Prince Henry's School*. In 1673, it ſuffered much by an inundation; which carried away ſeveral bridges, mills, &c. as well as much corn, &c.

OTODINI, ancient Britons, ſeated, as ſome ſuppoſe, to the north eaſt of the Brigantes, in the countries now called Northumberland, Merſe, and the Lothians. As the Otodini are not mentioned by any of the Roman hiſtorians, but only by Ptolemy, it is uncertain whether they formed a diſtinct independent ſtate, or were united with the Brigantes. They were, however, a conſiderable people, and poſſeſſed a long tract of the ſea-coaſt, from the river Tine to the Frith of Forth. Their name is derived by Baxter from the old Britiſh words *Ot o dineu*, which ſignify, "a highy and rocky ſhore;" deſcriptive enough of their country. They were probably reduced by Agricola at the ſame time with their more powerful neighbours the Brigantes; but as they lived without the wall of Severus, they were, like the reſt of the Mæatæ, engaged in frequent revolts. In the moſt perfect ſtate of the Roman government in this iſland, the country of the Otodini made a part of the Roman province called Valentia; which comprehended all that large tract between the two walls. As this province was never long together in the peaceable poſſeſſion of the Romans, they had but few ſtations in the country of the Otodini, except thoſe on the line of the wall of Severus.

Various authors have derived the name of this people in various ways, and it is very differently ſpelled; and various opinions ſtill ſeem to be entertained among the learned reſpecting their real ſituation: and it is even doubtful whether their country was in England or in Scotland. The celebrated Drummond of Hathornden contends for the latter.

OTRANTO, or TERRA D'OTRANTO, a province of Italy in the kingdom of Naples; bounded on the north by the Terra di Bari and by the gulph of Venice, on the eaſt by the ſame gulph, and on the ſouth and weſt by a great bay which is between that and the Baſilicata. It is a mountainous country, abounding in figs, olives, and wine. It is often viſited by locuſts, and by Algerine pirates, who carry off all the people they can catch into ſlavery. But to keep them off, there are a great many forts on the coaſts.

OTRANTO, a city of Italy, in the kingdom of Naples, and capital of the province of the ſame name, with a commodious harbour, an archbiſhop's ſee, and a ſtrong citadel where the archbiſhop reſides. Mr. Swinburne gives this account of it: "It is (ſays he) ſmall, ſtands on a hill, and contains only 3000 inhabitants. Its little harbour is not ſo bad but it might induce more people to ſettle here, as no port on the coaſt lies ſo convenient for traffic with Greece. The Adriatic gulf is here but 60 miles wide. I climbed to the top of a tower, to get a ſight of the Acroceraunian mountains; but a vapour hanging over the ſea, along the horizon, hid them from my view: in a clear morning their ſnowy tops are ſaid to be very viſible. The cathedral of Otranto is Gothic, and, according to the Puglian faſhion, has its ſubterraneous ſanctuary. The columns are of beautiful marble and granite; the pavement, a rude ſpecies of moſaic, commonly called *Saracenic*: As it is to be met with in all churches founded by the Norman kings of Sicily, the artiſts who laid it were probably Saracens, or at leaſt Greeks, their ſcholars. Theſe moſaics are compoſed of pieces of porphyry, ſerpentine, and cubes of gilt glaſs,—diſpoſed in ſtars, circles, or chequers. The compartments of the ſtalls are bordered with them; and the ſmall twiſted columns, which ſupport the pulpits and canopies, are ornamented with a ſpiral ſtripe of the ſame work. It is a pity ſo much durability, compactneſs, and beauty of materials, ſhould have been laviſhed on ſuch barbarous deſigns. Otranto was a Roman colony, as is certified by this inſcription, almoſt the only monument of antiquity left there, "*Num. Hydr.—ÆR. Caput barb. et laureat.* ΤΔΡΟΝΤΙΝΩΝ.=*Tridens, cum duobus delphinibus.*" In the tenth century it was made an archbiſhop's ſee.

In 1480, Laurence de Medici, to deliver himſelf from the attacks of the king of Naples, perſuaded Mahomet II. to invade the realm; and Otranto was the unfortunate place where the Turks landed. It was inveſted, ſtormed, and pillaged. Its prelate was ſlain at the door of his church; 800 principal citizens dragged out of the gates and butchered; their bodies left twelve months unburied, till the duke of Calabria retook the city, and committed them to hallowed earth. About 100 years after, a devout perſon affirmed, that theſe bones had appeared to him in a dream; and, upon the ſtrength of his viſion, they became,

for the vulgar, objects of almoſt equal veneration with the relics of the primitive martyrs."

OTRICOLI, a ſmall town of Italy, in the eccleſiaſtic ſtate, and in the duchy of Spoleto, in E. lon. 13. 15. N. lat. 42. 25. ſituated on a riſing ground on the frontiers of the patrimony of St. Peter. From this town is ſeen a fine plain, and ſome of the windings of the famous river Tiber. The ruins that are ſcattered here and there at the entrance of the plain, deſcending from Otricoli, are thought to be the remains of the ancient Otriculum; they conſiſt of ſome ſhapeleſs fragments of columns, cornices, and other pieces of marble. In the middle of the great ſtreet of Otricoli, there is a marble pedeſtal, upon which you ſee an inſcription, ſhowing they had erected a ſtatue to Julia Lucilla, who had built public baths at Otricoli at her own expence.

OTTER, in zoology. See MUSTELA.

OTTER *of Roſes*. See ROSES.

OTTERBURN, in England, in the county of Northumberland, near Elleſdon. It was the field of battle between the Engliſh and Scots in 1388, wherein Henry Piercy, called *Hotſpur* was taken priſoner, and Douglas the Scotch general was killed. On this battle was founded the delightful old ballad of Chevy chaſe; the village being ſituated by the river Rhead, on the ſouth ſide of the Cheviot hills. The entrenchments are ſtill viſible; and a number of tumuli ſcattered over the adjacent ground mark to future ages the ſlaughter made there.

OTTERY, ST. MARY'S, a market town in Devonſhire, ſituated 159 miles weſt of London, and 10 miles eaſt of Exeter. Its market is on Tueſdays, and it has two fairs. The church is very ancient, and ſomewhat reſembles a cathedral. A very extenſive woollen manufactory was eſtabliſhed here by Sir George Yonge and Sir John Duntze, barts. It has no corporation. It derived its name, as ſome ſuppoſe, from the river Otter, and that from the Otters formerly found in it. This town was given by king Edward the Confeſſor to the church of St. Mary at Rouen in Normandy; but was afterwards bought by Grandiſon biſhop of Exeter; who made of it a quarter college in 10 Edward III. and therein placed ſecular prieſts, with other miniſters, to whom he gave the whole manor, pariſh, tythes, fines, ſpiritual profits, &c. which amounted to 30*l.* 2*s.* 10*d.* yearly.

OTWAY (THOMAS), an eminent tragic poet, was the ſon of Mr Humphry Otway, rector of Wolbeding in Suſſex; and was born at Trottin in that county on the 3d of March 1651. He was educated at Oxford; when, leaving the univerſity without a degree, he retired to London, where he commenced player, but with indifferent ſucceſs. However, the ſprightlineſs of his converſation gained him the favour of Charles Fitz-Charles earl of Plymouth, who procured him a cornet's commiſſion in one of the new-raiſed regiments ſent into Flanders; but he returned from thence in very neceſſitous circumſtances, and applied himſelf again to writing for the ſtage. In comedy he has been deemed too licentious; which, however, was no great objection to his pieces in the profligate days of Charles II. But, in tragedy, few Engliſh poets have ever equalled him; and perhaps none ever excelled him in touching the paſſions, particularly the tender paſſion. There is generally ſomething familiar and domeſtic in the fable of his tragedies, and there is amazing energy in his expreſſion.—The heart that doth not melt at the diſtreſſes of his Orphan muſt be hard indeed! But though Otway poſſeſſed in ſo eminent a degree the rare talent of writing to the heart, yet he was not very favourably regarded by ſome of his cotemporary poets, nor was he always ſucceſsful in his dramatic compoſitions. After experiencing many reverſes of fortune in regard to his circumſtances, but generally changing for the worſe, he at laſt died wretchedly in a public houſe on Tower-hill; whither, it is ſuppoſed, he had retired, in order to avoid the preſſure of his creditors. Some have ſaid, that downright hunger compelling him to fall too eagerly on a piece of bread, of which he had been for ſome time in want, the firſt mouthful choaked him, and inſtantly put a period to his days. Dr. Johnſon gives this account of the matter: "He died in a manner which I am unwilling to mention. Having been compelled by his neceſſities to contract debts, and hunted, as is ſuppoſed, by the terriers of the law, he retired to a public-houſe on Tower-hill, where he died of want; or, as it is related by one of his biographers, by ſwallowing, after a long faſt, a piece of bread which charity had ſupplied. He went out, as is reported, almoſt naked, in the rage of hunger, and finding a gentleman in a neighbouring coffee-houſe, aſked him for a ſhilling. The gentleman gave him a guinea; and Otway going away bought a roll, and was choaked with the firſt mouthful. All this, I hope, is not true; but that indigence, and its concomitants ſorrow and deſpondency, brought him to the grave, has never been denied."

Johnſon ſpeaks of him in nearly theſe terms: Otway had not much cultivated verſification, nor much repleniſhed his mind with general knowledge. His principal power was in moving the paſſions, to which Dryden in his latter years left an illuſtrious teſtimony. He appears, by ſome of his verſes, to have been a zealous royaliſt; and had what was in thoſe times the common reward of loyalty; he lived and died neglected.—His dramatic writings are nine in number; the moſt admired of which are, *The Orphan* and *Venice Preſerved*. He had alſo made ſome tranſlations, and wrote ſeveral miſcellaneous poems. His whole works are printed in two pocket-volumes. He wrote four acts of a play which are loſt.

OVAL, an oblong curvilinear figure, otherwiſe called *ellipſis*. (See ELLIPSIS). However, the proper oval, or egg ſhape, differs conſiderably from that of the ellipſis, being an irregular figure, narrower at one end than at another: whereas the ellipſis, or mathematical oval, is equally broad at each end: though it muſt be owned, theſe two are commonly confounded together; even geometricians calling the oval a *falſe ellipſis*.

OVARY, in anatomy, that part of a female animal wherein the ova or eggs are formed or lodged. See ANATOMY.

OVARIUM, in botany a name by which botaniſts who are fond of aſſimilating the animal and vegetable kingdoms have diſtinguiſhed the germen or ſeed-bud, as containing the rudiments of the future ſeed.

OVATION, in the Roman antiquity, a leſſer triumph, allowed to commanders for victories won without the effuſion of blood; or for defeating a mean and inconſiderable enemy. The ſhow generally began at the Albanian mountain, whence the general with his retinue made his entry into the city on foot, with many flutes or pipes ſounding in concert as he paſſed along, and wearing a garland of myrtle as a token of peace. The term *ovation*, according to Servius, is derived from *ovis*, a "ſheep;" becauſe on this occaſion the conqueror ſacrificed a ſheep, as in triumph he ſacrificed a bull. The ſenate, knights, and principal plebeians, aſſiſted at the proceſſion; which concluded at the Capitol, where rams were ſacrificed to Jupiter. The firſt ovation was granted to Publius Poſthumius the conſul for his victory over the Sabines in the 253d year of Rome.

OUDENARDE, a rich and ſtrong town of the Auſtrian Netherlands, in the province of Flanders, in E. lon. 3. 30. N. lat. 50. 54. fifteen miles ſouth of Ghent, and eighteen from Tournay. It is a large well fortified town, having a very conſiderable fort in the middle of it, ſituated on the river Scheldt, which divides it into two parts. It is almoſt encompaſſed by meadows, only there is a hill which commands it on the ſouth ſide. The buildings are pretty good, and the ſtreets wide and handſome. The market place is adorned with a beautiful town-houſe, and a fine large fountain. There are ſeveral good churches and monaſteries well worthy of the notice of travellers. The town has a very flouriſhing trade in fine

linen and tapeſtry, and is the capital of a caſtellany, which contains 33 villages.

OUDRI (Jean Baptiste), a painter, was born at Paris, and died there May 1, 1755, aged about 74. He acquired the principles of his art under the celebrated Largillieres; and from this maſter he had thoſe ſure principles of colouring which he communicated at a meeting of the academy of painting, of which he was a member, and one of the profeſſors. Oudri's ſuperior talent for painting animals is well known: his compoſitions of this kind are full of truth, and are admirably handled. The Fables of La Fontaine have been engraved in 4 vols. folio from his etchings; but thoſe who finiſhed them poſſeſſed not equal abilities. He painted ſeveral hunting-pieces for the king, which adorn ſome of the royal caſtles, among others that of La Meute. Oudri was ſo well acquainted with the magic of his art, that he frequently pleaſed himſelf with painting white objects on white grounds; and theſe pictures have a good effect. He would likewiſe have ſucceeded in hiſtory-painting, as we may eaſily infer from ſeveral pieces which do him honour. He ſuperintended the manufactory of Beauvais, where pieces of tapeſtry were produced equally brilliant with the pictures which had ſerved for their model. The king gave him a penſion, and apartments in the Louvre.

OVERALL (John), a celebrated Engliſh biſhop, was born in 1559; and, after a proper foundation in grammar learning, was ſent to St. John's College, Cambridge, and was elected a ſcholar of that ſociety: but afterwards removing to Trinity, was choſen fellow of that college. In 1596 he was made regius profeſſor of divinity, when he took the degree of D. D. and about the ſame time was elected maſter of Catherine-hall. In 1601 he was raiſed to the deanry of St. Paul's, London, by the recommendation of his patron Sir Fulk Greville, and queen Elizabeth; and in the beginning of king James's reign, he was choſen prolocutor of the lower houſe of convocation. In 1612 he was appointed one of the firſt governors of the Charter-houſe hoſpital, then juſt founded by Thomas Sutton, Eſq. In April 1614 he was made biſhop of Litchfield and Coventry; and in 1618 he was tranſlated to Norwich, where he died in May 1619, aged, as it is reported, 60 years. He was buried in that cathedral, where he lay unnoticed and forgotten till ſome time after the reſtoration of Charles II. when Coſin, biſhop of Durham, who had been his ſecretary, erected a monument in 1669, with a Latin inſcription, in which he is ſaid to be, "Vir undequaque doctiſſimus, et omni encomio major."

Wood obſerves, that he had the character of being the beſt ſcholaſtic divine in England; and Coſin, who perhaps may be thought to rival him in that ſort of learning, calls himſelf his ſcholar, and abſolutely ſays that he derived all his knowledge from him. He is alſo celebrated by Smith for his diſtinguiſhed wiſdom, erudition, and piety. In the controverſy which in his time divided the reformed churches about predeſtination and grace, he held a middle opinion, inclining perhaps to Arminianiſm. He ſeems indeed to have paved the way for the reception of that doctrine in England, where it was generally embraced a few years afterwards, chiefly by the authority and influence of Archbiſhop Laud. Overall cultivated a particular friendſhip with Gerard Voſſius and Grotius; and was much grieved to ſee the love of peace, and the projects of this laſt great man to obtain it, ſo ill repaid. He laboured heartily himſelf to ſettle the differences in Holland, upon what is known by the name of the *Quinquarticular controverſy*; as appears in part by his letters to the two learned correſpondents juſt mentioned, ſome of which are printed in the *Epiſtolæ præſtantium virorum*, &c.

The biſhop is known in England chiefly by his *Convocation Book*, of which Biſhop Burnet gives the following account: "This book was wrote on the ſubject of government, the divine inſtitution of which was very poſitively aſſerted. It was read in convocation, and paſſed by that body, in order to the publiſhing of it; in oppoſition to the principles laid down in the famous book of Parſons the Jeſuit, publiſhed under the name of *Doleman*. But King James did not like a convocation entering into ſuch a theory of politics; ſo he diſcouraged the printing of it eſpecially ſince, in order to juſtify the owning of the United Provinces, who had lately thrown off the Spaniſh yoke, to be a lawful government, it was laid down, that when a change of government was brought to a thorough ſettlement, it was then to be owned and ſubmitted to as a work of the providence of God. Here it ſlept, till Archbiſhop Sancroft, who had got the book into his own hands, and not obſerving the laſt-mentioned paſſage in it, reſolved to publiſh it in the beginning of King William's reign, as an authentic declaration the church of England had made in the point of non-reſiſtance. Accordingly it was publiſhed in 4to, as well as licenſed by him, a very few days before he was under ſuſpenſion for not taking the oaths."

OVERBURY (Sir Thomas), a learned and worthy Engliſh gentleman, was born in 1581; and ſtudied at Queen's College, Oxford, after which he removed to the Middle-Temple, London. He afterwards travelled for ſome time, and returned a moſt accompliſhed perſon; when he contracted an intimate acquaintance with Sir Robert Carr, knight of the bath, who being ſoon after taken into his majeſty's favour, had Mr. Overbury knighted at Greenwich. Sir Thomas perceiving the familiarity which ſubſiſted between his patron Carr, now made viſcount Rocheſter, and the lady Frances, the wife of Robert earl of Eſſex, was ſo much diſpleaſed at it, that he endeavoured to diſſuade him from keeping her company, and from proceeding in the baſe deſign he had formed of having her firſt divorced from her huſband, and then marrying her. The viſcount, reſenting this honeſt advice, told what he had ſaid to the lady, who was as remarkable for her wickedneſs as for her beauty; on which they immediately reſolved on his deſtruction. About this time, the king wanting to ſend an ambaſſador abroad, the viſcount recommended Sir Thomas Overbury. His majeſty approving the choice, the viſcount imparted the king's intentions to Sir Thomas; but, under a treacherous ſhow of friendſhip, diſſuaded him from accepting of that employment, as it might hinder him from a better way of advancement; promiſing that he would prevent his majeſty from being diſpleaſed at his refuſal. The viſcount then went to the king, and artfully incenſing his majeſty againſt Sir Thomas for refuſing to obey his commands, that gentleman was committed to the Tower for his contempt, on the 21ſt of April 1613, where he continued till he was diſpatched by poiſon on the 15th of September following, and his body was interred in the Tower-chapel the ſame day. About two years after, the whole contrivance of his death was diſcovered. On this ſeveral perſons were condemned and executed; but though Carr, earl of Somerſet, and the lady Frances his counteſs, were condemned to death for contriving the murder, and hiring the perſons who were concerned in it, the king only baniſhed them from court, and afterwards pardoned them. Sir Thomas Overbury wrote ſeveral poems, &c. and an account of his travels.

His character is repreſented by an hiſtorian of thoſe times; who, after relating the occaſion and circumſtances of his death, proceeds in the following terms: "In this manner fell Sir Thomas Overbury, worthy of a longer life and a better fate; and, if I may compare private men with princes, like Germanicus Cæſar, both by poiſon procured by the malice of a woman, both about the 33d year of their age, and both celebrated for their ſkill and judgment in poetry, their learning, and their wiſdom. Overbury was a gentleman of an ancient family, but

had ſome blemiſhes charged upon his character, either through a too great ambition, or the inſolence of a haughty temper.—After the return from his travels, the viſcount Rocheſter embraced him with ſo entire a friendſhip, that, exerciſing by his majeſty's ſpecial favour the office of ſecretary proviſionally, he not only communicated to Sir Thomas the ſecrets, but many times gave him the packets and letters unopened before they had been peruſed by the king himſelf: which, as it prevailed too much upon his early years, ſo as to make him, in the opinion of ſome, thought high and ambitious; yet he was ſo far from violating his truſt and confidence, that he remains now one example among others who have ſuffered in their perſons or their fortunes for a freedom of advice, which none but ſincere friends will give, and which many are ſuch ill friends to themſelves as not to receive."

OVEN, a kind of domeſtic furnace, uſed for baking bread, pies, tarts, &c. of a circular ſtructure, with a very low roof, well lined, both on the top, bottom, and ſides, with ſtone; it has a ſmall entrance in the front, which is exactly fitted by a kind of door, which being clapped to the mouth of the oven confines the heat, while bread, pies, or puddings, are baking. Over this, paſtry-cooks, &c. have another oven built much in the ſame manner, which is uſed for ſuch things as require a leſs degree of heat. Ovens are heated by burning dry wood, faggots, &c. in them, till all the parts are equally hot.

OVER HAULING, the act of opening and extending the ſeveral parts of a tackle, or other aſſemblage of ropes, communicating with blocks or dead eyes. It is uſed to remove thoſe blocks to a ſufficient diſtance from each other, that they may be again placed in a ſtate of action, ſo as to produce the effect required.

OVER-*Hauling*, is alſo vulgarly expreſſed of an examination or inſpection into the condition of a perſon or thing.

OVER-*Rake*, among ſeamen: When a ſhip riding at anchor ſo overbeats herſelf into an high ſea, that ſhe is waſhed by the waves breaking in upon her, they ſay the waves over-rake her.

OVERT, the ſame with OPEN: Thus an overt act ſignifies an act which, in law, muſt be clearly proved; and ſuch is to be alleged in every indictment for high treaſon.

OVERTURE, or OUVERTURE, opening or preluding: a term uſed for the ſolemnities at the beginning of a public act or ceremony; an opera, tragedy, comedy, concert of muſic, &c.—The overture of the theatre or ſcene, is a piece of muſic uſually ending with a fugue: the overture of a jubilee is a general proceſſion, &c.

OVERYSSEL, ſo named from its ſituation beyond the river Yſſel, one of the Seven United Provinces; bounded on the eaſt by the biſhopric of Munſter, on the north by Frieſland and the territory of Groningen, on the weſt by the river Yſſel, and on the ſouth by the county of Zutphen and the biſhopric of Munſter. It is divided into three diſtinct parts; which are the territories of Drenſe, Twente, and Salland. There are many moraſſes in this province, and but few inhabitants, in compariſon of the reſt. Its greateſt riches conſiſt in turfs; which are dug up here, and ſent to the neighbouring provinces, particularly Holland. It extends near 60 miles in length from north to ſouth, and 40 in breadth from eaſt to weſt. The whole country is low and marſhy; but it produces a tolerable quantity of corn. It was formerly a dependence of the biſhopric of Utrecht, before Henry of Bavaria, biſhop of that ſee, transferred the ſovereignty of it to the emperor Charles V.

OVIEDA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants: and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquefid; the tube of the corolla almoſt cylindrical above, and very long; the berry globoſe and diſpermous.

OVIEDO, a town of Spain, and capital of Aſturias d'Oviedo, with a biſhop's ſee, and an univerſity; ſeated at the confluence of the rivers Ove and Deva, which form the Aſta, 50 miles north-weſt of Leon, and 208 north-weſt of Madrid. W. lon. 5. 47. N. lat. 43. 23.

OUGHTRED (WILLIAM), an eminent mathematician, was born at Eton in 1573, and educated in the ſchool there, whence he was elected to King's college in Cambridge, of which he afterwards became fellow. Being admitted to holy orders, he left the univerſity about the year 1603, and was preſented to the rectory of Aldbury, near Guildford in Surry; and about the year 1628 was appointed by the earl of Arundel to inſtruct his ſon in the mathematics. He kept a correſpondence by letters with ſome of the moſt eminent ſcholars of his time, upon mathematical ſubjects; and the moſt celebrated mathematicians of that age owed moſt of their ſkill to him, whoſe houſe was full of young gentlemen that came from all parts to receive his inſtruction. It is ſaid, that, upon hearing the news of the vote at Weſtminſter for the reſtoration of King Charles II. he expired in a ſudden tranſport of joy, aged 88. He wrote, 1. *Clavis Mathematica*; which was afterwards publiſhed in Engliſh. 2 A deſcription of the double horizontal dial. 3. *Opuſcula Mathematica*; and ſeveral other works. He left alſo behind him a great number of papers upon mathematical ſubjects, which are now in the muſeum of William Jones, Eſq. F. R. S.

David Lloyd, in his Memoirs, has given the following ſhort character of him: "That he was as facetious in Greek and Latin, as ſolid in arithmetic, geometry and the ſphere of all meaſures, muſic, &c. exact in his ſtyle as in his judgment; handling his tube and other inſtruments at 80 as ſteadily as others did at 30; owing this, as he ſaid, to temperance and archery; principling his people with plain and ſolid truths, as he did the world with great and uſeful arts; advancing new inventions in all things but religion, which, in its old order and decency, he maintained ſecure in his privacy, prudence, meekneſs, ſimplicity, reſolution, patience, and contentment."—He had one ſon, whom he put an apprentice to a watchmaker, and wrote a book of inſtructions in that art for his uſe.

OVID, or *Publius* OVIDIUS *Naſo*, a celebrated Latin poet of the Auguſtan age, was a Roman knight, born at Sulmo, in the 43d year before the Chriſtian era. He ſtudied rhetoric under Aurelius Fuſcus, and for ſome time frequented the bar. His progreſs in the ſtudy of eloquence was great, but the father's expectations were fruſtrated, his ſon was born a poet, and nothing could deter him from purſuing his natural inclination to write poetry, though he was often reminded that Homer lived and died in the greateſt poverty. Every thing he wrote was expreſſed in poetical numbers, as he himſelf ſays, *Et quod tentabam ſcribere verſus erat*. A lively genius and a fertile imagination ſoon gained him admirers: the learned became his friends: Virgil, Propertius, Tibullus, and Horace, honoured him with their correſpondence, and Auguſtus patronized him with the moſt unbounded liberality. Theſe favours, however, were but momentary; for after having obtained the eſteem of Auguſtus, he incurred his diſpleaſure, and was baniſhed to Tomos, a city on the Pontus Euxinus, near the mouth of the Danube, when he was 50 years of age. The true cauſe of this ſudden exile is unknown. Some attribute it to a ſhameful amour with Livia the wife of Auguſtus, while others ſuppoſe that it aroſe from the knowledge which Ovid had of the unpardonable inceſt of the emperor with his daughter Julia. Theſe reaſons are indeed merely conjectural; the cauſe was of a very private and very ſecret nature, of which Ovid himſelf is afraid to ſpeak. It was, however, ſomething improper in the family and court of Auguſtus, as theſe lines ſeem to indicate:

Cur aliquid vidi? Cur noxia lumina feci?
Cur imprudenti cognita culpa mihi eſt?

Inſcius Actæon vidit ſine veſte Dianam,
Præda fuit canibus non minus ille ſuis.

Again,

Inſciæ quod crimen viderunt lumina plector,
Peccatumque oculus eſt habuiſſe meum.

And in another place,

Perdiderunt cum me duo crimina, carmen & error,
Alterius facti culpa ſilenda mihi eſt.

In his baniſhment, Ovid betrayed his puſillanimity in a great degree; and however affected and diſtreſſed his ſituation was, yet the flattery and impatience which he ſhowed in his writings are a diſgrace to his pen, and lay him more open to ridicule than to pity. Though he proſtituted his pen and his time to adulation, yet the emperor proved deaf to all intreaties, and refuſed to liſten to his moſt ardent friends at Rome who wiſhed for his return. Ovid, who really wiſhed for a Brutus to deliver Rome of her tyrannical Auguſtus, ſtill continued his flattery even to meaneſs; and when the emperor died, he was ſo mercenary as to conſecrate a ſmall temple to the departed tyrant on the ſhore of the Euxine, where he regularly offered frankincenſe every morning. Tiberius proved as regardleſs as his predeceſſor to the intreaties which were made for the poet, and he died in the ſeventh or eighth year of his baniſhment, in the 57th year of his age. He was buried at Tomos. In the year 1508 of the Chriſtian era, the following epitaph was diſcovered at Stain, in the modern kingdom of Auſtria.

Hic ſitus eſt vates quem Divi Cæſaris ira
Auguſti patria cedere juſſit humo.
Sæpe miſer voluit patriis occumbere terris,
Sed fruſtra! Hunc illi fata dedere locum.

This, however, is an impoſition to render celebrated an obſcure corner of the world, which never contained the bones of Ovid. The greateſt part of his poems are remaining. His *Metamorphoſes*, in 15 books, are extremely curious, on account of the great variety of mythological facts and traditions which they relate, but they can have no claim to epic honours. In compoſing this the poet was more indebted to the then exiſting traditions, and to the theogony of the ancients, than the powers of his own imagination. His *Faſti* were divided into twelve books, like the conſtellations in the zodiac, but of theſe ſix are loſt; and the learned world have reaſon to lament the loſs of a poem which muſt have thrown ſo much light upon the religious rites and ceremonies, feſtivals and ſacrifices, of the ancient Romans, as we may judge from the ſix that have ſurvived the ravages of time and barbarity. His *Triſtia*, which are divided into five books, contain much elegance and ſoftneſs of expreſſion; as alſo his *Elegies* on different ſubjects. The *Heroides* are nervous, ſpirited, and diffuſe; the poetry is excellent, the language varied, but the expreſſions are often too wanton and indelicate, a fault which is very common with him. His three books *Amorum*, and the ſame number *de Arte Amandi*, with the other *de Remedio Amoris*, are written with peculiar elegance, and contain many flowery deſcriptions; but the doctrine which they hold forth is dangerous, and they are to be read with caution, as they ſeem to be calculated to corrupt the heart, and to ſap the very foundations of virtue and morality. His *Ibis*, which is written in imitation of a poem of Callimachus of the ſame name, is a ſatyrical performance. Beſides theſe, there are extant ſome fragments of other poems, and among theſe part of a tragedy called *Medea*. The talents of Ovid as a dramatic writer have been diſputed, and ſome have remarked that he who is ſo often void of ſentiment was not born to ſhine as a tragedian. He has attempted, perhaps, too many ſorts of poetry at once. On whatever he has written, he has totally exhauſted the ſubject. He everywhere paints nature with a maſterly hand, and adds ſtrength even to vulgar expreſſions. It has been judiciouſly obſerved, that his poetry after his baniſhment from Rome was deſtitute of that ſpirit and vivacity which we admire in thoſe which were written before. His *Faſti* are perhaps the beſt written of all his poems; and after them we may fairly rank his love verſes, his *Heroides*, and after all his *Metamorphoſes*, which were not totally finiſhed when Auguſtus baniſhed him. His *Epiſtles from Pontus* are the language of a weak and ſordid flatterer. However critics may have cauſe to cenſure the indelicacy and inaccuracies of Ovid, it is to be acknowledged that his poetry contains great ſweetneſs and elegance, and like that of Tibullus charms the ear, and captivates the mind.—Another perſon of the name of Ovid accompanied his friend Cæſonius, when baniſhed from Rome by Nero.

OVIEDO (John Gonsalvez de), born at Madrid about the year 1478, was educated among the pages of Ferdinand king of Arragon and Iſabella queen of Caſtile: and happened to be at Barcelona in 1493, when Chriſtopher Columbus returned from his firſt voyage to the iſland Haiti, which he called Hiſpaniola, and which now goes by the name of St. Domingo. He formed an intimate acquaintance with Columbus and his companions, and was at pains to inform himſelf of every thing relating to the new diſcoveries. He rendered ſuch eſſential ſervice to Spain during the war of Naples, that Ferdinand determined to ſend him to the of iſland Haiti, as intendant and inſpector general of the trade of the New World. The ravages which the venereal diſeaſe had made during that war, induced him to inquire into what were the moſt efficacious remedies for this malady, which was ſuppoſed to have come from the Weſt Indies. His inquiries were extended to every thing which regards the natural hiſtory of theſe regions; and on his return to Spain, he publiſhed *Summario de la Hiſtoria general y natural de las Indias Occidentales*, which he dedicated to Charles V. He afterwards made ſome additions to this work, which he publiſhed under the title of *La Hiſtoria general y natural de las Indias Occidentales*; Salamanca, 1535, folio. It was tranſlated into Italian, and afterwards into French; Paris, 1556, folio. In this work, Oviedo ſays that the French pox is endemical in the iſland of Haiti, and that it has paſſed from thence into Europe. He greatly extols the uſe of the wood of guiacum for the cure of this diſeaſe; but whether the diſeaſe is now become more obſtinate, or the remedy does not poſſeſs that efficacy which has been aſcribed to it, it is at preſent in little eſtimation.

OVILIA, or Septa, in ancient Rome, a place in the Campus Martius, at firſt railed in like a ſheep-pen, whence its name. Afterwards it was mounted with marble, and beautified with walks and galleries, as alſo with a tribunal, or ſeat of juſtice. Within this precinct or incloſure, the people were called to give their ſuffrages for the election of magiſtrates. The aſcent into the Ovilia was not by ſtairs, but by pontes, or narrow boards, laid there for the occaſion; on which account *de ponte dejici*, ſignified "to be deprived of the privilege of voting;" and perſons thus dealt with were called *depontani*.

OVIPAROUS, a term applyed to ſuch animals as bring forth their young from eggs; as birds, inſects, &c.

OVIS, the Sheep, in zoology, a genus of the mamalia claſs, and of the order of Pecora; the characters of which are theſe: The horns are concave, turned backwards, and full of wrinkles; there are eight fore teeth in the under-jaw, and no dog teeth. The wool of theſe animals is only a congeries of very long and ſlender hairs, oddly twiſted and contorted, and variouſly interwoven with one another. This, as far as is yet known, is a clothing peculiar to the ſheep kind, no other animal having been ſeen to poſſeſs it. It is not, however, the clothing of all the ſpecies of ſheep, ſome that are found in diſtant nations having ſhort hair like that of the goat.

Linnæus enumerates three ſpecies, which are perhaps only

varieties, viz. 1. The *ovis aries*, or ram ſheep, the horns of which are ſhaped like a half moon, and compreſſed. 2. The *ovis Guineenſis*, or Guinea ſheep, which has pendulous ears, lax hairy dewlaps, and a prominence on the hind part of the head. The wool is ſhort like that of a goat. It is, as its name imports, a native of Guinea. And, 3. The *ovis ſtrepſiceros*, or Cretain ſheep, which has ſtrait cariated horns, twiſted in a ſpiral manner, and is a native of Mount Iola. According to Mr. Pennant, the laſt two are to be reckoned only varieties. See plates 21 and 22.

The ſheep, unqueſtionably a mild and gentle creature, is alſo repreſented by Buffon as the moſt ſtupid, defenceleſs, and timid of all quadrupeds; inſomuch that, without the aſſiſtance of man, it could never, he thinks, have ſubſiſted or continued its ſpecies in a wild ſtate. "The female (ſays he) is abſolutely devoid of every art and of every mean of defence. The arms of the ram are feeble and aukward. His courage is only a kind of petulance, which is uſeleſs to himſelf, incommodious to his neighbours, and is totally deſtroyed by caſtration. The wedder is ſtill more timid than the ram. It is fear alone that makes ſheep ſo frequently aſſemble in troops: upon the ſmalleſt unuſual noiſe, they run cloſe together; and theſe alarms are always accompanied with the greateſt ſtupidity. They know not how to fly from danger, and ſeem not even to be conſcious of the hazard and inconvenience of their ſituation. Wherever they are, there they remain obſtinately fixed; and neither rain nor ſnow can make them quit their ſtation. To force them to move or to change their rout, they muſt be provided with a chief, who is taught to begin the march: the motions of this chief are followed, ſtep by ſtep, by the reſt of the ſtock. But the chief himſelf would alſo continue immoveable, if he were not puſhed off by the ſhepherd, or by his dog, an animal which perpetually watches over their ſafety, which defends, directs, ſeparates, aſſembles, and, in a word, communicates to them every movement neceſſary to their preſervation.

"Of all quadrupeds, therefore, ſheep are the moſt ſtupid, and derive the ſmalleſt reſources from inſtinct. The goat, who ſo greatly reſembles the ſheep in other reſpects, is endowed with much more ſagacity. He knows how to conduct himſelf on every emergency: he avoids danger with dexterity, and is eaſily reconciled to new objects. But the ſheep knows neither how to fly nor to attack: however eminent her danger, ſhe comes not to man for aſſiſtance ſo willingly as the goat: and, to complete the picture of timidy and want of ſentiment, ſhe allows her lamb to be carried off, without attempting to defend it, or ſhowing any marks of reſentment. Her grief is not even expreſſed by any cry different from that of ordinary bleating."

The annotator upon this article in the Edinburgh tranſlation of Buffon, denies the above to be the natural character of the animal. "All tame animals (he obſerves) loſe a portion of that ſagacity, dexterity, and courage, which they are obliged to employ againſt their enemies in a wild ſtate; becauſe they have been long accuſtomed to rely upon the protection of man. Sheep, when enſlaved by men, tremble at the voice of the ſhepherd or his dog. But, on thoſe extenſive mountains where they are allowed to range without controul, and where they ſeldom depend on the aid of the ſhepherd, they aſſume a very different mode of behaviour. In this ſituation, a ram or a wedder boldly attacks a ſingle dog, and often comes off victorious. But when the danger is of a more alarming nature, like man, they truſt not to the proweſs of individuals, but have recourſe to the collected ſtrength of the whole flock. On ſuch occaſions, they draw up into one compact body; they place the young and the females in the centre; and the ſtrongeſt males take the foremoſt ranks, keeping cloſe by each others ſides. Thus an armed front is preſented on all quarters, which cannot be attacked without the greateſt hazard of deſtruction. In this manner, they wait, with firmneſs and intrepidity, the approach of the enemy. Nor does their courage fail them in the moment of attack. For, if the aggreſſor advances within a few yards of the line, the ram darts upon him with ſuch impetuoſity, as lays him dead at their feet, unleſs he ſaves himſelf by flight. Againſt the attacks of ſingle dogs, or foxes, they are, when in this ſituation, perfectly ſecure. Beſides, a ram, regardleſs of danger, often engages a bull, and never fails to conquer him; for the bull, by lowering his head, without being ſenſible of his defenceleſs condition, receives between his horns the ſtroke of the ram, which uſually brings him to the ground.

"In the ſelection of food, few animals diſcover greater ſagacity than the ſheep; nor does any domeſtic animal ſhow more dexterity and cunning in its attempts to elude the vigilance of the ſhepherd, and to ſteal ſuch delicacies as are agreeable to its palate. When perfectly tamed, and rendered domeſtic, the ſportive gambols and troubleſome tricks of the animal, are too well known to require any deſcription."

As to the accuſations contained in the latter part of the character above quoted, every perſon, it is obſerved, who has attended to thoſe animals, at leaſt in this country, muſt know that they are not altogether juſt. "Individuals, in a ſtate of ſubjection, ſeem to have no idea of reſiſting the attacks of an enemy. But they ſoon learn that their protection lies in the ſhepherd or his dog: for, when it becomes neceſſary, in Britain, to watch the folds, in order to prevent aſſaults from foxes or dogs, upon the firſt alarm the whole flock run with violence to the place where the watchmen are ſtationed; ſo that, when they chance to ſleep, they are often hurt by the ſheep trampling upon them. On other occaſions, they never chooſe to make a very cloſe approach either to men or dogs; but the ſenſe of immediate danger makes them forget their uſual timidity, and their ſagacity teaches them where their ſafety lies. When the female is robbed of her lamb, ſhe bleats in a manner that ſtrongly marks the anguiſh ſhe feels. In the eagerneſs of her ſearch, her eye-balls ſeem to ſtart from their ſockets; and her irregular and diſtracted motions, joined to the violence and conſtancy of her bleatings, are evident indications of the moſt pungent grief."

"Theſe animals (continues the Count in the ſame captious ſtyle as before), ſo ſimple and dull in their intellect, are likewiſe very feeble in their conſtitution. They cannot continue long in motion. Travelling weakens and extenuates them: When they run, they pant, and ſoon loſe their breath. The ardour of the ſun is equally incommodious to them as moiſture, froſt, and ſnow. They are ſubject to many diſeaſes, moſt of which are contagious. A redundancy of fat often kills them; and always renders the ewes barren. They bring forth with difficulty; frequently miſcarry, and require more care than any other domeſtic animal." To which the annotator anſwers; "This is unqueſtionably another exaggeration. The ſheep, when nearly in a wild ſtate, is a robuſt, active animal, and capable of enduring much fatigue without injury. But, when immerſed in luxury, and pampered in rich paſtures, like creatures of a higher nature, the ſheep becomes overloaded with fat, and contracts diſeaſes which are not natural to him: beſides, no tamed animal requires or receives leſs aſſiſtance in bringing forth its young, for in thoſe parts of Britain where the beſt ſheep are bred, they are never houſed, nor, during the lambing ſeaſon, have any thing adminiſtered to them but their ordinary paſture. When in health, ſheep have no occaſion for water: in our northern climates, it is even injurious to them."

On the whole, many of Buffon's obſervations and aſſertions on this article appear to be haſty, and, we preſume, very ill founded. Reſpecting ſheep, the learned Count ſeems to have been ſtrangely miſinformed, or groſsly prejudiced. We eſteem

him as a great and an ingenious man, but we do not think that the celebrity of a name can add ſtrength to weakneſs, or make that be taken for granted on a bare aſſertion which wants proof, or which is contrary to experience, the boaſted guide of modern philoſophers. The *objections* and *accuſations* of this great naturaliſt are well obviated by his learned tranſlator. The great error of Buffon ſeems to lie in his conſidering ſheep in a domeſtic ſtate, and as they exiſt among us, without any reference to them in a ſtate of nature, and without ſuppoſing or allowing their exiſtence in ſuch a ſtate. That he was wrong in this reſpect, a very little reflection will convince us; and indeed his tranſlator has ſhown it in a very ample manner, by recurring to facts, which is the only legitimate way of reaſoning upon this or any ſubject of this nature. To ſet this matter in a ſtill ſtronger point of view, however, we ſhall give the following account of the Siberian *argali*, or wild ſheep, as it appeared in the 16th volume of a periodical work intitled *the Bee*; being extracted from the works of the celebrated naturaliſt Dr. Pallas.

This accurate obſerver "found the *ovis fera*, or wild ſheep, in all its native vigour, boldneſs, and activity, inhabiting the vaſt chain of mountains which run through the centre of Aſia, to the eaſtern ſea, and the branches which it ſends off to Great Tartary, China, and the Indies. This wild animal, which our learned naturaliſt declares to be the *muſimon* of Pliny, and the *ophion* of the Greeks, is called *argali* by the Siberians, which means wild ſheep; and by the Ruſſians *kamennoi barann*, or ſheep of the rocks, from its ordinary place of abode. It delights in the bare rocks of the Aſiatic chain juſt mentioned, where it is conſtantly found baſking in the ſun; but it avoids the woods of the mountains, and every other object that would intercept the direct rays of the glorious luminary. Its food is the Alpine plants and ſhrubs it finds amongſt the rocks. The argali prefers a temperate climate, although he does not diſdain that of Aſiatic Siberia, as he there finds his favourite bare rocks, ſunſhine, and Alpine plants; nay, he is even found in the cold eaſtern extremity of Siberia and Kamtſchatka, which plainly proves that nature has given a moſt extenſive range to the ſheep in a wild ſtate, equal even to what ſhe has given to man, the lord of the creation; a fact that ought to make us ſlow in believing the aſſertions not uncommon, which tend to prove the ſheep a local animal; or at leaſt that it muſt be confined to certain latitudes, to poſſeſs it in all its value.

"The argali loves ſolitude, or poſſibly perfect liberty, and therefore flees the haunts of all-ſubduing man; hence it gradually abandons a country in proportion as it becomes peopled, if no unſurmountable obſtacle obſtructs its flight; inſomuch that Dr. Pallas thinks that nothing but the ſurrounding ſea can account for the wild ſheep being found in an inhabited iſland, as is ſometimes the caſe. The ewe of the argali brings forth before the melting of the ſnow. Her lamb reſembles much a young kid; except that it has a large flat protuberance in place of horns, and that it is covered with a woolly hair, frizzled, and of a dark grey. There is no animal ſo ſhy as the argali, which it is almoſt impoſſible to overtake on ſuch ground as it keeps to. When purſued, it does not run ſtraight forward, but doubles and turns like a hare, at the ſame time that it ſcrambles up and over the rocks with wonderful agility. In the ſame proportion that the adult argali is wild and untameable, the lamb is eaſily tamed when taken young, and fed firſt on milk, and afterwards on fodder, like the domeſtic ſheep, as has been found on numerous experiments made in the Ruſſian ſettlements in theſe parts.

"This animal formerly frequented the regions about the upper Irtiſh, and ſome other parts of Siberia, where it is no longer ſeen ſince colonies have been ſettled in theſe countries. It is common in the Mongalian, Songarian, and Tartarian mountains, where it enjoys its favourite ſolitude or liberty. The argali is found likewiſe on the banks of the Lena, up as high as 60 degrees of north latitude; and it propagates its ſpecies even in Kamtſchatka, as noticed before. The argali is alſo found in the mountains of Perſia, and is ſaid to obtain in the Kuril iſlands in great ſize and beauty. It purges itſelf in the ſpring (like all the domeſtic varieties of the ſheep, when left at liberty to follow their inſtinct) with acrid plants of the anemonoide kind, till milder plants ſpring up, and ſhrubs begin to ſprout, which with Alpine plants conſtitute its uſual food. It likewiſe frequents the ſalt marſhes which abound every where in Siberia; and even licks the ſalt efflorescence that riſes on the ground, a regimen that fattens them up very quickly, and fully reſtores the health, vigour, and fleſh they had loſt during winter, and during the purging courſe, which, together with the reſtorative, is by the Almighty ſo wonderfully dictated to the ſheep ſpecies, whether in a wild or tame ſtate, if left to roam at large where the neceſſary plants are to be found." Here, then, we have a variety of the ſheep ſpecies, which by ſome indeed, and by Dr. Pallas among others, is thought to be the parent of all our domeſtic varieties, and which lives and propagates without any aid from man, and which on all occaſions carefully ſhuns him. That it is the parent ſheep we are not convinced; that being an opinion which requires proof, and better proof than we preſume the abettors of it are able to produce.

Having given a figure of this animal in Plate 22, we ſhall add the following deſcription of it, taken likewiſe from the Bee. The argali is about the height of a ſmall hart, but its make is much more robuſt and nervous. Its form is leſs elegant than that of the deer, and its legs and neck ſhorter. The male is larger than the female, and every way ſtouter. Its head reſembles that of a ram, with long ſtraggling hairs about the mouth; but no beard. Its ears are rather ſmaller than thoſe of a ram. The horns are exactly repreſented in the plate; they weigh in an adult ſometimes 16 pounds. The tail is very ſhort. The ſummer-coat conſiſts of ſhort hair, ſleek, and reſembling that of a deer. The winter-coat conſiſts of wool like down, mixed with hair every where an inch and a half long at leaſt, concealing at its roots, a fine woolly down, generally of a white colour. The colour of its coat was in general of a dark greyiſh brown, with white tips to the longer hairs, and conſiſted of hair mixed with wool, of a dark iron grey. By accounts lately received from the Tſhutſki, the argali is found of a white colour on the continent of America, oppoſite to their country. It is likewiſe of a whitiſh colour at Kamtſchatka.

But independent of its manners or its mental qualities, this animal is of the moſt extenſive utility to man. We are clothed by its fleece. The fleſh is a delicate and wholeſome food. The ſhin, dreſſed, forms different parts of our apparel; and is uſed for covers of books. The entrails, properly prepared and twiſted, ſerve for ſtrings for various muſical inſtruments. The bones calcined (like other bones in general), form materials for teſts for the refiner. The milk is thicker than that of cows, and conſequently yields a greater quantity of butter and cheeſe; and in ſome places is ſo rich, that it will not produce the cheeſe without a mixture of water to make it part from the whey. The dung is a remarkably rich manure; inſomuch that the folding of ſheep is become too uſeful a branch of huſbandry for the farmer to neglect. Nature, in ſhort, has given this animal nothing that does not redound to our benefit.

The ram is capable of generation at the age of 18 months; and the ewe can be impregnated when a year old. One ram is ſufficient, according to Buffon, for 25 or 30 ewes; they have often been known indeed to beget 100 lambs in a ſingle ſeaſon. He ought to be large and well proportioned; his head ſhould be thick and ſtrong, his front wide, his eyes black, his noſe flat,

his neck thick, his body long and tall, his teſticles maſſy, and his tail long. White is the beſt colour for a ram. The ewes whoſe wool is moſt plentiful, buſhy, long, ſoft, and white, are moſt proper for breeders, eſpecially when at the ſame time they are of a large ſize, have a thick neck, and move nimbly.

In this climate ewes fed in good paſture admit the ram in July or Auguſt; but September or October are the months when the greateſt part of our ewes, if left to nature, take the ram. They go with young about five months, and generally bring forth but one at a time, though frequently two: in warm climates, they may bring forth twice in a year; but in Britain, France, and moſt parts of Europe, only once. They give milk plentifully for ſeven or eight months. They live from ten to twelve years: they are capable of bringing forth as long as they live, when properly managed; but are generally old and uſeleſs at the age of ſeven or eight years. The ram, though he lives twelve or fourteen years, becomes unfit for propagating when eight years old.

When the male lambs are not intended to be kept for propogation, but fattened for food, they ought to be caſtrated at the age of five or ſix months. This operation is performed two ways: in the one, an inciſion is made, and the teſticles taken out; in the other, a ligature is tied tight round the ſcrotum, above the teſticles, which ſoon deſtroys the veſſels which nouriſh them. After caſtration they are called *wedders*.

The ram, ewe, and wedder, when one year old, loſe the two fore-teeth of the under jaw; ſix months afterwards, they loſe the two fore-teeth next to theſe; and at the age of three years, the teeth are all replaced. The age of a ram may likewiſe be diſcovered by his horns, which always appear the firſt year, and frequently as ſoon as he is brought forth. Theſe horns uniformly acquire an additional ring every year, as long as the creature lives. The ewes commonly have no horns, but a kind of long protuberances in place of them: however, ſome of them have two, and ſome four horns.

"It has been remarked by the ancients (ſays Buffon), that all ruminating animals have ſuet: But this remark, ſtrictly ſpeaking, holds only with regard to the ſheep and goat: The ſuet of the wedder is more copious, whiter, drier, firmer, and better, than that of any other animal. Fat or greaſe is very different from ſuet; the former being always ſoft, while the latter hardens in cooling. The greateſt quantity of ſuet is found about the kidneys; and the left kidney furniſhes more than the right. There are alſo conſiderable quantities in the epiploon or web, and about the inteſtines; but it is not near ſo firm or good as that of the kidneys, the tail, and other parts of the body. Wedders have no other greaſe but ſuet: and this matter is ſo prevalent in their bodies, that their whole fleſh is covered with it. Even the blood contains a conſiderable quantity of ſuet; and the ſemen is ſo charged with it, as to give that liquor a different appearance from that of other animals. The ſemen of men, of the dog, horſe, aſs, and probably of every animal which affords not ſuet, diſſolves with cold; or, when expoſed to the air, becomes more and more fluid from the moment it eſcapes from the body. But the ſemen of the ram, and perhaps of every animal that has ſuet, hardens and loſes its fluidity with its heat.

"In the ſheep, the taſte of the fleſh, the fineneſs of the wool, the quantity of ſuet, and even the ſize of the body, vary greatly in different countries. In France, the province of Berri abounds moſt in ſheep. Thoſe about Beauvais, and in ſome other parts of Normandy, are fatter and more charged with ſuet. They are very good in Burgundy; but the beſt are fed upon the ſandy downs of our maritime provinces. The Italian, Spaniſh, and even the Engliſh wools, are finer than the French wool. In Poitou, Provence, the environs of Bayonne, and ſeveral other parts of France, there is a race of ſheep which have the appearance of being foreign. They are larger, ſtronger, and better covered with wool than the common kind. They are likewiſe more prolific, producing frequently two lambs at a time. The rams of this race engender with the common ewes, and produce an intermediate kind. In Italy and in Spain, there are a great variety of races; but they ought all to be regarded as of the ſame ſpecies with our common ſheep, which, though ſo numerous and diverſified, extend not beyond Europe. Thoſe animals with a long broad tail, ſo common in Aſia and Africa, and which are called *Barbary ſheep* by travellers, appear to be a ſpecies different from the ordinary kind, as well as from the Pacos and Lama of America.

"As white wool is moſt valued, black or ſpotted lambs are generally ſlaughtered. In ſome places, however, almoſt all the ſheep are black; and black lambs are often produced by the commixture of white rams with white ewes. In France, there are only white, brown, black, and ſpotted ſheep; but in Spain, there is a reddiſh kind; and in Scotland there are ſome of a yellowiſh colour. But all theſe varieties of colour are more accidental than thoſe produced by different races; which, however, proceed from the influence of climate, and the difference of nourithment."

Reſpecting the varieties, or, as ſome will have it, the different ſpecies of ſheep, there has been a great difference of opinion amongſt the learned. Buffon, we find, in the above extract, if we underſtand him right, regards the variety of races in Italy and in Spain as of the ſame ſpecies with our common ſheep: but he conſiders the Barbary ſheep as a diſtinct ſpecies. Dr. Pallas, the learned naturaliſt already quoted, in very extenſive travels in the Ruſſian empire, more particularly in Siberia, and amongſt the paſtoral nations of great Tartary, found what he regards as only one ſpecies of ſheep, ſubdivided into four varieties, and diſtinguiſhed by their tails, the form of their heads, their ears and fleece. So that he condemns as unfounded and fanciful the erroneous idea of making *ſpecific* differences of the accidental varieties, which, in his opinion, education or mode of life, climate, food, and croſſing the breed, have produced in ſheep, as in other animals; and, in conformity to this opinion, he conſiders not only thoſe varieties found in Europe, but alſo thoſe of other quarters of the globe, as only accidental varieties of the ſame ſpecies; and his opinion is confirmed, by finding that they produce a prolific race though the breed be ever ſo much croſſed; which he thinks would not be the caſe were they different ſpecies. The varieties which Dr. Pallas examined, which, as we have already ſaid, are four, are as follow. The firſt is named both by the Tartars and Ruſſians *Tſcherkeſſian* ſheep, and by Pallas *dolichura* or long-tailed: it is the *ovis longicaudo* of authors.

The ſecond is called the Ruſſian ſheep by the natives, and by Pallas *brachiura* or ſhort tailed: it ſeems to be the *ovis Iſlandicus* of authors, with ſmaller horns.

The third has no fixed trivial name, as its appellations are as various as the provinces where it is reared; Pallas has called it *ſteatopyga* or fat-tailed: it is the *ovis laticaudata* of authors.

The fourth has likewiſe no fixed trivial name, but Pallas has called it *bucharian*, from finding it reared by the Bucharian Tartars in immenſe flocks. The Tſcherkeſſian ſheep, or firſt variety, is a handſome animal, with a noble air, in its native country and the ſouth of Ruſſia, reſembling in its habits, horns, fleece, and length of tail, the Spaniſh, but more particularly the Engliſh ſheep. Its head is well proportioned, and of an elegant form; ears ſtraight; horns large, even, rounded in the angles, tapering to a point, and bending inwardly towards the back. The rams are ſeldom without horns, and the ewes have them often bent in a lunar form. The wool, though coarſe, is without admixture of hair, which is perhaps but an accidental diſtinction, and promiſes to be much meliorated by croſſing the breed, and rearing the animal with more care and ſkill. It is even known to become much finer without the aſſiſtance of art,

merely from the influence of a temperate climate, as on mount Caucaſus. The tail of the ram is covered with fine long wool, like the Indian ſheep deſcribed by Buffon, which trails on the ground, ſo as to efface the prints made by the animal's feet on ſand, and it contains often 20 joints or vertebræ. In paſſing from the ſtate of nature to that of ſervitude, it ſeems to have loſt its native ferocity, together with its coarſe fleece. Dr. Pallas ſays it is a mild gentle animal, and is leſs *degenerated in form* from the argali, which, according to his ſyſtem, is the parent ſpecies, than the ſteatopyga, which on the other hand has preſerved much more of its wildneſs than the Tſcherkeſſian; perhaps becauſe it is allowed to range with little reſtraint on the wide extended plains of Great Tartary. The Tſcherkeſſian is reared in all the European regions of the Ruſſian empire, ſituated on this ſide the river Occa, in the nearer Poland, and by the paſtoral people of mount Caucaſus; and they are commonly of a white colour.

The ſame variety, we are told by Ruſſel, in his natural hiſtory of Aleppo, is reared under the name of *Bedouin ſheep* by the Arabs, and in the weſtern parts of Mauritania, with a trifling difference in the length and thickneſs of the tail. There are likewiſe ſheep in Morroco, which belong to this variety, on account of the diſtinguiſhing character of it, a long tail, although otherwiſe different, in having an ugly look, head covered entirely with hair, little hanging ears, and remarkably long wool.

The Indian and Guinea ſheep, ſo well deſcribed by Buffon, reſemble the Tſcherkeſſian only in the length of their tail, whilſt in other reſpects they come nearer the ſteatopyga or fat-rumped ſheep of Pallas in ſize, form, and fleece mixed with hair. The learned naturaliſt is of opinion, that the arid burning deſerts produce this change on the wool; but his reaſoning on this head is to us at leaſt as little ſatisfactory as that by which he endeavous to prove the argali to be the parent ſpecies. The inhabitants of Ukraine and Padoli carry on an extenſive and valuable traffic with the ſkins of Tſcherkeſſian ſheep, the beauty of which they heighten in a very curious manner.

The *brachiura*, ſhort-tailed, or ſecond variety which Dr. Pallas examined in his travels, is reared throughout all the north of Ruſſia, and reſembles that of Iceland in ſize, tail, and coarſeneſs of fleece; but though this be the caſe in theſe few reſpects, yet it differs from it in a very eſſential character, that of *horns*, which are much ſmaller, and have nothing of that exuberance which Buffon and others attribute to the ſheep of that iſland. It reſembles the Tſcherkeſſian ſheep in the form of its head, ſtraight upright ears, and in thickneſs of fleece; but the quality of the two fleeces are very different, this variety having wool almoſt as courſe as dog's hair: but the great diſtinguiſhing character between them is the tail, which is almoſt a quarter of a yard ſhorter than that of the Tſcherkeſſian. The brachiura, or ſhort-tailed ſheep, is reared not only by the northern Ruſſians, but likewiſe by the Fins and other neighbouring nations. Some of this variety have been tranſported into Siberia, where they have ſupported themſelves on ſome paſtures, though in poor condition; but through all the ſouthern counties they are in leſs eſtimation than the long-tailed and fat-tailed varieties, which are much ſuperior to them for ſize, fat, and good eating. The ewe of this ſhort-tailed variety couples readily with the ram of the ſteatopyga or fat-tailed breed, and produces an animal nobler and larger than its mother, with a tail ſwelled at the baſe with fate, but meagre towards the end like that of the mixed breed, which makes Dr. Pallas's fourth and laſt variety of domeſtic ſheep. The ewe alſo couples clandeſtinely with the domeſtic he-goat, and produces an animal much reſembling the mother, but with a fleece of wool and hair. This latter is a fact of the truth of which we have ſome doubt. The Doctor may eaſily have been miſled, and may have adopted his opinion merely from the ſhaggy appearance of the fleece of ſome breeds of ſheep, which much reſembles the hair of a goat; but theſe are found as well in countries where no goats exiſt, as in thoſe where they abound. The fact has not then, we think, been ſufficiently aſcertained. This variety ſupports extremely well the ſeverity of a northern climate; and Dr. Pallas doubts not but it might paſs the winter in the plains of mountainous northern countries where there is not much ſnow; nay, he even thinks it might augment their hardineſs and ſtrength, if we are to judge from the habits and treatment of the Iceland flocks, ſo well deſcribed by Anderſon in his account of that iſland.

Dr. Pallas remarked, that on mountainous paſtures expoſed to the ſun, ſuch as on the acclivity of the Ouralic chain, the Ruſſian or ſhort-tailed ſheep were larger, fatter, and had a finer fleece.

Croſſing the breed with the Tſcherkeſſian or long-tailed ſheep, likewiſe mends both the ſtature and fleece of the brachiura; whereas, in its own natural ſtate, without admixture of other varieties of ſheep, it is but ſmall, lean, and produces in the northern parts of Ruſſia, a wool ſo extremely coarſe as only to be fit for the cloth of peaſants in a ſtate of vaſſalage.

Whether coarſeneſs of wool and leanneſs be indeed characteriſtical marks of this ſpecies, is, we thing extremely doubtful: we are rather inclined to conſider them as mere accidental differences.

The Doctor's third variety, or *ſteatopyga*, which has a different name in almoſt every country where it is reared, is both the moſt abundant and largeſt breed of ſheep in the world. It is reared throughout all the temperate regions of Aſia, from the frontiers of Europe to thoſe of China, in the vaſt plains of Tartary. All the Nomade hordes of Aſia, the Turcomans, Kirgüiſe, Calmucks, and Mongal Tartars, rear it; and indeed it conſtitutes their chief riches, the number they poſſeſs being enormous. The Perſians alſo rear it in abundance; as likewiſe the Hottentots, as we are informed by Kolbe in his Travels to the Cape of Good Hope; whilſt Oſbeck, in his journey to China, aſſerts that the fat-tailed ſheep are reared through that whole empire. We are told alſo by Shaw and the Abbé Demanent, that the ſame breed obtains in Syria, Mauritania, and the other regions of Africa, under ſome modifications of form, from different cauſes; ſo that Dr. Pallas thinks there is ſufficient evidence that the ſteatopyga, or fat-rumped ſheep, is the moſt univerſally reared and multiplied of any breed in the world. The flocks of all the Tartar hordes reſemble one another by a large yellowiſh muzzle, the upper jaw often projecting beyond the lower; by long hanging ears; by the horns of the adult ram being large, ſpiral, wrinkled, angular, and bent in a lunar form. The body of the ram, and ſometimes of the ewe, ſwells gradually with fat towards the poſteriors: where a ſolid maſs of fat is formed on the rump, and falls over the anus in place of of a tail, divided into two hemiſpheres, which take the form of the hips, with a little button of a tail in the middle, to be felt with the finger. See A fig. 1. plate 22. The *uropygium* or fat-rump, which is made up of this oily ſpecies of fat, is ſo very large as to incommode the animal in walking; but when the ſame ſheep are carried into the interior parts of Ruſſia, the tail loſes half its ſize and weight, nay ſometimes more, from a change in their food and mode of life. This variety, beſides the characters mentioned above, have ſlender legs in proportion to their bodies, a high cheſt, large hanging teſticles, a large prepuce, and tolerably fine wool mixed with hair. Such are the great characteriſtic marks by which the flocks of all the Tartar hordes reſemble one another; but climate, ſoil, &c. produce ſome ſmall difference on this variety, whether reared by the Tartars or the Ruſſians, in the weſtern deſerts of Great Tartary, from the river Volga to the Irtiſh, and the Altaic chain of mountains. In all that tract of country, the paſturage is moſtly arid; and it abounds in acrid and liliaceous plants in ſpring, whilſt in ſummer it produces, at leaſt in the open ſpots where ſheep de-

light to feed, beſides gramen, bitter and aromatic plants, artemiſia, camphoroſna, and many ſpecies of ſalſola, abounding in juices and ſalts. There is likewiſe found everywhere an efflorescence of natron, with ſea or glauber's ſalt; nay, even the waters of the deſert contain in general the ſame ſalts. Now it is almoſt unneceſſary to inform European ſhepherds, that ſuch paſturage has the effect of augmenting the ſize of ſheep, if it produces no other change upon them; ſo that we ſee, in this inſtance, how ſome kind of difference may ariſe amongſt ſheep of the ſame breed merely from accidental cauſes, without the leaſt admixture of heterogeneous blood. This variety changes greatly in ſize and in other incidental circumſtances, according to the method of raiſing or of treating them in different places and by different people.

The fourth variety, raiſed by the Boucharian Tartars and Perſians in great numbers, Dr. Pallas regards as a mixed breed, ariſing, as he ſuppoſes, from the union of the firſt and third varieties, *i. e.* of the long and fat-tailed ſheep. The Doctor does not think that they ever attain to the ſize of either of their parents; though, as he never ſaw any full grown, he does not ſpeak poſitively upon the ſubject. The head of this variety is like that of the Kirguiſe; but the muzzle is ſharper, reſembling the Indian of Buffon: the body is rather ſmaller than that of the Kirguiſe ſheep: the ears are large and pendant: they have a ſmall uropygium, like that of the Tartar ſheep on the Jeniſy, eſpecially when begotten by a Kirguiſe ram; but in general they have a *tail* fat and broad at the baſe, with a long narrow appendage which reſembles the tail of the Tſcherkeſſian ſheep. The Boucharian Tartars have a very valuable traffic with the furs of the lambs of this variety, which are exquiſitely fine and beautiful. This ſame variety is likewiſe raiſed in great numbers by the Perſians; and it is more than probable, if we are to give credit to authors ancient and modern, that this very variety obtains in Syria, Paleſtine, and divers countries of Africa, known to them by the name of *ovis macrocereas*. It differs in all thoſe countries from the fat-tailed, or ſteatopyga of Pallas, in having a long tail, fat and broad above, with a long narrow appendage, which is exactly the great marked character of the Boucharian breed. Pliny tells us, that the Syrian ſheep have long fat tails, and carry wool; and by Ruſſel's account of them, in his Natural Hiſtory of Aleppo, they reſemble the Kirguiſe ſheep in the head, face, and ears hanging on the cheeks; but the tail is that of the Boucharian, fat above, with a long lean appendage. He adds that they are covered with a ſoft wool, which is another trait of reſemblance with our preſent variety; and that they weigh ſometimes 150 pounds, one third of which is the weight of the tail. Geſner, in his work on quadrupeds, tells us, that the Arab ſheep of Kay have nearly the ſame characteriſtic marks, eſpecially with regard to the tail.

Shaw relates in his Travels, that ſheep with ſuch a compound tail are common in Mauritania, and in all the Eaſt; whilſt Kolbe aſſures us that the ſheep which are brought on board the ſhips at the Cape of Good Hope have tails weighing 25 or 30 pounds, fat above, with a bony appendage hanging from it; and, laſtly, the Abbé Demanent, in his new Hiſtory of Africa, ſays, that ſheep are found in Africa covered with wool, and with ſuch a tail as we have been deſcribing; whilſt at Cape Guarda, in the ſouth of Africa, all the ſheep are white, with rather ſmall black heads, otherwiſe a large handſome breed, with broad fat tails, ſix or eight inches long.

The Doctor, however, does not entirely cloſe his proofs here; for he quotes ſeveral paſſages from Moſes in confirmation of what he has advanced, *viz.* that the Boucharian ſheep obtain in Syria, Paleſtine, and divers countries of Africa. The paſſages he quotes are theſe: Leviticus viii. 25. ix. 19. But whether theſe verſes prove what the Doctor has quoted them as proving, we will not determine.

Theſe are the four varieties which Dr. Pallas ſaw and examined in his extenſive travels. The account is, we think, curious; to naturaliſts intereſting; and to farmers it may be uſeful. If it only excite further reſearch and minuter inquiry, it will anſwer ſome purpoſe. Indeed, the man of ſcience will not reſt ſatisfied with what our preſcribed bounds have permitted us to bring forward, but will recur to the original work of the learned author to whom we are primarily indebted for the above account. We refer ſuch readers, then, to his *Spicilegia Zoologica, faſciculus undecimus*, printed at Berlin in 1776.

It may not be improper to deſcribe the figures of theſe four varieties. They are all contained in Plate 22. fig. 1 of which is the argali. Fig. 2. is a ſide and back view; letters A*a* of the ram of the ſteatopyga, or fat-rumped variety, in its greateſt purity of breed, as obtaining among the Kirguiſe Tartars in the vaſt plains of Southern Tartary. The poſition of the animal marked *a* ſhows the *uropygium* or fat rump. Letter *b* is a repreſentation of the head of the ſame animal, with a couple of noneola hanging from the neck, called by the Ruſſians *ear-rings*. Letter C is a drawing of another Kirguiſe ram with five horns, ſhowing alſo the hanging poſition of the ears of this variety. Fig. 3. is a drawing of a degenerate breed of the ſteatopyga variety of ſheep, reared on the banks of the Jeniſy and Volga, without horns, and with the uropygium or fat rump greatly diminiſhed, and one noneola. Letter *b* (fig. 4.) is a drawing of a ram of the ſame variety of ſheep, from the flocks of the Jeniſy Kirguiſe, with four horns ſymmetrically arranged by nature, as is frequently the caſe with this breed.

In a ſupplement to his article Sheep, Buffon has theſe words reſpecting the ſtrepſiceros: "I here give figures," ſays the Count (ſee Plate 22.) "of a ram and ewe, of which drawings were ſent me by the late Mr. Colinſon, fellow of the Royal Society of London, under the names of the *Walachian ram* and *ewe*. As this learned naturaliſt died ſoon afterwards, I could not diſcover whether theſe ſheep, whoſe horns are extremely different from thoſe of the ordinary kind, be common in Walachia, or whether they are only an accidental variety.*

"In the northern parts of Europe, as Denmark and Norway, the ſheep are not good; but, to improve the breed, rams are occaſionally imported from England. In the Iſlands adjacent to Norway, the ſheep remain in the fields during the whole year; and they become larger and produce finer wool than thoſe which are under the care and direction of men. It is alledged, that thoſe ſheep which enjoy perfect liberty always ſleep, during the night, on that ſide of the iſland from whence the wind is to blow next day. This natural indication of the weather is carefully attended to by the mariners.

"The rams, ewes, and wedders of Iceland, differ chiefly from ours by having larger and thicker horns. Some of them have three, four, and even five horns. But this peculiarity of having more horns than two, muſt not be conſidered as common to the whole race of Iceland ſheep; for in a flock of four or five hundred, hardly three or four wedders can be found with four or five horns, and theſe are ſent to Copenhagen as rarities. As a farther proof of their being ſcarce, they give a higher price in Iceland than the common kind."

In Spain and the ſouthern parts of Europe, the flocks of ſheep are kept in ſhades or ſtables during the night: but in Britain, where there is now no danger from wolves, they are al-

* Dr. Pallas thinks it very probable that the ſtrepſiceros variety of ſheep were produced by propagating a particular configuration of horns. He alludes to the animal which Bellonius firſt diſcovered on Mount Ida in Crete, and which he ſuppoſes the ſtrepſiceros of the ancients.

lowed to remain without, both night and day; which makes the animals more healthy, and their flesh a more wholesome food. Dry and mountainous grounds, where thyme and sheep's fescue grass abound, are the best for the pasturing sheep.

The sheep is subject to many diseases: some arising from insects which deposit their eggs in different parts of the animal: others are caused by their being kept in wet pastures; for as the sheep requires but little drink, it is naturally fond of a dry soil. The dropsy, vertigo (the *pendro* of the Welsh), the phthisis, jaundice, and worms in the liver, annually make great havock among our flocks: for the first disease the shepherd finds a remedy by turning the infected into fields of broom; which plant has been also found to be very efficacious in the same disorder among the human species.—The sheep is also infested by different sorts of insects: like the horse, it has its peculiar œstrus or gadfly, which deposits its eggs above the nose in the frontal sinuses (see Oestrus): when those turn into maggots, they become excessively painful, and cause those violent agitations that we so often see the animal in. The French shepherds make a common practice of easing the sheep, by trepanning and taking out the maggot; this practice is sometimes used by the English shepherds, but not always with the same success. Besides these insects, the sheep is troubled with a kind of tick and louse, which magpies and starlings contribute to ease it of, by lighting on its back, and picking the insects off.

We had intended to have introduced into this article some observations from Pennant; but it has already extended beyond its just limits, and we dare not venture to extend it further. Under the article Wool, which is intimately connected with the present, we may perhaps have an opportunity of introducing some additional remarks not without importance. At all events, we trust by that time to be able to give a favourable report of that truly patriotic society which has been lately instituted in Scotland for meliorating the breed of sheep, and in consequence the nature and quality of the *wool*. From the active and indefatigable exertions of Sir John Sinclair, baronet, the president of that society, we have every thing to hope from well conducted experiments, and nothing to fear from groundless hypotheses.

OUNCE, a little weight, the 16th part of a pound avoirdupois, and the 12th part of a pound Troy. The word is derived from the Latin, *uncia*, "the twelfth part of any whole," called *as*; particularly in geomctrical measures, an inch, or the 12th part of a foot. See Inch and As.

Ounce, in zoology. See Felis.

OVOLO, or Ovum, in architecture, a round moulding, whose profile or sweep, in the Ionic and Composite capitals, is usually a quadrant of a circle: whence it is also commonly called the *quarter round*. It is usually cut with representations of eggs and arrow heads, or anchors placed alternately.

OU-POEY-TSE, a name given by the Chinese to a kind of nests made by certain insects upon the leaves and branches of the tree called *yen fou-tse*. These nests are much used in dyeing, and the physicians employ them for curing many distempers. Some of these nests were brought to Europe, and put into the hands of the celebrated Mr. Geoffroy. After having examined them with the utmost attention, this learned academician thought he perceived some conformity in them to those excrescences which grow on the leaves of the elm, and which the vulgar call *elm-bladders:* he found these nests so sharp and astringent to the taste, that he considered them as far superior to every other species of galls used by the dyers. According to him, they are the strongest astringents existing in the vegetable kingdom.

It is certain that there is a great affinity between the *ou-poey-tse* and the elm-bladders. The form of both is unequal and irregular; they are covered on the outside with a short down, which renders them soft to the touch: within they are full of a whitish grey dust, in which may be observed the dried remains of small insects, without discovering any aperture through which they might have passed. These nests or bladders harden as they grow old; and their substance, which appears resinous, becomes brittle and transparent; however, the Chinese do not consider the ou-poey-tse, notwithstanding their resemblance to elm-bladders, as excrescences of the tree yen-fou-tse, upon which they are found. They are persuaded, that insects produce a kind of wax, and construct for themselves on the branches and leaves of this tree (the sap of which is proper for their nourishment) little retreats, where they may wait for the time of their metamorphosis, or at least deposit in safety their eggs, which compose that fine dust with which the ou-poey-tse are filled. Some of the *ou-poet-tse* are as large as one's fist; but these are rare, and are generally produced by a worm of extraordinary strength, or which has associated with another, as two silk-worms are sometimes seen shut up in the same ball. The smallest *ou-poey-tse* are of the size of a chestnut; the greater part of them are round and oblong; but they seldom resemble one another entirely in their exterior configuration. At first, they are of a dark green colour, which afterwards changes to yellow; and the husk, though pretty firm, becomes then very brittle.

The Chinese peasants collect these ou-poey tse before the first hoar-frosts. They take care to kill the worm inclosed in the husks, and to expose them for some time to the steam of boiling water. Without this precaution, the worm might soon break through its weak prison, which would immediately burst and be useless. The *ou-poey-tse* are used at Pekin for giving paper a durable and deep-black colour; in the provinces of Kiang-nan and Tche-kiang, where a great deal of beautiful sattin is made, they are employed for dyeing the silk before it is put on the loom. The Chinese literati also blacken their beards with them when they become white.

The medicinal properties of the *ou-poey-tse* are very numerous. The Chinese physicians introduce them into the composition of many of their remedies. They recommend them for stopping bloodings of every kind; they consider them as an excellent specific for curing inflammations and ulcers, and for counteracting the effects of poison; and they employ them with success in the dropsy, phthisis, epilepsy, catarrhs, sickness, fluxions of the eyes and ears, and in many other disorders.

Greater OUSE, a river which rises near Fitwell in Oxfordshire, and proceeds to Buckingham, Stoney-Stratford, and Newport-Pagnel, in Buckinghamshire; from thence it proceeds to Bedford, and turning north east it passes on to Huntingdon and Ely, till at length it arrives at Lynn-Regis in Norfolk, and falls into the sea. It is navigable to some distance above Downham, where there is a good harbour for barges; and a considerable trade is carried on by it to Lynn and other towns.

Smaller Ouse, rises in Suffolk, and, separating that county from Norfolk on the south west, discharges itself into the Great Ouse near Downham. There is still another of the same name which rises in the west-north west side of Yorkshire; and chiefly running to the south-east, at length falls into the Humber.

OUSTER, or Dispossession, in law, an injury which carries with it the amotion of possession; for by means of it the wrong doer gets into the actual possession of the land or hereditament, and obliges him that hath a right to seek a legal remedy, in order to gain possession, together with damages. This ouster may either be of the freehold by abatement, intrusion,

diſſeiſin, diſcontinuance, and deforcement; or of chattels real, as an eſtate by ſtatute-merchant, ſtatute-ſtaple or elegit, or an eſtate for years.

Ouster *le Main*, *amovere manum*, in law, denotes a livery of lands out of the king's hands; or a judgment given for him that traverſed, or ſued, a *monſtrans le droit*. When it appeared, upon the matter being diſcuſſed, that the king had no right or title to the land ſeized, judgment was given in chancery, that the king's hand be amoved; and *ouſter le main*, or *amoveas manum*, was therefore awarded to the eſcheator, to reſtore the land, &c. All wardſhips, liveries, *ouſter le mains*, &c. are now taken away and diſcharged by ſtatute 12. Car. II.

OUSTIOUG, a town of the Ruſſian empire, and capital of a province of the ſame name, with an archbiſhop's ſee and a caſtle; ſeated on the river Suchan, over-againſt the mouth of the Jug, in E. lon. 43. 25. N. lat. 61. 48.

Oustioug, a province of the Ruſſian empire, bounded on the north by Dwina, on the eaſt by the foreſt of Zirani, on the ſouth by Wologda, and on the weſt by Cargapol and Waga. It is divided into two parts by the river Suchana; is full of foreſts; and the rivers yield plenty of fiſh, which the inhabitants dry in the ſun, and which make their principal nouriſhment.

OUT-posts, in a military ſenſe, a body of men poſted beyond the grand guard; called *out-poſts*, as being the rounds or limits of the camp.

OUTLAW, ſignifies one that is deprived of the benefit of the law, and therefore held to be out of the king's protection. Bracton aſſerts, that an outlaw forfeits all he has, and that from the time of his outlawry, he wears a wolf's head; and any body may kill him with impunity, eſpecially if he defend himſelf or fly. But in Edward III.'s time it was reſolved by the judges, that it ſhould not be lawful for any man, but the ſheriff alone (having ſufficient warrant for it), to put to death a man that was outlawed.

OUTLAWRY, the puniſhment of a perſon who, being called into law, and lawfully, according to the uſual forms, ſought, does contemptuouſly refuſe to appear. The effect of being outlawed at the ſuit of another, in a civil cauſe, is the forfeiture of all the perſon's goods and chattels to the king, and the profits of his land, while the outlawry remains in force. If in treaſon or felony, all the lands and tenements which he has in fee, or for life, and all his goods and chattels, are alſo forfeited: and beſides, the law interprets his abſence as a ſufficient evidence of guilt; and without requiring farther proof, accounts the perſon guilty of the fact, on which enſues corruption of blood, &c. And then, according to Bracton, he may periſh without law, &c. However, to avoid inhumanity, no man is intitled to kill him wantonly or wilfully; but in ſo doing he is guilty of murder, unleſs it happens in endeavouring to apprehend him: for any body may arreſt an outlaw, either of his own head, or by writ or warrant of *capias utlagatum*, in order to bring him to execution.

If after outlawry, in civil caſes, the defendant publicly appear, he is to be arreſted by a writ of *capias utlagatum*, and committed till the outlawry be reverſed: which reverſal may be had by the defendant's appearing in court (and in the king's-bench, by ſending an attorney, according to ſtatute 4 and 5 W. and M. cap. 18.), and any plauſible circumſtance, however trifling, is in general ſufficient to reverſe it; it being conſidered only as a proceſs to force appearance. The defendant muſt, however, pay full coaſts, and muſt put the plaintiff in the ſame condition as if he had appeared before the writ of *exigi facias* was awarded. It is appointed by magna charta, that no freeman ſhall be outlawed, but according to the law of the land. A minor or a woman cannot be outlawed.

In Scotland outlawry anciently took place in the caſe of refuſal to fulfil a civil obligation, as well as in criminal caſes. At preſent, however, it only takes place in the two caſes of flying from a criminal proſecution, and of appearing in court attended by too great a number of followers. But the defender, upon appearing at any diſtance of time and offering to ſtand trial, is intitled *de jure* to have the outlawry reverſed, and to be admitted to trial accordingly, and even to bail if the offence be bailable. See Waive.

OVUM anguinum. See Anguinum.

OUTWORKS, in fortification, all thoſe works made without-ſide the ditch of a fortified place, to cover and defend it. See Fortification.

OUZEL, in ornithology; a ſpecies of Motacilla.

OWEN (Thomas), a judge of the common pleas, ſon of Richard Owen, Eſq. of Condover in Shropſhire, was educated at Oxford, and, as is generally ſuppoſed, at Chriſt-church college. Having taken a degree in arts, he left the univerſity, and entered himſelf of Lincoln's inn in London, where in proceſs of time he became an eminent counſellor. In 1583 he was elected Lent-reader to that ſociety. In 1590 he was made ſerjeant at law, and queen's ſerjeant ſoon after. He arrived at length at the dignity of judge of the common-pleas; which office he is ſaid to have executed, during five years, with great abilities and integrity. He died in 1598; and was buried on the ſouth of the choir in Weſtminſter abbey, where a monument was erected to his memory. He had the reputation of a learned man, and a patron of literature. He was the author of "Reports in the common pleas, wherein are many choice caſes, moſt of them thoroughly argued by the learned ſerjeants, and after argued and reſolved by the grave judges of thoſe times, with many caſes wherein the difference of the year books are reconciled and explained." Lond. 1656, folio.

Owen (Dr. John), an eminent and learned diſſenting miniſter, was born in 1616, at Hadham, in Oxfordſhire, of which place his father was vicar. He made ſuch ſurpriſing proficiency in learning, that at twelve years of age he was admitted into Queen's-college, Oxford, and in 1635 was made maſter of arts; but ſoon after, diſapproving the new regulations made by Archbiſhop Laud their chancellor, with which he refuſed to comply, he was obliged, in 1637, to leave the univerſity; when, taking orders, he became chaplain to Sir Robert Dormer, of Aſcot, in Oxfordſhire, and was at the ſame time tutor to his eldeſt ſon. He was afterwards chaplain to John lord Lovelace of Hurley, in Berkſhire; when the civil war broke out, he openly avowed the cauſe of the parliament; which was ſo reſented by an uncle, who had intended to leave him his eſtate, that he diſcarded him, and left it to another. Yet though lord Lovelace ſided with the king, he treated his chaplain with great civility: but on his going to join the royal army, Mr. Owen went to London, and ſoon after joined the non-conformiſts. In 1642 he publiſhed his book, intitled, *A Diſplay of Arminianiſm*, which laid the foundation of his future advancement; for the committee for purging the church of ſcandalous miniſters were ſo pleaſed with it, that Mr. White their chairman, ſent him a preſentation of the living of Fordham in Eſſex: but when he had been there about a year and a half, the patron hearing that the ſequeſtered incumbent was dead, preſented another to the living; upon which the earl of Warwick gave Mr. Owen the living of Coggeſhall. He had not, however, been long at that town before he left the Preſbyterians; and, joining the Independents, formed a church there. He was now ſent for ſeveral times to preach before the parliament; and among the reſt on the 28th of February 1648 9, the day of humiliation for the intended expedition to Ireland. Cromwell, who was preſent at this laſt diſcourſe, and had never heard him before, was extremely pleaſed with it, and deſired his company into Ireland, and that he would reſide in the college of Dublin. This he did; but returned in about half a year. Soon after Cromwell ſent him

into Scotland; but he alſo returned from thence after about half a year's ſtay at Edinburgh. He was then promoted to the deanery of Chriſt-church, Oxford, whither he went in 1651; and Cromwell, being now chancellor of the univerſity, nominated him his vice-chancellor. The next year he was created doctor of divinity by diploma. Dr. Owen enjoyed the poſt of vice-chancellor five years; during which he behaved with the greateſt moderation: for, though often ſolicited, he never moleſted the meeting of the royaliſts at the houſe of Dr. Willis the phyſician, where divine ſervice was performed according to the liturgy of the church of England; and though he was a commiſſioner for ejecting ſcandalous miniſters, he frequently overruled his brethren in favour of thoſe royaliſts who were diſtinguiſhed by their merit. At the death of Cromwell, he was removed from the vice-chancellorſhip; and at the Reſtoration was ejected from his deanery of Chriſt-church. But he had provided himſelf a comfortable retreat at an eſtate he had purchaſed at Hadham. He now employed himſelf in preaching as often as he had an opportunity, and in writing books; one of which, intitled *Fiat Lux*, falling into the hands of lord Clarendon, he was ſo pleaſed with it, or (as is ſaid) from policy pretended to be ſo, that he ſent for Dr. Owen, and acknowledging the ſervice he had done by it to the Proteſtant religion, offered to prefer him in the church if he would conform; but he deſired to be excuſed.—His moderation drew him reſpect from perſons of oppoſite principles; and in the number of his friends were Dr. Wilkins, biſhop of Cheſter, and Dr. Barlow, biſhop of London. He died at Ealing in 1683. His works are printed in ſeven volumes folio.

Wood, after cenſuring him in many reſpects, ſays nevertheleſs, that "to ſpeak impartially, he was a perſon well ſkilled in the tongues, Rabbinical learning, and Jewiſh rites and cuſtoms; that he had a great command of his Engliſh pen, and was one of the genteeleſt and faireſt writers who have appeared againſt the church of England."

OWHYHEE, the eaſternmoſt, and by far the largeſt, of the Sandwich iſlands. W lon. 156. 0. S. lat. 19. 28. Its greateſt length from north to ſouth is 28½ leagues, its breadth 24, and its circumference nearly 300 Engliſh miles. It is divided into ſix large diſtricts; two of which on the north-eaſt ſide are ſeparated by a mountain, that riſes in three peaks, which is perpetually covered with ſnow, and may be ſeen clearly at 40 leagues diſtance. To the north of this mountain, the coaſt conſiſts of high and ſteep cliffs, down which fall many beautiful caſcades of water. The whole country is covered with cocoa-nut and bread-fruit-trees. The peaks of the mountain on the north-eaſt ſide appear to be about half a mile in height, and entirely covered with ſnow. To the ſouth of this mountain, the coaſt preſents a proſpect of the moſt dreary kind, the whole country appearing to have undergone a total change by means of ſome dreadful convulſion. The ground is every where covered with cinders, and interſected in many places with black ſtreaks, which ſeem to mark the courſe of a lava that has flowed not many ages ſince from the mountain to the ſhore. The ſouthern promontory looks like the mere dregs of a volcano. The projecting headland is compoſed of broken and craggy rocks, piled irregularly upon one another, and terminating in ſharp points; yet, amidſt theſe ruins, there are many pieces of rich ſoil, which are carefully laid out in plantations, and the neighbouring ſea affords a vaſt variety of excellent fiſh: ſo that this quarter is much better inhabited than thoſe which are more verdant. The fields are incloſed with ſtone fences, and are interſperſed with groves of cocoa-nut trees. We are told indeed by ſome of Cook's people who walked through a conſiderable part of it, that they did not obſerve a ſpot of ground that was ſuſceptible of improvement left unplanted; and indeed the country, from their account, could ſcarcely be cultivated to greater advantage for the purpoſes of the natives. They were ſurpriſed at ſeeing ſeveral fields of hay; and upon their inquiry, to what particular uſe it was applied, they were informed, that it was intended to cover the grounds where the young *taro* grew, in order to preſerve them from being ſcorched by the rays of the ſun. They obſerved among the plantations a few huts ſcattered about, which afforded occaſional ſhelter to the labourers; but they did not ſee any villages at a greater diſtance from the ſea than four or five miles. Near one of them, which was ſituated about four miles from the bay, they diſcovered a cave, forty fathoms in length, three in breadth, and of the ſame height. It was open at each end; its ſides were fluted as if wrought with a chiſel; and the ſurface was glazed over, perhaps by the action of fire. There are ſuppoſed to be on this iſland about 150,000 inhabitants. So long as the name of Captain Cook ſhall be remembered, this iſland will not be forgotten; for he here fell a victim to a ſtrange concatenation of events. See Cook.

OWL, in ornithology. See Strix.

OWLING, ſo called from its being uſually carried on in the night, is the offence of tranſporting wool or ſheep out of this kingdom, to the detriment of its ſtaple manufacture. This was forbidden at common law, and more particularly by ſtatue 11 Edw. III. c. 1. when the importance of our woollen manufacture was firſt attended to; and there are now many later ſtatutes relating to this offence, the moſt uſeful and principal of which are thoſe enacted in the reign of Queen Elizabeth, and ſince. The ſtatute 8 Eliz. c. 3. makes the tranſportation of live ſheep, or embarking them on board any ſhip, for the firſt offence, forfeiture of goods, and impriſonment for a year, and that at the end of the year the left hand ſhall be cut off in ſome public market, and ſhall be there nailed up in the openeſt place; and the ſecond offence is felony. The ſtatutes 12 Car. II. c. 32. and 7 & 8 Will. III. c. 28. make the exportation of wool, ſheep, or fuller's earth, liable to pecuniary penalties, and the forfeiture of the intereſt of the ſhip and cargo by the owners, if privy; and confiſcation of goods, and three years impriſonment to the maſter and all the mariners. And the ſtatute 4 Geo. I. c. 11. (amended and farther enforced by 12 Geo. II. c. 21. and 19 Geo. II. c. 34), makes it tranſportation for ſeven years, if the penalties be not paid.

OXALIS, woodsorrel: A genus of the pentagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 14th order, *Gruinales*. The calyx is pentaphyllous; the petals connected at the heels; the capſule pentagonal, and opening at the angles. There are ſeven ſpecies; of which the only remarkable is the acetoſella, or common woodſorrel. This grows naturally in moiſt ſhady woods, and at the ſides of hedges in many parts of Britain, and is but ſeldom admitted into gardens. The roots are compoſed of many ſcaly joints, which propagate in great plenty. The leaves ariſe immediately from the roots upon ſingle long foot-ſtalks, and are compoſed of three heart-ſhaped lobes. They are gratefully acid, and of uſe in the ſcurvy and other putrid diſorders.

OXFORD, the capital of a county of the ſame name in England, celebrated for its univerſity, and pleaſantly ſituated in a plain, with a fine fruitful country all around. The compoſition of the name is obvious. In the Britiſh times it ſeems to have been a place of ſtudy. "The wiſdom of our anceſtors (ſays Camden), as appears in our hiſtory, conſecrated even in the Britiſh times this city to the muſes, tranſlating them from Greeklade (now a ſmall town in Wilts) hither, as to a more fruitful nurſery. For Alexander Necham writes, 'Italy claims ſuperior knowledge of civil law; but the ſtudy of divinity and the liberal arts prove, that the univerſity of Paris deſerves the preference of all others. Agreeable alſo to Merlin's prophecy,

Wiſdom has flouriſhed at the Ford of Oxen, and will in its due time paſs over alſo into Ireland.' But in the following Saxon age, when ſo many critics were deſtroyed, it underwent the common fate, and for a long while was famous only for the relics of Frideſwide, who was ranked among the ſaints for her holy life, merely becauſe ſhe had ſolemnly devoted herſelf to God; and prince Algar, ſoliciting her in marriage, was miraculouſly, as they ſay, deprived of his eye-ſight."

Perhaps the following additional extract from Camden will be more to the purpoſe in developing the ancient ſtate of learning in this city, than any thing which we could bring forward of our own. "When the ſtorm of the Daniſh war was over, the moſt religious prince Alfred, A. D. 886, reſtored their retreats to the long-exiled muſes, by founding three colleges, one for grammarians, another for philoſophy, and a third for divinity. This will be more fully explained by the following paſſage in the old annals of the New Monaſtery at Wincheſter. 'In the year of our Lord 806, the ſecond year of the arrival of St. Grimbald in England, the univerſity of Oxford was begun; the firſt who preſided and read divinity lectures in it being St. Neoth, an abbot and able divine; and St. Grimbald, a moſt eminent profeſſor of the incomparable ſweetneſs of the ſacred pages; Aſſer the monk, an excellent ſcholar, profeſſing grammar and rhetoric; John monk of the church of St. David giving lectures in logic, muſic, and arithmetic; and John the monk, colleague of St. Grimbald, a man of great parts, and a univerſal ſcholar, teaching geometry and aſtronomy before the moſt glorious and invincible king Alfred, whoſe memory will dwell like honey in the mouths of all." Soon after, as we find in an excellent MS. of the ſaid Aſſer, who was at that time profeſſor here, 'broke out a ſharp and fatal quarrel between Grymbold and thoſe very learned men whom he had brought thither with him, and the old ſcholars whom he found there; who, on his coming, unanimouſly refuſed to receive the rules, methods, and forms of lecturing, that Grymbold introduced. Three years had paſſed without any great difference between them; but the ſecret averſion afterwards broke out with the utmoſt violence. In order to quell it, the invincible King Alfred, as ſoon as he heard of it by the meſſages and complaints from Grymbold, went in perſon to Oxford to put an end to the diſpute, and he took the greateſt pains to hear the cauſes and complaints on both ſides. The foundation of the difference was this: The old ſcholars maintained, that before Grymbold came to Oxford learning had flouriſhed there, though the ſcholars at that time were fewer than in more ancient times, the greater part being driven out by the cruelty and oppreſſion of the Pagans. They alſo proved and ſhowed, and that by the undoubted teſtimony of ancient chronicles, that the ordinances and regulations of the place were eſtabliſhed by certain religious and learned men, ſuch as Gildas, Melkinus, Ninnius, Kentigern, and others, who had all lived to a good old age in theſe ſtudies, having ſettled matters there in peace and harmony; and alſo that St. Germanus came to Oxford, and ſtaid there half a year in his journey over Britain to preach againſt the Pelagian hereſies, and wonderfully approved their plan and inſtitution. The king, with unheard of condeſcenſion, gave both parties attentive hearing, and repeated his pious and ſeaſonable advice to maintain mutual union and concord, and left them with the proſpect that both parties would follow his advice and embrace his inſtitutions. But Grymbold, offended at this proceeding, immediately retired to the monaſtery at Wincheſter lately founded by king Alfred. He alſo cauſed his tomb to be removed to Wincheſter, in which he had intended to lay his bones when his courſe of life was ended, in the vault under the chancel of St. Peter's church at Oxford, which church himſelf had built from the ground of ſtone poliſhed in the moſt coſtly manner.'

"This happy reſtoration of learning was followed in a few years by various calamities. The Danes in the reign of Edward plundered and burnt the place; and ſoon after Harold Harefoot practiſed the moſt inhuman barbarities here in revenge for ſome of his men who were killed in an affray; ſo that the moſt melancholy remove of the ſtudents enſued, and the univerſity remained almoſt extinct, a lamentable ſpectacle till the time of William the Norman. Some have falſely ſuppoſed this prince took the city, miſled by a wrong reading in ſome copies of *Oxonia* for *Exonia*. At that time, however, it was the ſeat of an univerſity, as we learn from theſe words of Ingulphus, who lived at that time. 'I Ingulphus ſettled firſt at Weſtminſter, was afterwards ſent to ſtudy at Oxford, having made greater proficiency than many of my own age in Ariſtotle, &c.' What we call an *univerſity*, they in that age called a *ſtudy*." Many are of opinion that it was deſerted till about the year 1229, and that this deſertion was in conſequence of its having been beſieged and taken by William the Conqueror. About this year, however, Robert Pulen began to read lectures in divinity, or (as it is expreſſed in the chronicle of Oſeney abbey) the Holy Scriptures, which had fallen into neglect in England; and ſuch was the reſort of ſtudents to it, that in the reign of King John there were not fewer than 3000. Robert d'Oily, a Norman, to whom William the Conqueror had given the greateſt part of it, built a caſtle on the weſt ſide in 1071; and he is alſo ſuppoſed to have ſurrounded it with walls. In a palace built by Henry I. was born Richard I. commonly called *Cœur de Lion*. About the tenth of King John, there happened a quarrel between the citizens and ſtudents; in conſequence of which many of the latter quitted it, but returned again a few years afterwards. Here Henry III. held a parliament to ſettle the differences betwixt him and his barons; when he confirmed the privileges granted to the univerſity by his predeceſſors, and added others of his own. In this reign the ſtudents are ſaid to have been 30,000, who were all excommunicated by the pope for ſome rudeneſs to his legate. In the time of Duns Scotus, we are told that 30,000 ſcholars attended his lectures. Matthew Paris ſtyles the univerſity of Oxford, 'the ſecond ſchool of the church after Paris, and the very foundation of the church.' The popes had before this honoured it with the title of *Univerſity*, which they had conferred by their decrees on no other but that of Paris, this of Oxford, and thoſe of Bologna and Salamanca. It was decreed in the council of Vienne, that 'ſchools for the ſtudy of the Hebrew, Arabic, and Chaldee languages, ſhould be erected in the ſtudies of Paris, Oxford, Bologna, and Salamanca (as the moſt conſiderable), that the knowledge of theſe languages might prevail by their being thus taught; and that Catholic perſons be choſen, ſufficiently verſed therein, two in each language. For thoſe in Oxford, the biſhops, monaſteries, chapters, convents, colleges, exempt and not exempt; and the rectors of churches throughout England, Scotland, Ireland, and Wales, were to provide a competent maintenance." In Edw. III.'s time, the ſcholars were ſplit into two factions, called the *northern* and *ſouthern men*; a diviſion which was attended with many diſorders and much violence, but in a ſhort time concord and harmony again prevailed.

As colleges began about this time to be founded and endowed, we ſhall here preſent our readers with a liſt of them, together with the time when, and the perſons by whom, they were founded.

Colleges.	*Founders.*	*Kings reigns.*
Univerſity.	King Alfred.	Alfred.
Baliol.	Sir John Baliol, father to the king of Scots.	Henry III.
Merton.	Walter Merton, lord chancellor and biſhop of Rocheſter.	Edward I.
Oriel.	Edward II.	Edw. II.
Exeter.	Walter Stapleton, biſhop.	Edw. II.

Queens.	Robert Eglesfield, B. D.	Edw. III.
New College.	William of Wickham, biſhop of Wincheſter, lord chancellor.	Edw. III.
Lincoln.	Richard Fleming, biſhop of Lincoln.	Henry VI.
All-Souls.	Hugh Chicheley, archbiſhop of Canterbury.	Henry VI.
Magdalen.	William Wainfleet, biſhop of Wincheſter, lord chancellor.	Henry VI.
Brazen-noſe.	William Smith, biſhop of Lincoln, and Richard Sutton, Eſq.	Henry VIII.
Corpus-Chriſti.	Richard Fox, biſhop of Wincheſter, and lord privy ſeal.	Henry VIII.
Chriſt Church.	Henry VIII. and Cardinal Wolſey.	Henry VIII.
Trinity.	Sir Thomas Pope.	Mary.
St. John Baptiſt.	Sir Thomas White, merchant of London.	Mary.
Jeſus.	Queen Elizabeth.	Elizabeth.
Wadham.	Nicholas and Dorothy Wadham.	James I.
Pembroke.	Thomas Tiſdale, Eſq. and Dr. Richard Whitwick.	James I.

Worceſter was called *Glouceſter-hall* till lately, that it was endowed by Sir Thomas Coke, and made collegiate.

Hartford was *Hart-hall* till 1740, that it was erected into a college by Dr. Richard Newton.

All theſe are richly endowed, and have fine gardens, libraries, chapels, &c. The halls in which the ſtudents maintain themſelves, except a few that have exhibitions, are theſe: St. Edmund's, belonging to Queen's college; Magdalen, to Magdalen college; St. Alban's, to Merton; St. Mary's, to Oriel; New-Inn, to New-college. Several perſons have been great benefactors to particular colleges, as Dr. Ratcliffe to Univerſity college; Colonel Codrington and Dr. Clarke, to All-ſouls; Queen Caroline, to Queen's; the before mentioned Dr. Clarke and Mrs. Eaton, to Worceſter; Dr. Wake, archbiſhop of Canterbury, to Chriſt-church. The moſt conſiderable of theſe colleges are Magdalen's and Chriſt-church, which are as noble foundations as any in the world. The church of the latter is the cathedral, and has a dean, eight canons, eight chaplains, eight ſinging men, eight choriſters, a teacher of muſic, and an organiſt. Each of the colleges has its viſitor appointed by its ſtatutes, except Chriſt-church, which is ſubject to the viſitation of the Sovereign alone. The other remarkable buildings belonging to the univerſity are, firſt, the public ſchools; ſecondly, the Bodleian or public library; thirdly, Ratcliffe's library, a moſt elegant ſtructure, for building and furniſhing which, Dr. Ratcliff left 40,000l.; fourthly, the theatre, built by Sheldon, archbiſhop of Canterbury; fifthly, the muſeum, in which is an elaboratory and a repoſitory for natural and artificial rarities and antiquities; ſixthly, the Clarendon printing-houſe, ſo called, becauſe it was built partly with the money ariſing to the univerſity by the ſale of lord Clarendon's hiſtory. To the ſouth of Magdalen college lies the phyſic garden, inſtituted by the earl of Danby, and much improved by Dr. Sherrard. It contains five acres, in which is a complete ſeries of ſuch plants as grow naturally, diſpoſed in their reſpective claſſes: together with two neat and convenient green-houſes, ſtocked with a valuable collection of exotics, and a hot-houſe, where various plants brought from the warmer climates are raiſed. The whole body of the univerſity, including profeſſors, fellows, and ſtudents of all ſorts, exceeds 3000. Each college has its particular ſtatutes and rules for government. There are four terms in the year for public exerciſes, &c. and particular days and hours for public lectures by the ſeveral profeſſors. The univerſity is governed by a chancellor, high-ſteward, vice chancellor, two proctors, a public orator (ſee *Public* ORATOR); a keeper of the archives, a regiſter, three eſquire-beadles, and three yeoman-beadles. As to the city, it has had the ſame privileges granted to it as London, particularly an exemption from toll all over England. It was made an epiſcopal ſee in 1541, when Robert King, the laſt abbot of Oſeney, was elected Biſhop. It is governed by a mayor, high ſteward, recorder, four aldermen, eight aſſiſtants, two bailiffs, a town-clerk, two chamberlains, all that have borne the office of bailiff and chamberlain, and twenty-four common-council men: but theſe are ſubject to the chancellor or vice-chancellor of the univerſity in all affairs of moment; and not only the mayor, but the principal citizens, and ſheriff of the county, take an oath to maintain the privileges of the univerſity. The city, including the colleges, is a place of conſiderable magnitude, having 13 pariſh churches, beſides the cathedral, well built, clean, and regular. At the entrance of the town from the Woodſtock and Banbury roads, a neat hoſpital hath been lately erected by the truſtees of Dr Ratcliffe's benefaction, out of the ſurplus money remaining after defraying the expence of his library. The male line of the family of Vere, to whom the city had given the title of earl for 500 years, failing in Aubrey de Vere, who was twentieth earl, Queen Anne conferred the title upon Robert Harley, a deſcendant of the Veres, in whoſe family it ſtill continues. The chief trade of the city is in malt, conveyed in barges to London. It is impoſſible, in the narrow bounds neceſſarily preſcribed to this article, to give ſuch an account of this celebrated place as its importance demands; but we ſhall refer our readers to the article UNIVERSITY, which will contain farther particulars.

OXFORDSHIRE, which made part of the territory of the ancient *Dobuni*, a county of England, bounded on the weſt by Glouceſterſhire; on the ſouth, where it is broadeſt, the river Iſis divides it from Berkſhire; on the eaſt, it is bounded by Buckinghamſhire; and on the north, where it terminates in a narrow point, it has on the one ſide Northamptonſhire, and on the other Warwickſhire. It extends 50 miles from north to ſouth, and 35 from eaſt to weſt, making about 130 in circumference: within which are contained one city, 15 market-towns, 280 pariſhes, 14 hundreds, 534,000 acres, and about 120,000 ſouls. The air is ſweet and pleaſant, and the ſoil rich and fertile. The lower parts conſiſt of meadows and corn-fields, and the higher were covered with woods till the civil wars; in which they were ſo entirely deſtroyed, that wood is now extremely ſcarce and dear, except in what is called the chiltern, and ſo is coal; of conſequence fuel bears an exorbitant price. The county is extremely well watered: for beſides the Iſis, Tame, Cherwell, Evenlode, and Windruſh, there is a great number of leſſer rivers and brooks. One of the four great Roman ways paſſes quite through this county, entering at the pariſh of Chinner, and going out at that of Goring. There is another leſſer one, that extends between Colnbrook and Wallinford, called *Gremeſdike*. The county ſends nine members to parliament, viz. two for the ſhire, two for the city, two for the univerſity, two for new Woodſtock, and one for Banbury.

OXGANG, or OXGATE, is generally taken, in our old law-books, for 15 acres, or as much ground as a ſingle ox can plough in a year.

OXUCLÆ, in natural hiſtory, the name of a genus of foſſils of the claſs of ſelenitæ, but of the columnar, not the rhomboidal, kind. Of this genus there are only two known ſpecies: 1. A fine kind with thin flakes and tranſverſe filaments, found in the clayey banks of the river Nen, near Peterborough in Northamptonſhire; and, 2. A dull kind with thick plates and longitudinal filaments. This is not uncommon in Yorkſhire, and lies ſometimes in a yellow and ſometimes in a blue clay.

OXUS, or JIHUN, a large river of Aſia, much taken notice of in ancient hiſtories, but does not riſe in the north of India,

as moſt writers affirm; for, according to the beſt and lateſt maps made by thoſe who have been upon the ſpot, it ran a courſe of about 260 miles from the Caſpian Sea to the lake Aral, whoſe dimenſions have lately been diſcovered, and is but very lately known to the Europeans; but, as it paſſes through a deſert country abounding with ſands, the inhabitants ſo diverted its courſe, that the old channel can hardly be diſcovered.

OXYCRATE, in pharmacy, a mixture of vinegar and water, proper to aſſuage, cool, and refreſh. The uſual proportion is one ſpoonful of vinegar to five or ſix ſpoonfuls of water.

OXYD, is the term uſed in the new chemical nomenclature to expreſs a very numerous claſs of bodies formed by the union of certain baſes with a ſmaller proportion of oxygene than what is neceſſary for their converſion into acids. (See Oxygene). The moſt remarkable of theſe bodies are what were formerly called metallic calces, and have for their baſe ſome metallic ſubſtance. It is in this ſtate that metals are contained in their ores, from which they are extracted, and converted into the reguline or metallic form, by the proceſs called *reduction*. Metals are converted into oxyds by combuſtion, and by ſolution in acids; and many of them aſſume this form from the action of the atmoſphere alone, but more readily when this is aſſiſted by moiſture. During their converſion into oxyds, metals loſe their ſplendor, and, acquiring a conſiderable increaſe of abſolute weight, put on an earthy, pulverulent appearance. It has of late been ſuppoſed that all earths are metallic oxyds, and that all of them would be capable of reduction, were we poſſeſſed of any body for which oxygene had a ſtronger elective attraction than that by which it is kept in conjunction with the baſes of theſe ſuppoſed oxyds. But this opinion, being perfectly unſupported by experiment, cannot be admitted in a ſcience which, like the chemiſtry of the preſent day, aſpires to demonſtration.

The term oxyd, however, is not confined to the combinations of metals with oxygene, but expreſſes that firſt degree of oxygenation in all bodies which, without converting them into acids, cauſes them to approach to the nature of ſalts; and of theſe there is a prodigious variety: as the oxyd of phoſphorus, which is the white concrete ſubſtance into which that body is converted by combuſtion; the oxyd of azote, or nitrous air of Dr. Prieſtley: and a great many others. Moſt of the oxyds from the vegetable and animal kingdoms have baſes compounded of different ſimple combuſtible bodies. Thus ſugar, all the gums, mucus, and ſtarch, are vegetable oxyds; the baſes of which are hydrogene and carbone, combined in various proportions. We find accordingly, that all theſe bodies are, by farther additions of oxygene, convertible into acids; and it is probable that theſe acids differ from each other only in the proportion of the hydrogene and carbone in their baſes. The baſes of the animal oxyds are ſtill more complicated; all, or moſt of them, conſiſting of various combinations of azote, phoſphorus, hydrogene, carbone, and ſulphur. See Calx, Chemistry, and the *Table of Chemical Nomenclature*.

OXYDATION, is a term employed by the later chemiſts to expreſs the proceſs by which bodies are converted into oxyds; and it is allowed on all hands to be exactly ſimilar to combuſtion. The nature of this proceſs has been much diſputed; and the queſtion on this ſubject involves in itſelf great part of the controverſy between the followers of the immortal Stahl and the juſtly celebrated Lavoiſier, the founders of the plogiſtic and antiphlogiſtic theories, which have for ſome years divided the chemical world. A view of this queſtion, ſufficiently diſtinct, may be taken from the caſe of metals and their oxyds. Metallic calces (*oxyds* ſay the phlogiſtians) are ſimple bodies, which, when united with phlogiſton, form metals. The proceſs of *reduction* conſiſts in expoſing the ores of metals to an intenſe heat in contact with ſome inflammable body, moſt commonly charcoal. During this operation, ſay they, the charcoal being inflamed, parts with its phlogiſton, which is immediately abſorbed by the calx, and a metal is formed. Lavoiſier and his followers, on the contrary, contend that metals are ſimple bodies; but that in the ſtate of oxyds, that is, as they commonly exiſt in their ores, they are combined with oxygene. But as oxygene at a high temperature is more ſtrongly attracted by charcoal than by moſt metals, during the proceſs of reduction the oxyd is decompounded, and the oxygene unites with the charcoal to form carbonic acid, leaving the regulus or metal free. On this point hinges the great queſtion, the deciſion of which muſt materially affect almoſt every part of chemical theory. Without preſuming to decide between theſe two opinions, the former of which is ſtill ſupported by one or two chemiſts of the firſt rank, we agree with Dr. Black in thinking that, though there ſtill remain a few facts which have not been thoroughly explained on antiphlogiſtic principles, this theory is much more ſimple, and better ſupported by facts, than any that preceded it. It has this great advantage over the doctrine of Stahl, that it requires not the ſuppoſition of an arbitrary body, which does not affect our ſenſes, and of the exiſtence of which we have not even a ſhadow of proof. Perhaps we may farther venture to aſſert, that though it may be extremely difficult, or even impoſſible, to refute the phlogiſtic theory, influenced as we have all been by a ſtrong prejudice in its favour; yet had it been brought forward for the firſt time, when our knowledge had arrived at the point which it now holds, it never would have been generally received. See Calcination, Chemistry, Combustion, Inflammation.

OXYGENE, a term adopted in the new chemical nomenclature to expreſs the acidifying principle; from οξυς "acid," and γινομαι "to generate." It is not found naturally in a ſeparate ſtate, but always combined or mixed with ſome other ſubſtance. In its aeriform or elaſtic ſtate, it is called by the French chemiſts *oxygenous gas*, and is the ſame as the *dephlogiſticated air* of Prieſtley and Cavendiſh, the *empyreal air* of Scheele, the *vital air* and *pure air* of other modern chemiſts. It was called *dephlogiſticated* by the followers of Stahl's doctrine, who imagined it to be air deprived of phlogiſton; the epithet of *empyreal* was given to it by Mr. Scheele, who firſt diſcovered it to be the only conſtituent part of the atmoſphere which contributes to ſupport inflammation or combuſtion. He made many curious experiments on inflammation, and was the firſt who completely analiſed common air, ſhowing it to conſiſt of 27 parts of empyreal, 72 of foul, and 1 of fixed air. He found, that theſe 27 parts only were conſumed by a burning body; and that theſe, during the act of combuſtion, were united and combined with the inflammable body burnt in them, ſo as to form a compound no longer combuſtible. Lavoiſier extending theſe experiments, found that the body, thus produced by empyreal air, being combined with the matter of the inflammable body burnt in it, was, in many caſes, an acid; in conſequence of which property, he gave this air the name of *oxygene*, i. e. "the generator of acidity." He was perhaps too haſty in adopting this name; for the ſame air is found in combination with inflammable matter, forming compounds that are by no means acid, of which we ſhall content ourſelves with producing only one example, namely *water*, which is the compound reſulting from the combination of this air with inflammable air. See Water.

Common atmoſpheric air was found by Scheele to promote animal life in a manner ſomewhat ſimilar to its promoting combuſtion. He extended his experiments to this ſubject alſo; and he concludes, that this empyreal air is the only part of the atmoſphere which is capable of ſupporting animal life, and that no animal can exiſt a minute without it. In conſequence of this property it has been called *vital air*. Since, however, it is abſolutely neceſſary for the ſupport both of combuſtion and of animal life, and ſince neither of theſe can exiſt without it, both the terms *empyreal* and *vital* are deficient, expreſſing only

certain properties of this elaſtic fluid (which may be alſo ſaid of the word *oxygene*); and hence ſome later chemiſts have ſuggeſted the propriety of defining it by the name of *pure air*. See Combustion, Inflammation, Chemistry, Air, Water.

OXYGLYCU, a ſpecies of drink prepared of the ſweeteſt honey-combs macerated and boiled. The combs, from which all the honey has been expreſſed, are put into a pot with pure water, and boiled till they ſeem to have depoſited all their contained honey in the water. This liquor is to be kept; and, when diluted with cold water, is to be drank in the ſummer-time, in order to remove thirſt.

OXYMEL, in pharmacy, a compoſition of vinegar and honey. See Pharmacy.

OYER, in law-books, ſeems to have been anciently uſed for what is now called *aſſiſes*. See Assise.

OYES, a corruption of the French Oyez, *Hear ye*; a term or formula frequently uſed by the criers in our courts on making proclamations, or to enjoin ſilence.

OYSTER, in zoology. See Ostrea.

Oyster-*Catcher*. See Hæmatopus.

Oyster-*Fiſhery*. See *Oyſter*-Fishery and Ostrea.

Oysters, *Foſſile*. The largeſt bed that is known of foſſile oyſters is that near Reading in Berkſhire. They are entirely ſhaped, and have the ſame ſubſtance with the recent oyſter-ſhells; and yet ſince the oldeſt hiſtories that mention the place give an account of them, we muſt ſuppoſe they have lain there for a long time. They extend over no leſs than ſix acres of ground; and juſt above them is a large ſtratum of a greeniſh loam, which ſome writers call a green earth, and others a green ſand. It is compoſed of a crumbly marle, and a large portion of ſand. Under them is a thick ſtratum of chalk. They all lie in a level bed; and the ſtrata above the ſhells are natural, and appear never to have been dug through till the time of finding the ſhells.

The oyſter-ſhells and green earth united make a ſtratum of about two feet thick; and over this there is a much thicker ſtratum of a bluiſh and very brittle clay; but neither has this ever been dug through, except where the ſhells are found. This is vulgarly denominated *piercy clay*, and is eſteemed uſeleſs. This clay-bed is about a yard deep, and above it is a ſtratum of fuller's earth, about two feet and a half deep; it is extremely good, and is uſed by the clothiers. Over this there lies a ſtratum of a fine white ſand, unmixed either with the clay or fuller's earth: this is near ſeven feet deep, and above it is a ſtratum of a ſtiff red clay, of which tiles are made. This is again covered with a little vegetable mould; the depth however of this ſtratum of tile-clay cannot be aſcertained, on account of the unevenneſs of the hill. Theſe oyſters are occaſionally found whole, but moſt frequently in ſingle ſhells. When they are in pairs, there is generally ſome of the green ſand found within them: they ſeldom ſtick very faſt together; ſo that unleſs very careſully taken up, it is not eaſy to preſerve them in pairs.

OZÆNA, a foul and malignant ulcer of the noſe, diſtinguiſhed by its fœtor, and often accompanied with a caries of the bones of the noſe.

OZANAM (James), an eminent French mathematician, born at Boligneux in Breſſe, in 1640, of a wealthy family. His father gave him a good education, and deſigned him for the church: but ſome mathematical books falling into his hands, inſpired him with a love for that ſcience; and though he had no maſter to inſtruct him, he made ſuch progreſs in it, that, at 15 years of age, he wrote a piece in mathematics, which he thought proper to inſert in the works he afterwards publiſhed. He at length taught that ſcience at Lyons; and his mathematical leſſons brought him in a conſiderable revenue, till the year 1701: at which period, a war breaking out on the ſucceſſion to the crown of Spain, he loſt almoſt all his ſcholars, and was reduced to a very melancholy ſituation; and his wife dying the ſame year, he was ſo afflicted, that he never perfectly recovered it. In 1702 he was admitted into the Royal Academy of Sciences; and died of an apoplexy in 1717.—He was of a mild and ſerene temper, of ſingular generoſity, and of a cheerful diſpoſition.—He would not allow himſelf to know more of religion than the common people. He uſed to ſay, that "it was the buſineſs of the doctors of the Sorbonne to diſpute, of the pope to decide, and of a mathematician to go to heaven in a perpendicular line." His works are very numerous, and have met with the approbation of the learned. The principal are, 1. Practical geometry, 12mo. 2. A mathematical dictionary. 3. A courſe of mathematics, 5 vols, 8vo. 4. Mathematical and philoſophical recreations, the moſt complete edition of which is that of 1724, in 4 vols. 8vo. 5. An eaſy method of ſurveying. 6. New elements of algebra, a work much commended by Monſ. Leibnitz. 7. Theoretical and practical perſpective, &c.

OZELL (John), a well-known tranſlator, educated in Chriſt's Hoſpital, was poſſeſſed of a competent fortune, and always enjoyed good places, being auditor general of the city and bridge accounts, of St. Paul's cathedral, and of St. Thomas's hoſpital. Notwithſtanding his attention to buſineſs, he ſtill retained a love for polite literature: and though he did not appear as an original author, yet having made himſelf maſter of moſt of the living languages, he favoured the world with many tranſlations from theſe, as well as from the Latin and Greek; which, if they are not the moſt elegant, are generally faithful and true to the originals. He died in the year 1743.

OZIAS, in ſacred hiſtory, the ſon of Micha, of the tribe of Simeon, one of the governors of Bethulia when it was beſieged by Holofernes. He vigorouſly ſupported the ſiege againſt this general, and received Achior into his houſe, when he had been driven from the Aſſyrian camp. Finding however at length that the city was reduced to great neceſſity for water, and that the people mutinied againſt him, he promiſed to ſurrender the place in five days, if in that time God did not ſend them relief. Judith (vi. vii. viii. ix. and x.) being informed of this reſolution, ſent to ſpeak with Ozias and the other leading men of the city; made a prudent remonſtrance upon their ſeeming to preſcribe a time to the Lord, in which he muſt ſuccour them; encouraged them to patience; and without diſcovering her deſign, told them that ſhe would go out in the night. Ozias being at the gate of the city when Judith departed, opened it to her, and waited in the city for the ſucceſs of her undertaking, praying with her people to God that he would be pleaſed to deliver them. See the article Judith.

OZLEWORTH, in England, in Glouceſterſhire, about 18 miles from Glouceſter. It is remarkable for nothing but that in one year, during the reign of Queen Elizabeth, there were no leſs than 231 foxes killed at it.

OZOLÆ, or Ozoli, a people who inhabited the eaſtern parts of Ætolia which were called *Ozolea*. This tract of territory lay at the north of the bay of Corinth, and extended about 12 miles. They received their name from the bad ſtench (ὀζή) of their bodies and clothes, which were the raw hides of wild beaſts. Some derive it from the ſtench of the ſtagnated water in the neighbouring lakes and marſhes. According to a fabulous tradition, they received their name from a very different circumſtance: During the reign of a ſon of Deucalion, a bitch brought into the world a ſtick inſtead of whelps. The ſtick was planted into the ground by the king, and it grew up to a large vine, and produced grapes, from which the inhabitants of the country were called *Ozolæ*, not from ὀζειν, "to ſmell bad," but from ὄζος, "a branch or ſprout." The name *Ozolæ*, on account of its indelicate ſignification, was highly diſagreeable to the inhabitants; they therefore exchanged it ſoon for that of Ætolians.

P.

P the 15th letter and 11th conſonant of the alphabet; the ſound of which is formed by expreſſing the breath ſomewhat more ſuddenly than in forming the ſound of *b*; in other reſpects theſe two ſounds are pretty much alike, and are often confounded one with another. When *p* ſtands before *t* or *ſ*, its ſound is loſt; as in the words *pſalms, pſychology, ptolemaic, ptiſan*, &c. When placed before *h*, they both together have the ſound *f*; as in *philoſophy, phyſic*, &c.

P and *B* are ſo like each other, that Quintilian declares, that in the word *obtinuit*, his reaſon required him to put a *b*, but that his ears could hear nothing but a *p*, *optinuit*: hence in ancient inſcriptions, and old gloſſaries, it appears that theſe two letters have often been confounded. Several nations ſtill pronounce one for the other, the Welch and Germans particularly, who ſay, *ponum vinum*, for *bonum vinum*. Plutarch obſerves, it was uſual for thoſe of Delphi to ſay βαλειν for παλειν, βιχρον for πικρον; and among the Latins, as often as an *s* followed, the *b* was changed into a *p*, as *ſcribo, ſcripſi*.

As an abbrieviation, P ſtands for *Publius, Pondo*, &c. P. A. DIG. for *Patricia Dignitas*; P. C. for *Patres Conſcripti*; P. F. for *Publii Filius*; P. P. for *Propoſitum*, or *Propoſitum publice*; P. R. for *Populus Romanus*; P. R. S. for *Prætoris ſententia*, P. R. S. P. for *Præſes provinciæ*.

P. M. among aſtronomers, is frequently uſed for *poſt meridiem*, or "afternoon;" and ſometimes for *poſt mane*, "after the morning, i. e. after midnight." P. was alſo uſed among the ancients as a numeral letter, ſignifying the ſame with the G, viz. a hundred; according to the verſe of Ugutio, "*P ſimilem cum G numerum monſtratur habere.*" Though Baronius thinks it rather ſtood for ſeven.

When a daſh was added a-top of $\overline{P}$, it ſtood for four hundred thouſand.

St. Jerome obſerves, on Daniel, that the Hebrews had no *P*; but that the *ph* ſerved them inſtead thereof; adding that there is but one word in the whole Bible read with a *P*, viz. *apadno*. The Greek π ſignified 80. On the French coins, *P* denotes thoſe that were ſtruck at Dijon.

In the Italian muſic, P ſtands for *piano*, or "ſoftly;" and P. P. P. for *pianiſſimo*, or "very ſoftly."

Among phyſicians, P ſtands for *pugil*, or the eighth part of an handful; P. Æ. *partes æquales*, or equal parts of the ingredients; P. P. ſignifies *pulvis patrum*, or Jeſuit's bark in powder; and *ppt. preparatus* or prepared.

FABULUM, among natural philoſophers, the ſame with FUEL.

PACA. See the article MUS.

PACE, a meaſure taken from the ſpace between the two feet of a man in walking; uſually reckoned two feet and a half, and in ſome men a yard or three feet. The geometrical pace is five feet; and 60,000 ſuch paces make one degree on the equator.

PACE, in the manege, is of three kinds, viz. walk, trot, and gallop; to which may be added an amble, becauſe ſome horſes have it naturally. Horſes which go ſhuffling, or with mixed paces between the walk and amble, are for the moſt part of no value; which commonly proceeds from their fiery temper, but ſometimes from a weakneſs in their reins or legs.

PACE (Richard), a learned Engliſhman, born about the year 1482. He was educated at the charge of Thomas Langton biſhop of Wincheſter, whom he ſerved as an amanuenſis, and afterwards entered into the ſervice of cardinal Bainbridge. His accompliſhments rendered him ſo acceptable to Henry VIII. that he made him ſecretary of ſtate; and, entering into orders, he was admitted prebendary in the church of York, archdeacon of Dorſet, and dean of St. Paul's, &c. which preferments were conferred on him during his abſence on foreign embaſſies. In 1524 he was ſent to Rome on the death of Pope Leo X. to ſolicit the papal chair for cardinal Wolſey; but a new pope was elected before his arrival, a circumſtance that proved the epocha of his troubles. He fell under the diſpleaſure of the diſappointed cardinal; and being ſoon after employed as ambaſſador at Venice, he was ſo neglected and hardly uſed, that he was ſeized with a frenzy: upon which the king ordered him home; and being carefully attended by the phyſicians at the king's command, he was in a ſhort time reſtored to the uſe of his reaſon, and then applied himſelf to the ſtudy of the Hebrew tongue. Being now introduced to his Majeſty, he remonſtrated againſt the cardinal's cruelty: who being ordered to clear himſelf, ſummoned Pace before him, ſitting in judgment with the duke of Norfolk and others; who condemned Pace, and ſent him to the Tower; where he remained two years, till he was diſcharged by the king's command.—When he was enlarged, he reſigned his deaneries, and died in retirement at Stepney in 1532; after having wrote ſeveral works. There is an elegant and juſt character of him by Leland, written upon his return from Venice. He was much eſteemed by the learned men of his time, eſpecially Sir Thomas More and Eraſmus. The latter had a great opinion of Pace on account of his candour and ſweetneſs of temper; ſo that he was much afflicted at his misfortunes, and could never forgive the man that cauſed them. Stow gives him the character of a right worthy man, and one that gave in council faithful advice: learned he was alſo, ſays that antiquary, and endowed with many excellent parts and gifts of nature; courteous, pleaſant, and delighting in muſic; highly in the king's favour, and well heard in matters of weight. There is extant a remarkable letter of his to the king, written in 1527, wherein he very honeſtly gives his opinion concerning the divorce; and Fiddes obſerves, that he always uſed a faithful liberty to the cardinal which brought him at laſt to confinement and diſtraction.

PACHAMAC, a valley of Peru, in South America, ten miles ſouth of Lima; celebrated for its pleaſantneſs and fertility, but more on account of a magnificent temple built by the Incas of Peru, to the honour of their god. When the Spaniards conquered Peru they found immenſe riches therein.

PACHODECARHOMBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of *ſelenitæ*. The word is derived from the Greek παχυς *thick*, δεκα *ten*, and ρομβος *a rhombus*,

and expreſſes a thick rhomboidal body compoſed of ten planes. The characters of this genus are, that the ſelenitæ of it conſiſt of ten planes; bnt as the top and bottom in the leptodecarhombes, or moſt common kind of the ſelenitæ, are broader and larger planes than any of the reſt, the great thickneſs of this genus, on the contrary, makes its four longer planes in all the bodies of it, meeting in an obtuſe angle from its ſides, its largeſt planes. There are four ſpecies of it.

PACHSU, a ſmall iſland in the Mediterranean ſea; near the coaſt of Epirus, and in European Turkey. It lies ſouth of Corfu, and is ſubject to Venice.

PACIFIC OCEAN, that vaſt ocean which ſeparates Aſia from America. It is called *Pacific*, from the moderate weather the firſt mariners who ſailed in it met with between the tropics: and it was called *South Sea*, becauſe the Spaniards croſſed the iſthmus of Darien from north to ſouth when they firſt diſcovered it; though it is properly the Weſtern ocean with regard to America. Geographers call the South Sea *Mare Pacificum*, "the Pacific Ocean," as being leſs infeſted with ſtorms than the Atlantic; but M. Frezier affirms it does not deſerve that appellation, and that he has ſeen as violent ſtorms therein as in any other ſea: but Magellan happening to have a very favourable wind, and not meeting with any thing to ruffle him when he firſt traverſed this vaſt ocean in 1520, gave it the name which it has retained ever ſince. Maty, however, adds, that the wind is ſo regular there, that the veſſels would frequently go from Acapulco to the Philippine Iſlands without ſhifting a ſail.

PACK, in commerce, denotes a quantity of goods made up in loads or bales for carriage. A pack of wool is 17 ſtone and 2 pounds, or a horſe's load.

PACKAGE, is a ſmall duty of one penny in the pound, paid for all goods not particularly rated.

PACKET, or PACKET *Boat*, a veſſel appointed by the government to carry the mail of letters, packets, and expreſſes from one kingdom to another by ſea in the moſt expeditious manner. Thus, the packet-boats, under the direction of the poſt-maſter-general of Great Britain, carry the mails from Dover to Calais, from Falmouth to Liſborn, from Harwich to Helvoetſluys, and from Parkgate to Dublin. See POST.

PACOS, in zoology, a name given to a ſpecies of camel, commonly though improperly reckoned a ſpecies of ſheep; and known among many by the name of the *Indian ſheep* or *Peruvian ſheep*. See CAMELUS. This creature has been accounted a ſheep, becauſe its hair is ſo long as to reſemble wool, and it is prodigiouſly thick, its head and neck alone having more wool on them than the whole body of our largeſt ſheep. Its body is clothed in the ſame proportion with a woolly hair equally fine.

PACTOLUS (anc. geog.), a river of Lydia, called *Chryſorrhoas*, from its rolling down golden ſand, according to Herodotus, Plutarch, Pliny, and Strabo; riſing in mount Tmolus (Strabo). From this river Crœſus is thought to have had all his riches. In Strabo's time it ceaſed to roll down any. It ran through Sardes; after which it fell into the Hermus, and both together into the Ægean ſea at Phocæa in Ionia. A river celebrated by Virgil, Ovid, Lucan, Lycophron, Horace, Apollonius.

PACUVIUS (MARCUS), of Brunduſium in Calabria, a tragic poet in high reputation about the year of Rome 600. He was nephew of Ennius; publiſhed ſeveral theatrical pieces, though we have only ſome fragments of his poetry remaining; and died at Tarentum at above 90 years of age.

PADAN-ARAM (Bible), literally *the plains of Aram*, or *Syria*; tranſlated by the Seventy ſimply *Meſopotamia*, or *Meſopotamia of Syria*; by the Vulgate, *Syriæ*; the Syrians on this and on the other ſide of the Euphrates, not differing remarkably from each other in language and manners, as Joſephus allows.

PADDOC, or PADDOC-*Courſe*, a piece of ground encompaſſed with pales or a wall, and taken out of a park, for exhibiting races with greyhounds, for plates, wagers, or the like. A paddoc is generally a mile long, and a quarter of a mile broad: at the one end is a little houſe were the dogs are to be entered, and whence they are ſlipped; near which are pens to incloſe two or three deer for the ſport. Along the courſe are ſeveral poſts, viz. the low poſt, which is 160 yards from the dog-houſe and pens; the quarter of a mile poſt, half-mile poſt, and pinching poſt; beſides the ditch, which is a place made to receive the deer, and preſerve them from farther purſuit. And near this place are ſeats for the judges choſen to decide the wager. The keepers, in order to ſlip the dogs fairly, put a falling collar upon each, ſlipped round a ring; and the deer being turned looſe, and put forward by a teazer, as ſoon as he is arrived at the low poſt, the dog-houſe door is thrown open, and the dogs ſlipped. If now the deer ſwerve ſo much, as that his head is judged nearer the dog-houſe than the ditch before he arrive at the pinching poſt, it is no match, and muſt be run over again three days after: but if the deer runs ſtraight beyond the pinching poſt, then that dog which is neareſt when he ſwerves, or is blanched by any accident, wins the match; but if no ſuch ſwerve happens, then the match is won by the dog who firſt leaps the ditch.

PADERBORN, a dutchy of Germany in the circle of Weſtphalia, has the county of Lippe on the north and weſt; Heſſe-Caſſel and Waldeck, on the ſouth; and Munſter, with the duchy of Weſtphalia, on the weſt. Its greateſt length from eaſt to weſt is about 40 miles, and its breadth where wideſt 30. Some parts of it yield good paſture, and breed abundance of cattle; but it is not very fruitful in corn. There is a heath called the *Senne* or *Sende*, of great extent, but very barren and deſolate. There are, however, good iron mines in the country, with ſalt and medicinal ſprings, plenty of deer and other game; and it is watered with ſeveral rivers abounding with fiſh, as the Weſer, the Dimer, the Bever, the Nette, the great Emmer, the Lippe, the Alme, and the Pader. It contains 54 pariſhes, in which are 25 market-towns and 16 monaſteries. The Roman Catholic is the predominant religion of the country, yet there are alſo many Proteſtants in it. The biſhopric was erected by Charlemagne, towards the cloſe of the eighth century; and the cathedral was conſecrated by pope Leo in perſon, anno 796. The biſhop is ſovereign of the country, a prince of the empire, and ſuffragan of the archbiſhop of Mentz. His revenue is about 30,000 pounds a-year, and he is able to raiſe 3000 men. In the matricula, his aſſeſſment is 18 horſe and 34 foot, or 352 florins monthly in lieu of them. Towards the charges of the ſovereign courts of the empire, he pays for each term 162 rix-dollars and 29 kruitzers. The chapter conſiſts of 24 capitular canons, who muſt prove their noble extraction by four deſcents. The arms of the biſhopric are a croſs or, in a field gules. For the government of it, and the adminiſtration of juſtice, there are ſeveral councils and colleges under the biſhop. Here are alſo a hereditary marſhal, ſewer, cup-bearer, chamberlain, ſteward, and purveyor. It was in this biſhopric that Quintilius Varus, with the Roman army under his command, was routed by the Germans under Arminius.

PADERBORN, the capital of the above biſhopric. It ſtands 40 miles north-weſt of Caſſel, 50 ſouth-eaſt of Munſter, and 60 ſouth-weſt of Hanover; being a large, populous, well built, and well-fortified city. Its name is compounded of *pader*, a rivulet, which riſes juſt under the high altar of the cathedral, and *born*, *i. e.* a ſpring. It was one of the Hanſe-towns; and, till 1604, an imperial city. The cathedral is a grand fabric, inferior to few in the empire. There is a gold crucifix in it of 60 pounds weight, preſented by Otho II. The univerſity, of which the Jeſuits have the direction, was founded in 1592,

and the walls were built in the beginning of the 11th century. In 1530 an attempt was made to introduce Lutheraniſm; but 16 of the principal citizens who had embraced it were executed, and the reſt obliged to abjure it. Duke Chriſtian of Brunſwick carried off from hence, in 1692, the ſilver images of the twelve apoſtles, and the ſilver coffin of St Lotharius; and had them coined into money, with this inſcription, *God's Friend, the Prieſts Enemy*. The trade of this town, though formerly great, is now inconſiderable; and the inhabitants ſubſiſt moſtly by agriculture and breeding of cattle. Though the biſhop has a palace in the city, he reſides (when he vouchſafes to viſit this country, which is ſeldom, having other and more valuable benefices) at Neuhaus, ſeven miles off, where he has a magnificent caſtle. Charlemagne and other emperors ſometimes reſided here, and held diets of the empire.

PADOGI, a puniſhment uſed in Ruſſia. The body of the criminal is ſtripped to the waiſt, and then laid upon the ground; one ſlave holds the head of the perſon to be puniſhed between his knees, and another the lower part of the body; then rods are applied to the back till ſome perſon gives notice to deſiſt, by crying out, enough. This puniſhment is conſidered in Ruſſia merely as a correction of the police, exerciſed on the ſoldier by military diſcipline, by the nobility on their ſervants, and by perſons in authority over all ſuch as are under their command. After the acceſſion of Elizabeth to the throne of Ruſſia, the puniſhments were reduced to two kinds, viz. the padogi and KNOUT.

PADUA, an ancient, large, and celebrated city of Italy, with an univerſity and a biſhop's ſee. It is alſo capital of the Paduano; but is much leſs conſiderable than it was formerly: for it now contains no more than 30,000 inhabitants, whereas it formerly had 100,000, and many of the houſes are gone to ruin: however, the hall where juſtice is adminiſtered is a ſuperb ſtructure. The cathedral church, and the college of the univerſity, are in that part called the *Old Town*; and there are piazzas under all the houſes, where perſons may walk without being expoſed to the weather. The garden of the univerſity is curious, on account of the number of plants. Here a ſtudent may take his degrees, let him be of what ſect of Chriſtianity he will; nay, though he ſhould be a Jew or a Turk. The patron of this city is St. Anthony, who lies in the cathedral; they have ſuch a veneration for him, that the beggars do not aſk charity in the name of God, but for the love of St. Anthony. The Jews live in a diſtinct part of the city; and the neighbouring mountains produce excellent wine and oil, with delicious fruit. It was taken by the Venetians in 1706. It is ſeated on the rivers Brentac and Bachiglione, in a fine plane; and is about ſeven miles in circumference. E. long. 11. 55. N. lat. 45. 24.

PADUAN, among the medaliſts, a modern medal ſtruck in imitation of the antique, or a new medal ſtruck with all the marks and characters of antiquity. This name is properly applicable to thoſe medals only that were ſtruck in the ſeventh century by an Italian painter born at Padua; who ſucceeded ſo well in the impoſture, that the beſt judges are at a loſs to diſtinguiſh his medals from the genuine ones. Though it is frequently uſed in general for all medals of this kind.

PADUANO, a ſmall province of Italy, in the territory of Venice, bounded on the eaſt by the Dogado, on the ſouth by the Poleſino di Rovigo, on the weſt by the Veroneſe, and on the north by the Vicentino. Its ſoil is well watered; and is one of the moſt fertile in Italy. The province is about 40 miles in length, and 35 in breadth. Padua is the capital town.

PADUS, anciently called *Eridanus*, eſpecially by the Greeks; a river famous for the fable of Phaeton, (Ovid). It riſes in mount Veſulus, in the Alpes Cothiæ, from three ſprings, dividing the Ciſalpine Gaul into the Tranſpadana and Ciſpadana, (Strabo); and, ſwelled by other rivers falling into it on each ſide from the Alps and Apennines, it diſcharges itſelf with a courſe from weſt to eaſt, at ſeven mouths, into the Adriatic (Mela). The lake through which it diſcharges itſelf into the ſea, is called by the natives the *Seven Seas*. Now the *Po*.

PADUS, in botany. See PRUNUS.

PÆAN, among the ancient pagans, was a ſong of rejoicing ſung in honour of Apollo, chiefly uſed on occaſions of victory and triumph. See APOLLO.

PÆAN, in the ancient poetry, a foot conſiſting of four ſyllables; of which there are four kinds, the pæan primus, ſecundus, &c. The *pæan primus* conſiſts of one long ſyllable and three ſhort ones, or a trochæus and pyrrhichius, as *temporibus*; the pæan ſecundus conſiſts of a ſhort ſyllable, a long, and two ſhort, or an iambus and a pyrrhichius, as *potentia*; the pæan tertius conſiſts of two ſhort ſyllables, a long and a ſhort one, or a pyrrhichius and a trochæus, as *animatus*; the pæan quartus conſiſts of three ſhort ſyllables and a long one, or a pyrrhichius and iambus, as *celeritas*.

PÆDEROTA, in botany: A genus of the monogynia order, belonging to the pentendria claſs of plants; and in the natural method ranking under the 30th order, *Contortæ*. The berry is empty, brittle, and diſpermous; the ſtyle bifid.

PÆDO BAPTISM; infant-baptiſm, or that conferred on children; from παις *infant*, and βαπτισμος *baptiſm*. This has been the ſubject of great controverſy in the church. See ANABAPTISTS, BAPTISTS, &c.

PÆONIA, PIONY: A genus of the digynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 26th order, *Multiſiliquæ*. The calyx is pentaphyllous; the petals five; there are no ſtyles; the capſules are polyſpermous. There are two ſpecies, both of them very hardy, and will flouriſh in any common ſoil. They are large herbaceous flowery perennials, with tuberous roots, ſending up ſtrong annual ſtalks from one to three feet in height; terminated by very large flowers of a beautiful red colour, and much larger than any roſe. The common officinal, or male piony, is alſo remarkable for its capſules turning backward, opening and diſplaying their red inſide, together with the numerous ſeeds, in a ſingularly agreeable order, appearing very ornamental after the flower is paſt. The plants may be propagated either by parting the roots or by ſeed. This plant was formerly celebrated in nervous diſtempers, but the preſent practice pays very little regard to it.

PÆSTUM, called *Poſidonia* by the Greeks, a town of Lucania, on the Sinus Pæſtinus; an ancient colony prior to the firſt Punic war, according to Livy; but later, according to Velleius. *Pæſtanæ roſæ* were in great eſteem, and produced twice a-year (Virgil, Ovid).

PAGAN (Blaiſe Francois Compte de), an eminent French mathematician, was born at Avignon in Provence, March 3, 1604; and took to the profeſſion of a ſoldier at fourteen, having been bred to it with the greateſt care. In 1620 he was engaged at the ſiege of Caen, in the battle of Pont de Ce, and the reduction of the Navareins, and the reſt of Bearn; where he ſignalized himſelf, and acquired a reputation far ſurpaſſing his years. He was preſent, in 1621, at the ſiege of St. John d'Angeli, as alſo that of Clarac and Montauban, where he loſt his left eye by a muſket-ſhot. At this ſiege he had another loſs, which equally afflicted him, viz. that of the conſtable of Luynes, who died there of a ſcarlet fever. The conſtable was a near relation, and had been his patron at court. He did not, however, ſink under the misfortune, but on the contrary took freſh ſpirits from the neceſſity he was now in of truſting ſolely to himſelf. Accordingly there happened after this time neither ſiege, battle, nor any other occaſion, in which he did not ſig-

nalize himſelf by ſome effort of courage and conduct. At the paſſage of the Alps, and the barricade of Suza, he put himſelf at the head of the forlorn hope, conſiſting of the braveſt youths among the guards; and undertook to arrive the firſt at the attack, by a private way which was extremely dangerous; when, having gained the top of a very ſteep mountain, he cried out to his followers, "See the way to glory!" He ſlipt along this mountain; and, his companions following him, they came firſt to the attack, as they wiſhed to do. They immediately began a furious aſſault; and, the army coming to aſſiſt, they forced the barricades. He had afterwards the pleaſure of ſtanding on the left hand of the king, when his majeſty related this heroic action to the duke of Savoy with the deſerved commendations, in the preſence of a very full court. When the king laid ſiege to Nancy, in 1633, our hero had the honour to attend his ſovereign, in drawing the lines and ſorts of circumvallation. In 1642 his majeſty ſent him to the ſervice in Portugal, in the poſt of field marſhal. In this ſame year he unfortunately loſt his eye-ſight by a diſtemper. But though he was thus diſabled from ſerving his country with his conduct and courage, he reaſſumed, with greater vigour than ever, the ſtudy of the mathematics and fortification; and, in 1645, gave the public a treatiſe on this latter ſubject. It was allowed by all who underſtood the ſcience, that nothing had then appeared that was preferable to it; and indeed, whatever improvements have been made ſince, they have perhaps been derived chiefly from this treatiſe, as concluſions from their principles. In 1651 he publiſhed his Geometrical Theorems, which ſhow a perfect knowledge of all the parts of the mathematics. In 1655 he printed A Paraphraſe, in French, of the Account, in Spaniſh, of the River of the Amazons, by Father de Rennes, a Jeſuit; and we are aſſured, that, though blind, he drew the chart of that river and the parts adjacent which is ſeen in this work. In 1657 he publiſhed The Theory of the Planets, cleared from that multiplicity of eccentric circles and epicycles, which the aſtronomers had invented to explain their motions. This work diſtinguiſhed him among aſtronomers as much as that of fortification did among engineers; and he printed, in 1658, his Aſtronomical Tables, which are very ſuccinct and plain. Few great men are without ſome foible: Pagan's was that of a prejudice in favour of judicial aſtrology; and though he is more reſerved than moſt others, yet we cannot put what he did on that ſubject among thoſe productions which do honour to his underſtanding. He was beloved and reſpected by all perſons illuſtrious for rank as well as ſcience; and his houſe was the rendezvous of all the polite and worthy both in city and court. He died at Paris Nov. 18, 1665; and was never married. The king ordered his firſt phyſician to attend him in his illneſs, and gave ſeveral marks of the extraordinary eſteem which he had for his merit.

He had an univerſal genius; and, having turned himſelf entirely to the art of war, and particularly to the branch of fortification, he made extraordinary progreſs in it. He underſtood mathematics not only better than is uſual for a gentleman whoſe view is to puſh his fortune in the army, but even to a degree of perfection ſuperior to that of the ordinary maſters who teach that ſcience. He had ſo particular a genius for this kind of learning, that he obtained it more readily by meditation than by readings authors upon it: and accordingly ſpent leſs time in ſuch books than he did in thoſe of hiſtory and geograghy. He had alſo made morality and politics his particular ſtudy; ſo that he may be ſaid to have drawn his own character in his *Homme Heroique*, and to have been one of the completeſt gentlemen of his time. Louis XIII. was heard to ſay ſeveral times, that the Count de Pagan was one of the moſt worthy, beſt turned, moſt adroit, and moſt valiant men, in his kingdom.—That branch of his family, which removed from Naples to France in 1552, became extinct in his perſon.

PAGAN, a heathen, gentile, or idolater; one who adores falſe gods. See MYTHOLOGY.

PAGANALIA, certain feſtivals obſerved by the ancient Romans in the month of January. They were inſtituted by Servius Tullius, who appointed a certain number of villages *(pagi)*, in each of which an altar was to be raiſed for annual ſacrifices to their tutelar gods; at which all the inhabitants were to aſſiſt, and give preſents in money, according to their ſex and age, by which means the number of country-people was known. The ſervants upon this occaſion offered cakes to Ceres and Tellus, to obtain plentiful harveſts.

PAGANELLUS, in ichthyology. See GOBIUS.

PAGANISM, the religious worſhip and diſcipline of pagans; or, the adoration of idols and falſe gods. See IDOLATRY, MYTHOLOGY, and POLYTHEISM.

PAGEANT, a triumphal car, chariot, arch, or other like pompous decoration, variouſly adorned with colours, flags, &c. carried about in public ſhows, proceſſions, &c.

PAGI (ANTONY), a very famous Cordelier, and one of the ableſt critics of his time, was born at Rogne in Provence, in 1624. He took the habit in the convent at Arles, in 1641, and was at length four times provincial of his order; but his religious duties did not prevent his vigorous application to the ſtudy of chronology and eccleſiaſtical hiſtory, in which he excelled. His moſt conſiderable work is, A Critique upon the Annals of Baronius; where, following the learned cardinal year by year, he has rectified an infinite number of miſtakes both in chronology and in the repreſentation of facts. He publiſhed the firſt volume in 1689, dedicated to the clergy of France, who allowed him a penſion: the whole was printed after his death, in 4 vols. folio, at Geneva, in 1705, by the care of his nephew Francis Pagi, of the ſame order. He wrote ſome other things before his death, which happened in 1699; and had the character of an able hiſtorian as well as of a learned and candid critic. His nephew Francis, above-mentioned, wrote A Chronological Abridgment of the Hiſtory of the Popes, in Latin, 3 vols. 4to. Francis had alſo a nephew, Anthony Pagi, who added three more volumes to the Hiſtory of the Popes; of which two more were intended, if not executed.

PAGNINUS (SANCTES), an Italian Dominican, eminent for his ſkill in Oriental languages and biblical learning, was born at Lucca, in 1466, and became afterwards an eccleſiaſtic of the order of St. Dominic. He was deeply and accurately ſkilled in Latin, Greek, Hebrew, Chaldea, and Arabic; but he was particularly excellent in the Hebrew. He applied himſelf to examine the vulgar tranſlation of the Scriptures; and believing it to be either not of Jerome, or greatly corrupted, he undertook to make a new one from the preſent Hebrew text: in which he meant to imitate St. Jerome, who ſet about making a new tranſlation at a time when the church would admit no other but the Septuagint. This deſign of Pagninus, ſo early after the reſtoration of letters, ſeemed a bold one; yet ſuch was the reputation of the man, that it was approved by Pope Leo X. who promiſed to furniſh him with all neceſſary expences for carrying on the work: and, beſides, we find at the beginning of this tranſlation, which was printed at Lyons, in 1527, two letters of the ſucceeding popes, Hadrian VI. and Clement VII. which licenſed the printing of it. Pagninus, in his Letters to Pope Clement, for the printing of this tranſlation, openly declares, that the Vulgar edition, as it is at preſent, is not St. Jerome's: yet adds, that he has retained in his tranſlation as much of it as he could. It appears by a letter of Picus Mirandula to Pagninus, that he had ſpent 25 years upon this tranſlation. It is the firſt modern tranſlation of the Bible from the Hebrew text; and the Jews who read it affirmed, that it agreed exactly with the Hebrew, and was in ſome reſpects ſuperior to the ancient tranſlations. The great fault of Pagninus was, that he adhered

with two great ſervility to the original text; and this ſcrupulous attachment made his tranſlation, ſays Father Simon, "obſcure, barbarous, and full of ſoleciſms. He imagined, that to make a faithful tranſlation of the Scriptures, it was neceſſary to follow exactly the letter according to the ſtrictneſs of grammar. This, however, is quite contrary to his pretended exactneſs, becauſe two languages ſeldom agree in their ways of ſpeaking; and therefore, inſtead of expreſſing the original in its proper purity, he defaces and robs it of all its ornaments." Father Simon nevertheleſs allows the great abilities and learning of Pagninus; and all the later commentators and tranſlators of the Scriptures have agreed in giving him his juſt praiſe. Huetius, though he thinks Father Simon's criticiſm of him juſt and well grounded, yet propoſes his manner as a model for all tranſlators of the ſacred books: *Scripturæ interpretandæ rationis utile nobis exemplar propoſuit Sanctus Pagninus.* He alſo tranſlated the New Teſtament from the Greek, as he had done the Old from the Hebrew, laying the Vulgar all the while before him; and dedicated it to pope Clement VII. He was author of an Hebrew Lexicon, and an Hebrew Grammar: which Buxtorf, who calls him *vir linguarum Orientalium peritiſſimus*, made great uſe of in compiling his. He died in 1536, aged 70. Luther ſpoke of him and his tranſlations in terms of the higheſt applauſe.

PAGO, an iſland in the gulph of Venice, ſeparated from the continent of Morlachia by a narrow channel. The ancient geographers have left us no deſcription of it; though its form, extent, and rich produce, unqueſtionably deſerved it. And this is the more unaccountable, as we know the Romans were well acquainted with it; and on the other iſlands adjoining to it are many veſtiges of buildings, inſcriptions, tiles, and hewn ſtones, all ſure ſigns of Roman habitations. Its ancient name was in all probability *Fortunata*. "This iſland (ſays Mr. Fortis, in his travels into Dalmatia), is extended from north to ſouth over againſt maritime Croatia, or the mountain Morlacca. It is about 50 miles long; its breadth is unequal. One particular circumſtance diſtinguiſhes it from all the other iſlands of the Adriatic, and is a large internal ſalt-water lake 15 miles long from ſouth to north, into which the ſea enters by a canal not above a quarter of a mile broad in ſome places. This lake is frequented by the tunny fiſh, which, when once in, cannot return again to the ſea. There are alſo two ſmaller lakes on the iſland; one near Vlaſſich, abounding in fiſh, particularly eels; and one near the hamlet of Slabine.

"Many veſtiges of ancient habitations ſtill remain on the iſland of Pago, as well as of walled places, which either have been deſtroyed by the incurſions of enemies or by time. Hiſtorians ſay, that the iſland was often abandoned by its inhabitants; and indeed it is rather to be wondered at how men ever could reſolve to ſettle in ſo wretched a country. The ſmall number of inhabitants, after ſo many years of peace and tranquillity under the Venetian government, evidently proves how little the iſland is really habitable. The town of Pago was built by the Venetians about 300 years ago; and contains upwards of 2000 inhabitants, and all the reſt of the iſland ſcarcely 900. The difficulty of acceſs to the city of Pago, and the ill accommodation that ſtrangers meet with, make it very little frequented. Hence the inhabitants are as wild and unpoliſhed as if they lay at the greateſt diſtance from the ſea and the commerce of polite people. The gentry, who pretend to ſhow their manners different from thoſe of the vulgar, are truly groteſque figures, both in their dreſs, behaviour, and inſolent pretenſions. The ignorance of their clergy is incredible; a prieſt of the greateſt conſequence there, and who was thought a man of learning, did not know how Pago was called in Latin. There are two convents of friars in Pago and one of nuns; and ſeveral churches, all in very bad order, and ill ſerved. At Terra Vecchia alſo there is a convent of Franciſcan monks; a race of men who, under various names and diſguiſes, infeſt every place where credulous ignorance can be perſuaded to maintain the idle and ſuperſtitious. One ſuperſtitious cuſtom, amongſt a variety of others, exiſts among their women, and particularly among thoſe who have been married but a ſhort time, if their huſband happens to die, they tear their hair out in good earneſt, and ſcatter it on the coffin; and this ceremony is ſo much conſecrated by cuſtom, that no woman, even though ſhe had notoriouſly hated her huſband, would fail in performing it."

PAGOD, or PAGODA, a name given by the Eaſt Indians to the temples where they worſhip their gods. We ſhall not in this place enter into a full detail of the ſeveral pagodas of different nations, and their peculiar circumſtances. Theſe matters ſeem to come in more properly under the *religion*, or, as others will call it, the *ſuperſtition*, of the people to whom they belong. We ſhall therefore content ourſelves in the preſent article with an account of a paper in the *Aſiatic Reſearches*, concerning the ſculptures, &c. at Mavalipuram, a few miles north of Sadras, and known to ſeamen by the name of the *ſeven pagodas*.

The monuments which Mr. Chambers (who communicated the paper) deſcribes, appear, he ſays, to be the ruins of ſome great city decayed many centuries ago. "They are ſituated cloſe to the ſea, between Covelong and Sadras, ſomewhat remote from the high road that leads to the different European ſettlements. And when viſited in 1776, there was ſtill a native village adjoining to them which retained the ancient name, and in which a number of *bramins* reſided that ſeemed perfectly well acquainted with the ſubjects of moſt of the ſculptures to be ſeen there.—The rock, or rather hill of ſtone, on which great part of theſe works are executed, is one of the principal marks for mariners as they approach the coaſt, and to them the place is known by the name of the *Seven Pagodas*, poſſibly becauſe the ſummits of the rock have preſented them with that idea as they paſſed: but it muſt be confeſſed, that no aſpect which the hill aſſumes as viewed on the ſhore, ſeems at all to authoriſe this notion; and there are circumſtances, which will be mentioned in the ſequel, that would lead one to ſuſpect, that this name has ariſen from ſome ſuch number of pagodas that formerly ſtood here, and in time have been buried in the waves." The rock here mentioned, as it riſes abruptly out of a level plain of great extent, naturally engroſſes the attention of the eye. It conſiſts chiefly of a ſingle ſtone; and in its ſhape (which is ſingular and romantic), in a diſtant view, it has the appearance of an antique and lofty edifice. Works of imagery and ſculpture crowd thicker upon the eye on a nearer approach, and at firſt ſight at leaſt favours the idea of a petrified town, which, through the credulity of travellers, has been believed to exiſt in various parts of the world. "Proceeding on by the foot of the hill on the ſide facing the ſea, there is a pagoda riſing out of the ground of one ſolid ſtone, about 16 or 18 feet high, which ſeems to have been cut upon the ſpot out of a detached rock that has been found of a proper ſize for that purpoſe. The top is arched, and the ſtyle of architecture according to which it is formed, different from any now uſed in thoſe parts." Beyond this a numerous group of human figures in baſs relief, conſiderably larger than life, attract attention. They repreſent conſiderable perſons, and their exploits, many of which are now very indiſtinct through the injuries of time, aſſiſted by the corroding nature of the ſea-air; others, while protected from that element, are as freſh as when recently finiſhed.

The hill, which is at firſt of eaſy aſcent, "is in other parts rendered more ſo, by very excellent ſteps cut out in ſeveral places, where the communication would be difficult or impracticable without them. A winding ſtair of this ſort leads to a kind of temple cut out of the ſolid rock, with ſome figures of idols in high relief upon its walls, very well finiſhed, and perfectly freſh, as it

faces the weſt, and is therefore ſheltered from the ſea air." This temple our author conjectures to have been a place of worſhip appertaining to a palace; ſome remains of which ſtill exiſt, and to which there is a paſſage from the temple by another flight of ſteps. This conjecture (for it is brought forward merely as ſuch) is in ſome meaſure favoured by ſeveral ruins ſtill remaining, and by the tradition of the bramins who inhabit the place. This finiſhes the objects "on that part of the upper ſurface of the hill, the aſcent to which is on the north; but on deſcending from thence, you are led round the hill to the oppoſite ſide, in which there are ſteps cut from the bottom to a place near the ſummit, where is an excavation that ſeems to have been intended for a place of worſhip, and contains various ſculptures of Hindoo deities. The moſt remarkable of theſe is a gigantic figure of *Viſhnou*, aſleep on a kind of bed, with a huge ſnake wound about in many coils by way of pillow for his head; and theſe figures, according to the manner of this place, are all of one piece hewn from the body of the rock." Theſe works, however, although they are unqueſtionably ſtupenduous, are, in our author's opinion, ſurpaſſed by others about a mile and a half to the ſouthward of the hill. "They conſiſt of two pagados of about 30 feet long by 20 feet wide, and about as many in height, cut out of the ſolid rock, and each conſiſting originally of one ſingle ſtone. Near theſe alſo ſtand an elephant full as big as life, and a lion much larger than the natural ſize, but very well executed, each hewn alſo out of one ſtone. None of the pieces that have fallen off in cutting theſe extraordinary ſculptures are now to be found near or any where in the neighbourhood of them, ſo that there is no means of aſcertaining the degree of labour and time that has been ſpent upon them, nor the ſize of the rock or rocks from which they have been hewn; a circumſtance which renders their appearance the more ſtriking and ſingular. And though their ſituation is very near the ſea-beach, they have not ſuffered at all by the corroſive air of that element, which has provided them with a defence againſt itſelf, by throwing up before them a high bank that completely ſhelters them. There is alſo great ſymmetry in their form, though that of the pagados is different from the ſtyle of architecture according to which idol temples are now built in that country. The latter reſembles the Egyptian; for the towers are always pyramidical, and the gates and roofs flat, and without arches; but theſe ſculptures approach nearer to the Gothic taſte, being ſurmounted by arched roofs or domes that are not ſemicircular, but compoſed of two ſegments of circles meeting in a point at top." Our author obſerves, that the lion in this groupe, as well as one on a ſtone couch in what he took to be a royal palace, are perfectly juſt repreſentations of the true lion, and the natives there give them the name which is always underſtood to mean a lion in the Hindoo language, to wit, *ſing*; but the figure which they have made to repreſent that animal in their idol temples for centuries paſt, though it bears the ſame appellation, is a diſtorted monſter totally unlike the original; inſomuch that it has from hence been ſuppoſed, that the lion was not anciently known in this country. and that *ſing* was a name given to a monſter that exiſted only in Hindoo romance. But it is plain that that animal was well know to the authors of theſe works, who in manners as well as arts ſeem to have differed much from the modern Hindoos.

"There are two circumſtances attending theſe monuments which cannot but excite great curioſity, and on which future inquiries may poſſibly throw ſome light. One is, that on one of the pagados laſt mentioned, there is an inſcription of a ſingle line, in a character at preſent unknown to the Hindoos. It reſembles neither the Deyva-nâgre, nor any of the various characters connected with or derived from it, which have come to the writer's knowledge from any part of Hindoſtan. Nor did it, at the time he viewed it, appear to correſpond with any character, Aſiatic or European, that is commonly known. He had not then, however, ſeen the alphabet of the Balic, the learned language of the Siameſe, a ſight of which has ſince raiſed in his mind a ſuſpicion that there is a near affinity between them, if the character be not identically the ſame. But as theſe conjectures, after ſuch a lapſe of time, are ſomewhat vague, and the ſubject of them is perhaps yet within the reach of our reſearches, it is to be hoped that ſome method may be fallen upon of procuring an exact copy of this inſcription.

"The other circumſtance is, that though the outward form of the pagodas is complete, the ultimate deſign of them has manifeſtly not been accompliſhed, but ſeems to have been defeated by ſome extraordinary convulſion of nature. For the weſtern ſide of the moſt northerly one is excavated to the depth of four or five feet, and a row of pillars left on the outſide to ſupport the roof; but here the work has been ſtopped, and an uniform rent of about four inches breadth has been made throughout the ſolid rock, and appears to extend to its foundations, which are probably at a prodigious depth below the ſurface of the ground. That this rent has happened ſince the work began, or while it was carrying on, cannot be doubted; for the marks of the maſon's tools are perfectly viſible in the excavated part on both ſides of the rent, in ſuch a manner as to ſhow plainly that they have been divided by it. Nor is it reaſonable to ſuppoſe, that ſuch a work would ever have been deſigned or begun upon a rock that had previouſly been rent in two. Nothing leſs than an earthquake, and that a violent one, could apparently have produced ſuch a fiſſure in the ſolid rock; and that this has been the caſe in point of fact, may be gathered from other circumſtances, which it is neceſſary to mention in an account of this curious place. The great rock above deſcribed is at ſome ſmall diſtance from the ſea, perhaps 50 or 100 yards, and in that ſpace the Hindoo village before mentioned ſtood in 17-6. But cloſe to the ſea are the remains of a pagado built of brick, and dedicated to Sib, the greateſt part of which has evidently been ſwallowed up by that element; for the door of the innermoſt apartment, in which the idol is placed, and before which there are always two or three ſpacious courts ſurrounded with walls, is now waſhed by the waves, and the pillar uſed to diſcover the meridian at the time of founding the pagado is ſeen ſtanding at ſome diſtance in the ſea. In the neighbourhood of this building there are ſome detached rocks, waſhed alſo by the waves, on which there appear ſculptures, though now much worn and defaced. And the natives of the place declared to the writer of this account, that the more aged people among them remembered to have ſeen the tops of ſeveral pagodas far out in the ſea, which being covered with copper (probably gilt) were particularly viſible at ſun-riſe, as their ſhining ſurface uſed then to reflect the ſun's rays, but that now that effect was no longer produced, as the copper had ſince become incruſted with mould and verdigris."

From theſe circumſtances our author conjectures, and we think reaſonably, that the magnificent city of which theſe appear to be part of the ruins, has been deſtroyed partly by an earthquake by which the rock was rent, and partly by a ſudden inundation of the ſea, occaſioned by this commotion of the earth. The bramins give an account of this matter peculiar to themſelves, filled with extravagance, fable, and folly; from which, however, with the aſſiſtance of ancient monuments, coins, and and inſcriptions, ſome probable conjectures at leaſt, if not important diſcoveries, may, it is hoped, be made on theſe ſubjects, which are far from being unintereſting to us, either as men, philoſophers, or Chriſtians. Our author thinks, therefore, that the inſcription on the pagodo mentioned above is an object which merits conſiderable attention; and he defends, by very reputable authorities, the conjecture which places it among the languages of *Siam*; but which it is unneceſſary for us either to abridge or to tranſcribe. In the courſe of this inquiry, our author remarks a very near reſemblance between *Sommonacodom*, the

idol of the *Sanieſe*, and the great idol Buddou, held ſacred by the *Chingelays*; and this reſemblance extends alſo to their prieſts. But from the detail of circumſtances which our author brings forward, and to which we refer, he thinks this a ſyſtem of religion different from that of the *Veds*, and ſome of them totally inconſiſtent with the principles and practice of the *bramins*; none of whom, as far as we can collect from Mr. Knox, exiſt among the Chingelays, whoſe religion is totally different from that of the preſent Hindoos. The only part in which there ſeems to be any agreement is in the worſhip of the Debtahs, which has probably crept in among them from their Tamulian neighbours, but that is carried on in a manner very different from the braminical ſyſtem, and appears to be held by the nation at large in very great contempt, if not abhorrence. Knox's account of it is this: "Their temples (*i. e.* thoſe of the Debtahs) are called *covels*," which is the Tamulic word for pagado. He then goes on to ſay, "a man piouſly diſpoſed build a ſmall houſe at his own charge, which is the temple, and himſelf becomes prieſt thereof. This houſe is ſeldom called *God's Houſe*, but moſt uſually *Jacco* the *Devil's*." But of the prevailing religion he ſpeaks in very different terms. and deſcribes it as carried on with much parade and ſplendour, and attended with marks of great antiquity. "The pagados and temples of their gods (ſays he) are ſo many, that I cannot number them. Many of them are of rare and exquiſite work built of hewn ſtone, engraven with images and figures, but by whom and when I could not attain to know, the inhabitants themſelves being ignorant therein. But ſure I am they were built by far more ingenious artificers than the Chingelays that now are on the land. For the Portugueſe in their invaſions have defaced ſome of them, which there is none found that hath ſkill enough to repair to this day." In another place, he ſays, "here are ſome ancient writings engraven upon rocks which puzzle all that ſee them. There are divers great rocks in divers parts in Cande Uda, and in the northern parts. Theſe rocks are cut deep with great letters for the ſpace of ſome yards, ſo deep that they may laſt to the world's end. Nobody can read them, or make any thing of them, I have aſked Malabars and Gentoos, as well as Chingelays and Moors, but none of them underſtood them. There is an ancient temple, Goddiladenni in Yattanour, ſtands by a place where there are of theſe letters." From all which the antiquity of the nation and their religion is ſufficiently evident, and from other paſſages it is plain, that the worſhip of Buddou, in particular, has been from remote times a very eminent part of their religion; for the ſame author, ſpeaking of the tree at Anurodgburro, in the northern part of the iſland, which is ſacred to Buddou, ſays, "the due performance of this worſhip they reckon not a little meritorious: inſomuch that, as they report, 90 kings have reigned there ſucceſſively, where, by the ruins that ſtill remain, it appears they ſpared not for pains and labour, to build temples and high monuments to the honour of this god, as if they had been born to hew rocks and great ſtones, and lay them up in heaps. Theſe kings are now happy ſpirits, having merited it by theſe labours." And again he ſays, "For this god, above all other, they ſeem to have an high reſpect and devotion," &c.

Such is the nature of Mr. Chambers's communication, as far as it reſpects pagados; a ſubject to which the *Aſiatic Society* will doubtleſs again direct their attention; and from the penetration and aſſiduity of its members we have much to expect. Other parts of this paper ſhall be brought forward under other articles, to which we refer. Few reſearches are of more ſervice to true religion, than thoſe which give us a correct view of the falſe and ſuperſtitious modes of worſhip practiſed by men who have had no light but reaſon, or weak and corrupted traditions. They are uſeful likewiſe to the philoſopher, as they always tend to give us a minuter view of the real nature of man as he is in himſelf, and ſhew with ſufficient ſtrength the imbecility of the human intellect without ſome ſupernatural aid. The external pomp of all Pagan religions ſeems to have been their eſſence: a circumſtance which alone ſhows the neceſſity of that, the intention of which is to reform the heart. See SIAM, SOMMONACADON, TEMPLE, &c.

PAGOD, or *Pagado*, is alſo the name of a gold and ſilver coin, current in ſeveral parts of the Eaſt Indies.

PAIN, an uneaſy ſenſation, ariſing from a ſudden and violent ſolution of continuity, or other accident in the nerves, membranes, veſſels, muſcles, &c. of the body. Pain, according to ſome, conſiſts in a motion of the organs of ſenſe; and according to others, it is an emotion of the ſoul occaſioned by thoſe organs.

As the brain is the ſeat of ſenſation, ſo it is of pain. Boerhaave, and moſt other authors on this ſubject, aſſign a ſtretching of the nerves as the only immediate cauſe of pain: but as the nerves do not appear to conſiſt of fibres, this cauſe of pain does not ſeem to be well founded; nor indeed will it be eaſy to treat this ſubject clearly, but in proportion as the means of ſenſation are underſtood.

Many kinds of pain are met with in authors: ſuch as, A gravitative pain; in which there is a ſenſe of weight on the part affected, which is always ſome fleſhy one, as the liver, &c. A pulſative pain; which, Galen ſays, always ſucceeds ſome remarkable inflammation in the containing parts, and is obſerved in abſceſſes while ſuppurating. A tenſive pain, which is alſo called a *diſtending* pain; it is excited by the diſtenſion of ſome nervous, muſcular, or membranous part, either from ſome humour, or from flatulence. An acute pain is, when great pain is attended with quick and lively ſenſations: A dull pain is, when a kind of numbneſs is as much complained of as the pain is.

The mediate and more remote cauſes of pain are generally obvious; and when ſo, the cure will conſiſt for the moſt part in removing them: for though in many inſtances the chief complaint is very diſtant from the ſeat of theſe cauſes, yet their removal is the proper method of relief. See MEDICINE, *paſſim*.

Perhaps all pains may be included, with irritation, in thoſe that have ſpaſm or inflammation for their ſource. When pain is owing to inflammation, the pulſe is quicker than in a natural ſtate; it is alſo generally full, hard, and tenſe; the pain is equal, throbbing, and unremitting. If a ſpaſm is the cauſe, the pulſe is rarely affected; at intervals the pain abates, and then returns with ſome degree of aggravation; gentle motion ſometimes abates, or even cures, in ſome inſtances: but in inflammatory caſes no ſuch effects are ever experienced. See Dr. Lobb's *Treatiſe on Painful Diſtempers*.

The pain ſo frequently attendant on women in child-bed, called *after-pains* (from their happening only after being delivered of a child), are often occaſioned by ſcooping to fetch away coagulated blood, which is a needleſs endeavour. When no improper treatment in delivering the ſecundines can be ſuſpected, the irritability of the uterus alone is to be conſidered as the cauſe. Care ſhould be taken not to confound theſe after-pains with, or miſtake the pains attending puerperal fevers for, the colic. After-pains come by fits, and ſoon go off; but return at different intervals, which are longer each day, and after two two or three days are uſually at an end, though ſometimes they continue ſeven or eight; notwithſtanding theſe pains, the lochia flow properly, and generally more abundantly after the ceſſation of each fit; this does not happen in colicky complaints, nor is the belly ſo free from tumefaction when the puerperal fever is attendant.

As theſe pains are of the ſpaſmodic kind, anodynes and gentle opiates, with frequent draughts of warm caudle, camomile tea, &c. are all that are required in order to their relief.

Among the various cauſes of pain, a ſingular one is related in the third vol. of the *Lond. Med. Obſ. and Inq.* p. 241, &c. Some perſons who had taken cold during their being ſavilated, were afflicted with pains which reſiſted all the uſual methods of relief. At length the author of the narrative referred to ſuggeſted the cauſe; and by exciting a freſh ſalivation the pains abated: the ſpitting was kept up a little while, and permitted to abate with ſome caution: and thus the cures were completed.

PAINTING,

THE art of repreſenting to the eyes, by means of figures and colours, every object in nature that is diſcernible by the ſight; and of ſometimes expreſſing, according to the principles of phyſiognomy, and by the attitudes of the body, the various emotions of the mind. A ſmooth ſurface, by means of lines and colours, repreſents objects in a ſtate of projection; and may repreſent them in the moſt pleaſant dreſs, and in a manner moſt capable of enchanting the ſenſes. Still farther, the objects which delight us by their animation and lively colours, ſpeak to the ſoul, by giving us the image of what we hold moſt dear, or by indicating an action which inſpires us with a taſte for innocent pleaſures, with courage, and with elevated ſentiments.

By an admirable effort of human genius, painting offers to our eyes every thing which is moſt valuable in the univerſe. Its empire extends over every age and country. It preſents to us the heroic deeds of ancient times as well as the facts in which we are more converſant, and diſtant objects as well as thoſe which we daily ſee. In this reſpect it may be conſidered as a ſupplement to nature, which gives us only a view of preſent objects.

In laying before our readers a ſuccinct account of this noble art, we ſhall, firſt, give the hiſtory of painting, including its riſe, progreſs, and decline, in ancient and modern times; an account of the ſchools, and of the different merits of painters; and a compariſon between the ancient and modern painting. We then ſhall lay down the principles of the art, and the order in which the artiſt conducts his ſtudies; concluding with an enumeration of the different claſſes of painting.

HISTORY.

SECT. I. *Riſe, Progreſs, and Decline of Painting in Ancient and Modern Times.*

IT is to be imagined that men muſt naturally, and very early, have conceived an idea of the firſt principles of the art of painting; the ſhadow of each plant and animal, and of every object in nature, muſt have afforded them the means of conceiving, and pointed out the poſſibility of imitating, the figures of all bodies. Thus the ſavage nations, an emblem of what men were in the infancy of ſociety, poſſeſs the firſt rudiments of this art, even before thoſe which are uſeful and almoſt neceſſary to exiſtence; their naked bodies are covered with punctures of various forms, into which they infuſe indelible colours. The next demand for this art, is to preſerve the memory of warlike exploits. It is more natural to form ſome repreſentation of an action, than to give an account of it by means of arbitrary characters. Hence the picture writing of the Mexicans, and the more artful hieroglyphics of Egypt.

Painting conſiſted of ſimple outlines long before the expreſſion of relievo or the application of colour. It was ſimply drawing; and the maſter-pieces of painting in that rude period were not ſuperior to the ſports of children. Although occupied about a ſingle point, it was not brought to perfection: for conſtant experience inſtructs us that men never excel in the inferior parts of an art till they are capable of carrying the whole to perfection.

After employing for a long time thoſe ſimple outlines, the next ſtep in the art of painting was to make the imitation more complete, by applying colours: this was firſt accompliſhed by covering the different parts of the figure with different colours in the ſame way that we colour maps; and ſeveral nations, as the Egyptians, the Chineſe, and the different nations of India, have never painted in a better manner. Other nations, more ingenious and more attentive to the arts, obſerving that the objects of nature have relievo, have invented what is called *clare-obſcuro*. The Greeks, the moſt ingenious, penetrating, and delicate of all, invented this part antecedent to colours; than which there cannot be a greater proof of their exquiſite taſte, as the glare of colours without judgment excites more admiration in the minds of the vulgar and ignorant, than the camaieu or drawings of one colour executed by the moſt ſkilful artiſt.

Theſe general obſervations concerning the gradual improvement of this art, will be beſt illuſtrated by a more particular attention to the ancient nations in which it flouriſhed.

Plato, who lived 400 years before the Chriſtian era, informs us that painting had been practiſed in Egypt for ten thouſand years; that ſome of the productions of that high antiquity were in exiſtence; and that they bore an exact reſemblance to thoſe which the Egyptians executed in his time. Without regarding the period of ten thouſand years mentioned by Plato, it is reaſonable to conſider it as an indeterminate period, which carries us back to very remote antiquity.

The figures either in the painting or ſculpture of Egypt were extremely ſtiff; the legs were drawn together, and their arms were paſted to their ſides. It appears that their only model was their mummies, and that their ſkill in anatomy was derived from embalming them. They were extremely incorrect in every part of the head; they placed the ears much higher than the noſe. Beſides, they gave the face the form of a circle inſtead of an oval; the chin was ſhort and rounded; the cheeks exceſſively ſo; and they turned upwards the corners of the mouth and eyes. Many of theſe faults may be aſcribed to the formation of the human face in Egypt; but the placing of the ears could only be founded in caprice or ignorance.

The exactneſs of the Egyptian proportion is much celebrated; but although we grant that they obſerved the proper length of the different parts of the human body, they were ſtill defective artiſts, ſince they did not obſerve the breadth, and were moreover ignorant altogether of the ſhape and ſize of the muſcles. Works converted to religious purpoſes chiefly occupied the Egyptian painters. They had figures for imitation from which they would not depart, and thoſe figures were monſtrous; the bodies of animals with the heads of men; the bodies of men with the heads of animals: or, if the figure was more agreeable to nature in its parts, yet it was ſo deformed and imaginary, as to have nothing ſimilar to it as a whole in the creation of God.

The monuments of Egyptian painting with which we are beſt acquainted (ſays Winklemann) are the cheſts of mummies. Theſe works have reſiſted the injuries of time, and are ſtill ſubmitted to the examination of the curious. The white, made of white lead, is ſpread over the ground of the piece; the outlines of the figure are traced with black ſtrokes, and the colours are

four in number; namely, blue, red, yellow, and green, laid on without any mixture or ſhading. The red and blue prevail moſt; and thoſe colours ſeem to have been prepared in the coarſeſt manner. The light is formed by leaving thoſe parts of the ground where it is neceſſary, covered with the white lead, as it is formed by the white paper in ſome of our drawings. This deſcription is ſufficient to convince us that the whole art of painting in Egypt conſiſted in colouring; but every perſon knows, that without tints and the mixture of colours painting can never arrive at great perfection.

In Upper Egypt there ſeems to have exiſted a kind of coloſſian painting, which has never been examined except by travellers who were no great critics in the art. Winklemann had ſome reaſon to expreſs a deſire that thoſe remains of antiquity, with regard to the manner of working, the ſtyle, and the character, had been accurately explored. Walls of 24 feet in height, and pillars of 32 feet in circumference, are wholly covered with thoſe coloſſian figures. According to Norden they are coloured in the ſame manner with the mummies: the colours are applied to a ground prepared in manner of freſco; and they have retained their freſhneſs for many thouſand years. Winklemann adds, that all the efforts of human ſkill and induſtry could make as little impreſſion on them as the injuries of time. His enthuſiaſm for antiquity has perhaps led him into this extravagant exaggeration.

It appears that the great employment of the Egyptian painters was on earthern veſſels, on drinking cups, in ornamenting barges, and in covering with figures the cheſts of mummies. They painted alſo on cloth; but painting, as an induſtrious occupation, ſuppoſes a workman, not an artiſt: the decoration of temples, houſe-painting, and that of the figures relative to religion, are to be conſidered only in this point of view. The workmen in Ruſſia who paint our Saviour holding the globe in one hand, and bleſſing the people with the other, are not members of the imperial academy of fine arts.

Pliny informs us that the Egyptian artiſts painted alſo the precious metals; that is to ſay, they varniſhed or enamelled them. It is doubtful what this art was, but moſt probably it conſiſted in covering gold or ſilver with a ſingle colour.

The Egyptians are ſuppoſed to have continued this coarſe ſtyle till the reign of the Ptolemies.

The Perſians were ſo far from excelling in the arts, that the paintings of Egypt were highly eſteemed among them after they had conquered that country.

The carpets of Perſia were of great value in Greece, even in the time of Alexander the Great, and theſe were adorned with various figures; but this is no proof that they were well executed, any more than a demand for ſeveral of the Chineſe productions is at preſent a proof of the taſte of that people in the arts. It was the fabrication of the ſilk, and not the truth of the repreſentation, which made the Greeks admire the carpets of Perſia.

The Perſians, as well as the Arabians, had ſome knowledge of Moſaic work. This is only valuable when it copies, in a manner that cannot be deſtroyed, the works of a great maſter; but if the Perſians had no good pictures to copy into Moſaic, it was of no conſequence to be able to arrange, in a ſolid manner, pieces of flint one beſide another.

There is only one Perſian painter whoſe name has deſcended to poſterity; and he is preſerved, not becauſe he was a painter, but becauſe he accommodated the ancient doctrine of the two principles to the Chriſtian religion. Beſides, it is doubted whether *Manes* was a Perſian or a Greek, and it is ſtill leſs known whether he was a painter. He is praiſed in Aſia for drawing ſtraight lines without a ruler.

The modern Perſians have made no kind of progreſs in the arts. The emperor Schah-abbas, wiſhing from caprice to be inſtructed in drawing, was obliged to have recourſe to a Dutch painter who happened to be in his dominions.

The modern Perſians paint on cloth, and the artiſts in India are their rivals in this branch of induſtry; but their paintings are purely capricious. They repreſent plants and flowers which have no exiſtence in nature; and their only merit conſiſts in the brightneſs and the ſtrength of their colours.

Beſides this, the art in India, as it was in the moſt remote antiquity, is confined to monſtrous figures connected with their religion, animals not to be found in the world, and idols with a multitude of arms and heads, which have neither exactneſs in their forms nor proportions. See POLYTHEISM.

The paintings of Thibet diſcover great patience in the artiſt, and are remarkable for the fineneſs of their ſtrokes. Their painters might diſpute with Apelles and Protogenes for extreme tenuity of pencil; but it is in this alone, without any regard to the art, in which their merit conſiſts.

Some of the idols in Thibet are executed in a certain ſtyle of relievo; but thoſe productions are not only imperfect, they are alſo ſo deſtitute of beauty as to forbid every hope of excellence in the art. The ſame thing may be obſerved with regard to many of the eaſtern nations; they ſeem to have that want of ſtyle which would for ever condemn them to mediocrity, even if they ſhould happen to arrive at it.

An obſcure Italian painter, named *Giovani Ghirardini*, who travelled into China, whoſe judgment is more to be depended on in an art which he practiſed than that of other travellers, declares that the Chineſe have not the leaſt idea of the fine arts; and this opinion is confirmed by every thing which we know of that people.

The Chineſe ſeem not to have the ſmalleſt conception of perſpective. Their landſcapes have no plan, no variety in the appearance of the clouds, and no diminiſhing of the objects in proportion to their diſtance.

The great object of their painting ſeems to conſiſt in making their figures as unlike nature as poſſible: it is a ſerious caricature of the human figure.

To make the art flouriſh, it is neceſſary that the artiſt be eſteemed and rewarded. In China, there is no artiſt ſo poorly paid as the painter.

The ignorant admire the brightneſs and purity of their colours; but ſimple colours appear always bright and pure: The difficulty of the art conſiſts in melting them into one another in ſuch a manner that the mixture ſhall not be perceived. It muſt at the ſame time be confeſſed, that their natural colours are more brilliant than ours; but if there be any merit in this, it is to be aſcribed to their climate, not to their ability.

A Jeſuit miſſionary, who in his youth had been a grinder of colours, was raiſed to the greateſt eminence as a painter in the imperial court of China, and Raphael himſelf was never ſo much reſpected. The Chineſe battles ſent from that country to Paris to be engraved, are the works of the Jeſuits; and except they were done by the Chineſe themſelves, it is impoſſible to conceive that they could be worſe executed.

The Chineſe, like other eaſtern nations, have a few ſimple ſtrokes which they repeat in all their variety of figures. In the figures on the earthen ware, they diſcover no knowledge of forms, no expreſſion of the moſt conſpicuous muſcles, and no idea of proportion. And in all the paintings of China, anatomy ſeems to bear no relation to the art. Some heads done by a Chineſe painter have a ſort of reſemblance to nature, but they are in a low and vicious taſte: The fulneſs of the drapery conceals the parts in ſuch a manner that they do not ſeem to exiſt under it. Sculpture in China is in a ſtate of no great perfection, but at the ſame time it is better executed than their paintings.

The ancient inhabitants of Etruria, now called *Tuſcany*, were

the firſt who connected the arts with the ſtudy of nature. In ſome of their monuments which ſtill remain, there is to be obſerved a firſt ſtyle, which ſhows the art in its infancy; and a ſecond, which, like the works of the Florentine artiſts, ſhows more of greatneſs and exaggeration in the character than preciſion or beauty.

Pliny ſays that painting was carried to great perfection in Italy before the foundation of Rome; perhaps he means in compariſon with the infancy of the art in Greece at that period; but it appears that even in his time the painters of Etruria were held in great reputation.

The only Etrurian paintings which remain, have been found in the tombs of the Tarquins. They conſiſt of long painted frizes, and pilaſters adorned with huge figures, which occupied the whole ſpace from the baſe to the cornice. Theſe paintings are executed on a ground of thick mortar, and many of them are in a ſtate of high preſervation.

Winklemann is of opinion that the Greek colonies eſtabliſhed at Naples and Nola, had at a very early period cultivated the imitative arts, and taught them to the Campanians eſtabliſhed in the middle of the country. This learned antiquarian conſiders as work purely Campanian, certain medals of Capua and Teanum, cities of Campania into which the Greek colonies never penetrated. The head of a young Hercules, and the head of a Jupiter, according to Winklemann, are executed in the fineſt manner. It is ſtill a queſtion, however, in the learned world, whether theſe medals owe their exiſtence to Carthage or to Campania.

"But there have been diſcovered (adds Winklemann) a great number of Campanian vaſes covered with painting. The deſign of the greateſt part of theſe vaſes (ſays he) is ſuch, that the figures might occupy a diſtinguiſhed place in a work of Raphael. Thoſe vaſes, when we conſider that this kind of work admits of no correction, and that the ſtroke which forms the outline muſt remain as it is originally traced, are wonderful proofs of the perfection of the art among the ancients." Winklemann had an opportunity of examining a very fine Campanian vaſe, on which was painted a burleſque repreſentation of the loves of Jupiter and Alcmene. But as this muſt have been derived from ſome fragment of a Grecian comedy, the Count de Caylus is perſuaded that the Campanian vaſes are of Greek origin.

Although the hiſtory of Greek painting be more fully known than that of the ſame art among the barbarous nations, it is nevertheleſs involved in much obſcurity. Pliny is almoſt the only author who has preſerved the materials of its hiſtory; and he complains, that on this occaſion the Greek writers have not diſcovered their uſual exactneſs They place, ſays he, the firſt painter of whom they ſpeak in the 90th Olympiad, 420 years before the Chriſtian era. It is certain that painting in dry colours exiſted at the time of the ſiege of Troy, or at leaſt when Homer wrote the account of it. The buckler of Achilles is a ſufficient proof that the Greeks were then acquainted with the baſſo-relievo, a kind of ſculpture which bears a near affinity to painting.

In the Iliad, Helen is repreſented as working at a tapeſtry, whereon ſhe figured the numerous combats of which ſhe was the cauſe. When Andromache was informed of her huſband's death, ſhe was occupied in repreſenting on tapeſtry flowers of various colours. From theſe facts, it is certain that painting was not confined to ſimple ſtrokes, nor even to the camaieu; and hence it is reaſonable to conclude, that what is called *linear painting* was practiſed long before the time of Homer. Polygnote of Thaſos, who lived about 420 years before the Chriſtian era, was the firſt painter of any eminence in Greece. Pliny informs us that he was the firſt who clothed his female figures, who varied the colours of the different parts of their dreſs, or who opened their mouths in ſuch a manner as to ſhow their teeth. Ariſtotle, who flouriſhed in a ſubſequent period, allows this painter to have excelled in expreſſion. But the art of painting may be ſtill conſidered in its infancy in Greece, till about 400 years before the Chriſtian era, when Zeuxis and Parrhaſius flouriſhed. In the conteſt between theſe eminent painters, Zeuxis declared himſelf to be overcome, becauſe in a cluſter of grapes which he painted he had deceived the birds; whereas Parrhaſius in a curtain which he executed deceived his rival. The principal works of Zeuxis are his Penelope, in which, according to Pliny, he appears to have expreſſed the manners of that princeſs; a Jupiter ſurrounded by the gods; a Hercules ſtrangling the ſerpents in the preſence of Amphitrion and Alcmene; an Helen and a Marſyas bound. From this enumeration of theſe works, and from the fame which they have acquired, it is evident that the difficult parts of the art, and thoſe which in the execution render it eſtimable, were now begun to be ſtudied. By Appelles, Protogenes, and Euphranor, it was carried to the greateſt height of perfection. Grace, and ſymmetry, and proportion, and illuſion, were now added by the greateſt maſters to the nobleſt objects of nature.

We have already ſeen, that before the foundation of Rome the arts were cultivated in Etruria. They were alſo early introduced into Latium; but whether that country employed its own artiſts or thoſe of Etruria, remains altogether uncertain. One need not be aſtoniſhed, that at a period when the arts were in their infancy in Greece, they were raiſing ſtatues to their kings in Rome: but at that period all their artiſts were Etrurians or Latins; and when they conquered Italy, they made all the nations of it as barbarous as they were themſelves.

In the year 259 from the building of the city of Rome, and 494 years before the Chriſtian era, Appius Claudius conſecrated a number of ſhields in the temple of Bellona, which contained in baſſo relievo the portraits of his family. This example was followed; and in proceſs of time it was common among the Romans to place thoſe images in private houſes. The execution in baſſo-relievo is a proof that they had an idea of painting, at leaſt with one colour. As long as the Romans employed artiſts of other nations, they had little deſire to cultivate the arts; but towards the year of Rome 450, and 303 years before Chriſt, one of the Fabii thought it no diſcredit to a noble family to employ himſelf in painting. He painted the temple of Safety; and his works remained till that temple was deſtroyed by fire, in the reign of Claudius. It is worthy of remark, that the ſame man was the firſt painter and the firſt hiſtorian in his country.

The example of Fabius, ſurnamed *Pictor* from his profeſſion, did not excite his fellow-citizens to imitation. A century and a half elapſed before the tragic poet Pacuvius, nephew of Ennius, painted the temple of Hercules in the *forum boarium*. The glory which he had acquired by his dramatic works ſhed ſome luſtre on the art, which he condeſcended to exerciſe; but did not confer on it that reſpect which could recommend it to general practice. The paintings of Fabius were the works or rather the recreations of his youth; thoſe of Pacuvius, the amuſements of his old age: but painting is a difficult art, which requires the whole attention, and which can never be proſecuted with ſucceſs, except thoſe who love it are ſolely devoted to the performance.

It appears that there were no eminent painters at Rome till the time of the emperors; but as the national ſpirit was changed, the profeſſion of the fine arts acquired more reſpectability. The Romans, during the time of the republic, were animated with the ſpirit of liberty and the deſire for conqueſt. When theſe two paſſions were weakened, the love of the arts obtained among them. As a proof of this it is ſufficient to ſay, that Nero himſelf gloried in being an artiſt. A coloſſian

picture of 120 feet was painted at Rome by the command of this emperor, which was afterward deſtroyed by lightning. The name of the painter is not recorded, and there are various opinions concerning the merit of the performance; but the thing chiefly worthy of obſervation is, that this is the only painting on cloth mentioned by ancient authors.

The paintings of the ancient artiſts were either moveable or on the ceilings or compartments of buildings. According to Pliny, the moſt eminent were thoſe who painted moveable pictures. The latter were either on fir-wood, larch, boxwood, or canvas, as in the coloſſian picture mentioned above, and ſometimes on marble. When they employed wood, they laid on in the firſt inſtance a white ground. Among the antiquities of the Herculaneum are four paintings on white marble.

Their immoveable paintings on walls were either in freſco or on the dry ſtucco in diſtemper. Indeed all the ancient paintings may be reduced to, *firſt*, freſco painting; *ſecondly*, water-colour or diſtemper-painting on a dry ground; and, *thirdly*, encauſtic painting.

The ancient freſco-paintings appear to have been always on a white ſtucco-ground, the colours inlaid very deep, and the drawing much more bold and free than any ſimilar performance of modern art. The outlines of the ancient paintings on freſco were probably done at once, as appears from the depth of the inciſion and the boldneſs and freedom of the deſign, equal to the care and ſpirit of a pencilled outline.

In general the ancients painted on a dry ground, even in their buildings, as appears from the Herculanean antiquities, moſt of which are executed in this manner. At Rome and Naples, the firſt (deepeſt) coat is of true Puzzolana, of the ſame nature with the *terras* now uſed in mortar, required to keep out wet, about one finger thick; the next of ground marble or alabaſter, and ſometimes of pure lime or ſtucco, in thickneſs about one third of the former. Upon this they appear to have laid a coat of black, and then another of red paint; on which laſt the ſubject itſelf was executed. Such ſeems to have been their method of painting on walls; but in their moveable pictures, and in the performance of their firſt artiſts, and where effect of ſhade and light were neceſſary, they doubtleſs uſed white.

The colours employed they ſeem to have mixed up with ſize, of which they preferred that made by boiling the ears and genitals of bulls. This appears to have made the colours ſo durable and adheſive, that the ancient paintings lately found bear waſhing with a ſoft cloth and water, and ſometimes even diluted aquafortis is employed to clean their paintings on freſco. Pliny ſays that glue diſſolved in vinegar and then dried, is not again ſoluble.

What the encauſtic painting of the ancients was, has been much diſputed. From the works of Vitruvius and Pliny, it appears evidently that it was of three kinds. *Firſt*, where a picture painted in the common way, was covered with a varniſh of wax melted, diluted with a little oil, and laid on warm with a bruſh. *Secondly*, where the colours themſelves were mixed up with melted wax, and the mixture uſed while warm. And, *Thirdly*, where a painting was executed on ivory by means of the *ceſtrum* or *viriculum*. Some experiments on this laſt method by Mr. Colebrook may be found in the Phil. Tranſ. vol. 51. and more particular directions in Muntz's Treatiſe on Encauſtic Painting.

It appears from ancient writings of the beſt authority, that in the earlieſt and pureſt times of this art, the painters uſed few colours, perhaps not more than four. "The paintings of the ancients (ſays Dionyſius Halicarnaſſeus) were ſimple and unvaried in their colouring, but correct in their drawing, and diſtinguiſhed by their elegance. Thoſe which ſucceeded, leſs correct in their drawing, were more finiſhed, more varied in their light and ſhades, truſting their effect to the multitude of their colours." But no certain concluſion can be drawn, that the more early among the great painters of the ancients, ſuch as Apollodorus, Zeuxis, Timanthes, &c. had no more colours than four to uſe, merely becauſe they did not uſe them. On the contrary, it may be conjectured with ſome degree of probability, from their chaſteneſs in deſign, and from the complaints Pliny makes of the gaudy taſte of the Roman painters, that the Greeks in general were *deſignedly* chaſte in their colouring, and not ſo merely from neceſſity, at leaſt about the time of Zeuxis and Apelles; for the former could not have painted grapes ſo naturally as he is ſaid to have done with four colours only: and the rebuke given by the latter to one of his ſcholars who had painted an Helen very guadily, is a confirmation of theſe obſervations. "Young man (ſays Apelles), not being able to make her beautiful, you have made her rich."

Of white colouring ſubſtances, the ancients had white lead variouſly prepared, a white from calcined egg-ſhells, and preparations from cretaceous and argillaceous earths. The moderns in addition have magiſtery of biſmuth, little uſed; and *ought* to have the calces of tin and zinc.

Of *blacks*, the ancients had preparations ſimilar to lamp, ivory, blue, and Frankfort black; alſo to Indian ink and common writing ink; and they uſed, what we do not, the precipitate of the black dyers vats.

The ancients poſſeſſed a ſpecies of *vermilion* or fine cinnabar, a coarſer cinnabar, red-lead, various earths burnt and unburnt, apparently, ſimilar to our red ochre; Venetian red, Indian red, Spaniſh brown, burnt terra de Sienna, and ſcarlet ochre; they had alſo a ſubſtance alike in colour and in name to our dragon's blood.

The yellow pigments of the ancients were generically the ſame with our orpiments, king's-yellow, Naples-yellow, &c. They did not poſſeſs turbeth-mineral, mineral-yellow, or gamboge; nor do they appear to have known of gall-ſtone as a pigment.

Of blue paints they had preparations from the lapis ſyanus and lapis armenus. Indigo they had, and perhaps bice and ſmelt; for they made blue glaſs, but whether from ſome ore of cobalt or of wolfram muſt be uncertain: they had not Pruſſian blue, verditer, nor litmus, which we have. We do not uſe the blue precipitate of the dyers vats, nor mountain blue, which they certainly employed.

Of green colours, they had verdegris, terra vert, and malaſhite or mountain green. The latter is not in uſe among us. Sap green, green verditer, and Scheele's green, appear to have been unknown to them: like us, they procured as many tints as they pleaſed from blues and yellow vegetables.

We have no original *purple* in uſe: that from gold by means of tin, though very good when well prepared, is too dear perhaps, and unneceſſary. Their purple was a tinged earth. Their orange or ſandarac (red orpiment) we alſo poſſeſs. Hence there does not appear to have been any great want of pigments, or any very material difference between the colours they uſed and ſuch as we generally employ. Perhaps the full effect of colouring may be obtained without the uſe of the exceeding brilliant pigments, depending chiefly on the proportion and oppoſition of tints.

The ancients could not know any thing about the ſpirit varniſhes, diſtillation being a modern invention; but they were undoubtedly acquainted with the uſe of the better oil varniſhes, that is, with the uſe and effect of reſinous gums diſſolved in boiling inſpiſſated oils.

One of the beſt preſerved mummies in the Britiſh muſeum has an aſtoniſhing brightneſs of colours on the outſide of the coffin. Thouſands of years have not impaired them; they are as freſh as if they had been laid on yeſterday.

The chalk ground, and the excellency of the colours, ſome of which imply a good deal of chemical and metallurgical knowledge, do not ſufficiently account for their ſplendour and freſhneſs: it muſt be owing to other circumſtances: either to the mixture of ſhining colours, or to a hard gloſſy ſkin which viſibly covers them all over.

From an accurate examination of one of thoſe mummies belonging to the univerſity of Cambridge, it appeared, that the varniſh which covered the colours could not be diſſolved, or in the leaſt affected by common water; and that it equally reſiſted the diſſolving power of the ſtrongeſt ſpirits: hence it is reaſonable to conclude, that the coffins of the mummies were not covered with ſize, whites of eggs, ſimple gums, or any preparation of wax, but with a fine tranſparent oil varniſh. It was diſcovered at the ſame time, that the colours themſelves were not prepared or mixed with oil; for where the external gloſſy ſkin was damaged, broken, or rubbed off, even common water would waſh the colours away, and affect the chalk ground under them.

Pliny has deſcribed the general and particular effects of the varniſh of Apelles, under the name of *atrament*, ſo diſtinctly, that nobody can miſtake the thing or the mixture he is ſpeaking of. He has mentioned the ſhining gloſſy ſkin of the varniſh which excites the brightneſs of the colours, and preſerves them againſt duſt; he obſerved, that this ſkin was laid on ſo thin, that it could not be diſcerned at any diſtance: nor was he leſs accurate in reporting the particular effects of that mixture which Apelles made uſe of; it harmoniſed and lowered the tone of the brighteſt florid colours in an imperceptible manner, and the whole appeared as if it had been ſeen through ſinglaſs. The chemiſts and connoiſſeurs are fully of opinion, that no liquid ſubſtance or mixture of any kind is fit to produce theſe effects beſides the oil varniſhes: and if there are not, Apelles and the Greeks were certainly acquainted with thoſe varniſhes; a fact which might be ſtrongly urged in behalf of their knowledge of oil colours.

The black outlines of the figures on the moſt ancient Greek paintings yet extant, that is, on Etruſcan vaſes, are ſo ſharp, ſo thick, and drawn in ſo eaſy and maſterly a manner, that one cannot help looking upon them as having been drawn in oil colours. Had they been in diſtemper or water colours on the red clay ground on which they are applied, they would have been imbibed and ſoaked into it. Our china and enamel painters prepare and apply their colours with ſpike or other liquid oils; and the Greek maſters ſeem to have done the ſame, unleſs they ſhould appear to have burnt their vaſes before they painted them, or to have uſed a mixture of diſſolved wax or gum for giving a body to their colours, which might have anſwered the ſame end as oils. And this is the more probable, as there is ſome reaſon to believe that theſe vaſes went through two different fires, that of baking them, and that of ſmelting or burning in their colours.

The Greek and Roman paintings that have been preſerved or diſcovered at Rome and Herculaneum do not countenance the ſuppoſition of oil colours; at leaſt Turnbull and the academiſts at Naples, who have deſcribed the royal collection at Portici, Cochin, and many other authors who have ſeen and deſcribed them, do not hint any thing of that nature. On the other hand, Vitruvius, who has left us ſo many valuable notices of the ancient arts, acquaints us, that there was a kind of painting which abſolutely required a mixture of oil: And Pliny, to the ſame purpoſe, expreſsly ſays, "Sun and moon ſhine are inimical and obnoxious to red lead. The remedy is to apply the red wax when hot and melted *with ſome oil* on the well-dried walls, which is to be done with bruſhes."

From theſe obſervations, the evidence which the ancients have given us in behalf of themſelves, and of their knowledge of oil painting, may be ſummed up in a few words.

Their having been acquainted with the white chalk ground, which many modern maſters have uſed for oil painting on boards, proves no more than that the ancients might have done the ſame.

The oil varniſhes uſed by the Egyptians and by Apelles might have brought them to the diſcovery of oil painting; but as it appears both from mummies and from the works of Pliny, that their colours were not prepared and mixed with that varniſh, and as it is plain rather that this varniſh was externally laid over the finiſhed pictures; no other concluſion can be drawn, except that they were within ſight of the diſcovery, and that it is a matter of wonder that they ſhould not have laid hold of it.

The outlines of the old Greek or Etruſcan vaſes are merely fallacious appearances.

The old Greek and Roman paintings on walls and ſtones are either painted in diſtemper and freſco, or they have not been ſufficiently examined.

The oil uſed in the coarſer wax and wall paintings, proves at moſt that experiments had been tried with oils; but we have no direct proofs of oil painting having been underſtood or uſed by the Egyptians, Greeks, or Romans; and that, however great their ſkill or ingenuity, they might very well have been within ſight and reach of the diſcovery, and nevertheleſs have miſſed it.

The art of painting was revived in Europe about the end of the 13th or beginning of the 14th century. The human mind, however, plunged in profound ignorance, was deſtitute of every principle of ſound philoſophy which might enable it to determine on the objects of the arts; and of conſequence the painters contented themſelves with works adapted to the general taſte, without beauty and without proportion. In Italy, where the firſt attempts were made, they were employed in repreſenting the myſteries of the *paſſion*, and ſubjects of a ſimilar nature, on the walls of chapels and churches. Their labours were directed to a vaſt number of figures, rather than to the beauty and perfection of each; and the art in more modern times has always preſerved ſomewhat of this abſurd fault which it contracted at that early period. The artiſt in our times is not, like thoſe in Greece, at liberty to devote his talents only to men of knowledge and diſcernment; he is conſtrained to pleaſe thoſe who are rich, and very frequently thoſe who are ignorant. Inſtead of propoſing to himſelf the perfection of the art as the great object of his purſuit, he muſt reſt his ſucceſs and character on the facility of his operation and the abundance of his works.

Painting did not long continue in the imperfect condition in which it was left by thoſe who firſt cultivated it among the moderns. It was natural that their ſucceſſors ſhould endeavour to ſurpaſs them by joining ſome degree of theory to the barbarous practice they had adopted. The firſt thing which they diſcovered, or rather which they revived after the manner of the ancients, was perſpective. This made the artiſts capable of expreſſing what is called *foreſhortening*, and of giving more effect and more truth to their works.

Dominique Ghirlandaios, a Florentine, was the firſt who enriched the ſtyle of his compoſition by grouping his figures, and who gave depth to his pictures, by diſtinguiſhing, by exact gradations, the ſpaces which his figures occupied; but his ſucceſſors have far ſurpaſſed him in boldneſs of compoſition.

Leonard da Vinci, Michael Angelo, Giorgion, Titian, Bartholemew de St. Marc, and Raphael, flouriſhed about the end of the 14th century. Leonard da Vinci was the inventor of a great many details in the art: Michael Angelo, by ſtudying the ancients, and by his knowledge of anatomy, arrived at great elegance in drawing the outlines of his figures: Giorgion enriched the art in general, and gave greater brilliancy to his colours than his predeceſſors: Titian, by a careful imitation of

nature, made great proficiency in the truth and perfection of his tones: Bartholemew de St. Marc ſtudied particularly the part of drapery, and diſcovered the claro obſcuro, the beſt manner of giving drapery to his figures, and of making the naked to be felt even where they were covered: Raphael, endowed with a ſuperior genius, began with ſtudying carefully all his predeceſſors and all his contemporaries. He united in himſelf all the excellencies which they poſſeſſed; and formed a ſtyle more perfect and more univerſal than any painter who went before or who has ſucceeded him. But while he excelled in every part of the art, he was chiefly ſuperior in thoſe of invention and of compoſition. It is probable that the Greeks themſelves would have been filled with admiration if they had beheld his chief pieces in the Vatican, where to the greateſt abundance of paintings is joined ſo much perfection, and purity, and eaſe.

After painting had arrived at the greateſt perfection among the Greeks by the exertions of Zeuxis and Parrhaſius, Apelles found nothing to add to the art except grace; in the ſame manner among the moderns, after Raphael had appeared, grace was the only thing wanting to the art, and Corregio became the Apelles of Europe. Painting was by him carried to the higheſt degree among the moderns; the taſte of the beſt critics and the eye of the vulgar were equally gratified.

After theſe great maſters a conſiderable interval elapſed till the time of the Caracci. Thoſe artiſts, born at Bologna, by ſtudying the works of their predeceſſors with great care, and particularly thoſe of Corregio, became the firſt and the moſt celebrated of their imitators. Hannibal poſſeſſed a very correct deſign, and united ſomewhat of the ancient ſtyle to that of Lewis his brother; but he neglected to inquire into the intricate principles and philoſophy of the art. The pupils of the Caracci formed a ſchool after their manner; but Guido, a painter of an eaſy and happy talent, formed a ſtyle altogether graceful, and rich, and eaſy. Guerſhem formed after Caravaggio, or invented himſelf a particular ſtyle of the claro-obſcuro, compoſed of ſtrong ſhades and vivid oppoſitions.

Peter de Cortona ſucceeded thoſe great imitators of their predeceſſors and of nature; who finding it difficult to ſucceed in that kind of painting, and having beſides great natural abilities, applied himſelf chiefly to compoſition or arrangement, and to what the artiſts call taſte. He diſtinguiſhed invention from compoſition; appeared not to have attended to the former, but chiefly to thoſe parts which are moſt prominent in the picture, and to the contraſting of groups. It was then that the practice was introduced of loading pictures with a great number of figures, without examining whether or not they agreed to the ſubject of the hiſtory. The ancient Greeks employed a very ſmall number of figures in their works, in order to make the perfection of thoſe which they admitted more evident. The diſciples or imitators of Cortona, on the other hand, have ſought to conceal their imperfections by multiplying their figures. This ſchool of Cortona is divided into many branches, and has changed the character of the art. The multiplication of figures, without a judicious and proper choice, carried back the art of painting to that point where the firſt reſtorers of it among the moderns had left it; while at the ſame time the diſciples of Cortona were enabled to give to this firſt condition of the art a greater degree of perfection than the firſt artiſts.

About the middle of the 17th century flouriſhed at Rome Carlo Maratti, who, aiming at the greateſt perfection, carefully ſtudied the works of the firſt painters, and particularly thoſe of the ſchool of the Caracci. Although he had already ſtudied nature, he diſcovered by the works of theſe artiſts that it is not always proper to imitate her with a ſcrupulous exactneſs. This principle, which he extended to every part of the art, gave to his ſchool a certain ſtyle of carefulneſs, which however is conſiderably degenerated.

France has alſo produced great maſters, particularly in the part of compoſition; in which Pouſſin, after Raphael, is the beſt imitator of the ſtyle of the ancient Greeks. Charles le Brun and many others diſtinguiſhed themſelves for great fertility of genius; and as long as the French ſchool departed not from the principles of the Italian ſchool, it produced maſters of great merit in the different branches of the art.

Mengs, from whom this account is taken, is not deceived when he declares the art of painting to have degenerated in France after Le Brun; but he ſeems to be miſtaken in giving the imitation of the works of Rubens found at Paris as the cauſe of this decay. It appears from this opinion, that the recent French ſchool was not well known to him. The French, indeed, if we may believe their own authors, were never much occupied in the imitation of Rubens; and they have for a long time deſpiſed him. But the perfection of the dramatic art in France, the dreſs of their actors, the magnificence and manners of the court, have contributed very much to the decay of painting. Inſtead of forming their taſte on the beautiful ſimplicity of nature, their painters ſtudied the geſtures and the attitudes of comedians, the fopperies of women of faſhion, the affected airs of courtiers, the pagentry of Verſailles, and the magnificence of the opera. Mengs ſays, "that the French have formed a national ſtyle, of which ingenuity and what they call *eſprit* are the diſcriminating qualities; that they have ceaſed to introduce Greek, Egyptian, Roman, or barbarian perſonages into their paintings; and that, after the example of Pouſſin, they content themſelves with figures altogether French, as if it were their intention to hand down to poſterity that ſuch a nation once exiſted."

Since, according to the confeſſion of Mengs, their figures are altogether French, there is no reaſon to believe that the French painters have imitated Rubens, whoſe works are marked much more ſtrongly than thoſe of his maſter Æneas with the Flemiſh character. The truth is, that their painters, like Cortona and Maratti, have crowded their pictures with a great number of figures; have grouped them in a manner moſt calculated to ſtrike the ſenſes; have been more intent on agreeable artifices than expreſſion and beauty; and, finally, that they have borrowed the manners of the court and theatre.

The firſt maſters of the great ſchools of painting, with the ancients and nature for their guides, and their genius for their ſupport, carried every part of the art to the greateſt height of perfection. Thoſe who followed them, and who had the example of their predeceſſors in addition to the firſt ſources of truth and beauty, did by no means arrive at the ſame excellence. The Caraccis in their ſchool, Paul Veroneſe, and all the painters of his time, Vandyke, and all thoſe who exerciſed the art in Italy, in Flanders, and in France, ſupported it with great brilliancy. But ſoon after the number of artiſts was multiplied; and ſlaviſhly copying men of inferior talents, they produced works of an inferior nature. Some wanting to be colouriſts, their pieces were exaggerated; others affecting ſimplicity, became cold and inſipid. At this period of the art, men of real abilities, and covetous of fame, who wiſhed to riſe ſuperior to the mediocrity of the times, ſeem not to have taken the road of truth and nature. They affected a ſtyle of pompous preparation, and annexed a kind of merit to the expert management of the pencil. The affected forms of Cortona and of his pupils, the fantaſtical attitudes and the poignant effects of Piazetta, and in ſhort the ingenious contrivances of the laſt maſters of the French ſchool, are decided proofs of this increaſing bad taſte.

It appears, that for ſome time paſt greater pains have been

taken to form men for the art than to encourage thoſe who poſſeſs the talent. In conſequence of this ruinous practice, ſchools for drawing, very different from thoſe formed by able painters, have been exceedingly multiplied; and theſe give the elements according to an uniform ſyſtem, by which the mind is laid under a regular reſtraint at the very threſhold of the profeſſion. This evil is productive of two inconveniences; it gives middling painters, and it multiplies them to that degree, as to haſten the downfall and bring into contempt the art itſelf.

The particular reputation of the Italian painters furniſhes another reaſon for the decline of the art. The firſt painters of that country were few in number; they were honoured, and they deſerved to be honoured. Their diſtinguiſhed reputation has conferred a value on the general paintings of their countrymen. The deſire of poſſeſſing taſte, or of being thought to poſſeſs it, has led the rich and the ignorant of all nations to give a preference to the Italian market. Neceſſity, in this caſe, would multiply the painters; and their abilities muſt bear a pretty exact proportion to the diſcrimination of thoſe who give the price.

The decline of painting has alſo ariſen from the deſpotiſm which for ſome time reigned in the academic ſocieties. In fact, theſe have often been ruled by men who would force every exertion of genius into their peculiar tract of operation. If they required ſuch or ſuch merit of execution, the firſt principles of the art were neglected for that peculiar excellency. In this manner the ſchools were abſolute in behalf of deſign as long as ſtatuary was held in chief eſtimation. The artiſt, whoſe abilities and inclination led him to colouring, was obliged to abandon a purſuit which could be of no ſervice to him, and devote himſelf to that for which he was not qualified by nature. On the other hand, if the inſtructions of the ſchools be confined to colouring, a mind diſpoſed to the choice and exactneſs of forms will find no encouragement, and be for ever loſt to the art. In this manner the ignorance of thoſe who wiſh to be connoiſſeurs, and the narrow views of thoſe who pretend to direct the general taſte, have equally contributed to the decline of the arts.

Sect. II. *Of the Schools.*

A School, in the fine arts, denominates a claſs of artiſts who have learned their art from a certain maſter, either by receiving his inſtructions, or by ſtudying his works; and who of conſequence diſcover more or leſs of his manner, from the deſire of imitation, or from the habit of adopting his principles.

All the painters which Europe has produced ſince the renovation of the arts are claſſed under the following ſchools: the the ſchool of Florence, the ſchool of Rome, the ſchool of Venice, the Lombard ſchool, the French ſchool, the German ſchool, the Flemiſh ſchool, the Dutch ſchool, and the Engliſh ſchool.

This ſchool is remarkable for greatneſs; for attitudes ſeemingly in motion; for a certain dark ſeverity; for an expreſſion of ſtrength, by which grace perhaps is excluded; and for a character of deſign approaching to the gigantic. The productions of this ſchool may be conſidered as overcharged; but it cannot be denied that they poſſeſs an ideal majeſty, which elevates human nature above mortality. The Tuſcan artiſts, ſatisfied with commanding the admiration, ſeem to have conſidered the art of pleaſing beneath their notice.

This ſchool has an indiſputable title to the veneration of all the lovers of the arts, as the firſt in Italy which cultivated them.

Painting, which had languiſhed from the deſtruction of the Roman empire, was revived by Cimabue, born of a noble family in Florence in the year 1240. This painter tranſlated the poor remains of the art from a Greek artiſt or two into his own country. His works, as may eaſily be imagined, were in a very ordinary ſtyle, but they received the applauſe and admiration of his fellow citizens; and if Cimabue had not found admirers, Florence in all probability would not have been honoured with Michael Angelo. The number of painters became ſoon ſo conſiderable in Florence, that in the year 1305 they eſtabliſhed a ſociety under the protection of St. Luke.

Maſſolino, towards the beginning of the 15th century, gave more grandeur to his figures, adjuſted their dreſs better, and ſhed over them a kind of life and expreſſion. He was ſurpaſſed by Maſſacio his pupil; who firſt gave force, animation, and relievo to his works.

Andrew Caſtagna was the firſt Florentine who painted in oil. But Leonardo da Vinci and Michael Angelo, contemporary painters, were the glory of the ſchool of Florence. Michael Angelo was ſuperior to Leonardo in grandeur, in boldneſs of conception, and in knowledge of deſign; but Leonardo was ſuperior to him in all the amiable parts of the art. Leonardo, poſſeſſed of a fine imagination, and full of ſenſibility, devoted himſelf in painting to expreſs the affections of the ſoul; and if, in this ſublime branch of the art, he was afterwards ſurpaſſed by Raphael, he had at leaſt the glory not only of exceeding all the painters who went before him, but of purſuing a path which none of them had attempted. His deſign was pure and neat, and not wholly deſtitute of greatneſs. He never went beyond nature, and he made a good choice of objects for imitation.

Michael Angelo, leſs formed to experience ſweet affections than vehement paſſions, ſought in nature what the ſtrength of man might accompliſh, not that which conſtitutes beauty. He delighted in being great and terrible, more than in graceful and pleaſant attitudes. Well acquainted with anatomy, he knew more exactly than any other artiſt in what manner to expreſs the joining of the bones of the body, and the office and inſertion of the muſcles; but too eager to diſplay his knowledge of anatomy, he ſeems to have forgotten that the muſcles are ſoftened by the ſkin which covers them; and that they are leſs viſible in children, in women, and in young men, than in confirmed and vigorous manhood. "In his figures (ſays Mengs) the articulations of the muſcles are ſo eaſy and free, that they appear to be made for the attitude in which he repreſents them. The fleſhy parts are too much rounded, and the muſcles are in general too large and of two equal ſtrength. You never perceive in his figures a muſcle at reſt; and although he knew admirably well how to place them, their action is very frequently inconſiſtent with their ſituation."

"He did not poſſeſs (ſays Sir Joſhua Reynolds) ſo many delightful parts of the art as Raphael; but thoſe which he had acquired were of a more ſublime nature. He ſaw in painting little more than what might be attained in ſculpture; and he confined it to exactneſs of form and the expreſſion of paſſions."

He informs us, in one of his letters, that he modelled in earth or wax all the figures which he intended to paint. This method was familiar to the great painters of his time, and ought never to be abandoned. It appears, that in repreſenting them in this manner in relievo, the painter can imitate them much more exactly than when they are drawn with a crayon or pencil on a plain ſurface.

"Michael Angelo (continues Sir Joſhua Reynolds) never attempted the leſſer elegancies and graces in the art. Vaſari ſays, he never painted but one picture in oil; and reſolved never to paint another, ſaying it was an employment only fit for women and children.

"If any man had a right to look down upon the lower accompliſhments as beneath his attention, it was certainly Michael Angelo, nor can it be thought ſtrange, that ſuch a mind ſhould have ſlighted, or have been with-held from paying, due attention to all thoſe graces and embelliſhments of art which have diffuſed ſuch luſtre over the works of other painters."

Ancient Rome, rich with the works brought from Greece, or finiſhed in its own boſom by Grecian artiſts, handed down in its ruins the remains of that glory to which it had been elevated. It was by the ſtudy of theſe remains that the modern artiſts were formed: they derived from them the knowledge of deſign, the beauty of exquiſite forms, greatneſs of ſtyle, and juſtneſs of expreſſion, carried to that length only which did not affect the beauty of the figure. From them alſo they derived the principles of the art of drapery; and they followed theſe principles even while they made the drapery of modern paintings more large and flowing than what was practiſed by the ancient ſculptors. The Roman ſchool was altogether devoted to the principal parts of the art, to thoſe which require genius and vaſt conceptions; and was no farther occupied with colours than what was neceſſary to eſtabliſh a difference between painting and ſculpture, or rather between painting varied with colours and in clara-obſcuro.

Raphael Sanzio, born at Urbino in 1483, and ſcholar to Pietro Perugeno, was the undoubted founder of this ſchool. His firſt manner was that of Perugeno his maſter; but he travelled twice to Florence to ſtudy the great artiſts who flouriſhed in that city.

It was fortunate for Raphael, ſays Mengs, that he was born in what he terms the infancy of the art, and that he formed himſelf by copying nature before he had acceſs to ſee the works of any great maſter. He began by ſtudying, with great exactneſs, the ſimple truth in his figures. He was then ignorant that any choice was neceſſary; but he ſaw the works of Leonardo da Vinci, of Maſſacio, and of Michael Angelo, which gave his genius a new direction. After this he perceived that there was ſomething more in the art of painting than a ſimple imitation of truth. But the works of thoſe maſters were not ſufficiently perfect to point out the beſt choice to make; and he continued in uncertainty till he ſaw at Rome the works of the ancients. Then he perceived that he had found the true models which he wanted; and in imitating them he had only to follow the natural impulſe of his genius.

Habituated by his firſt manner to imitate nature with preciſion, it was not difficult to carry the ſame exactneſs into the imitation of the ancients; and it was a great advantage to him that he flouriſhed in an age wherein the artiſts were not arrived at facility of execution at the expence of rigorous exactneſs. He never loſt ſight of nature; but he was inſtructed by the ancients in what manner ſhe ſhould be ſtudied. He perceived, that the Greeks had not entered into minute details, that they had ſelected what was great or beautiful, and that one of the chief cauſes of the beauty of their works was the regularity of their proportions: he began, therefore, by carefully ſtudying this part of the art. He ſaw alſo that the joinings of the bones, and the free play of their articulations, are the cauſes of all graceful movement: he therefore, after the example of the ancients, gave the greateſt attention to this part, and was led by theſe obſervations not to be contented with the ſimple imitation of nature.

His deſign is excellent, but neither ſo perfect nor ſo finiſhed as that of the Greeks. He excelled in repreſenting the character of philoſophers, apoſtles, and other figures of that kind; but he did not equal the Greeks in ideal figures, which ought to carry the impreſſion of divinity. His taſte for deſign was more Roman than Greek, becauſe he formed it chiefly on the baſſo-relievos which he found at Rome. On this account he had the habit of marking ſtrongly the bones and the articulations, and labouring the fleſhy parts leſs; but as theſe baſſo-relievos are very exact with regard to the reciprocal proportions of every member, he excelled in this part, while at the ſame time he did not give to his figures all the elegance of the Greek artiſts, nor the flexibility of articulation which is admired in the Laocoon, in the Apollo of Belvidere, and in the Gladiator.

The manners and ſpirit of his age, and the ſubjects which he moſt commonly treated, prevented him from reaching the ideal of the ancients. Having ſeldom occaſion to repreſent figures altogether ideal, he devoted himſelf to purity of expreſſion. He knew that the expreſſion of the paſſions of the ſoul is abſolutely neceſſary in an art which repreſents the actions of men, ſince from thoſe affections the actions may be ſaid truly to originate. To make figures act, and yet neglect the interior ſprings of action, is nothing more than a repreſentation of automata. The attitudes and action are evident; but they appear not to act of themſelves, becauſe they are void of thoſe principles from which alone men are ſuppoſed to act. An artiſt who neglects expreſſion, gives no juſt repreſentation of character, even though he ſhould take nature for his model.

Raphael's firſt care, when he wanted to compoſe a piece, was to weigh the expreſſion; that is to ſay, to eſtabliſh, according to the nature of the ſubject, the paſſions which were to animate the characters. All the figures, all the acceſſories, all the parts of the compoſition, were moulded to the general expreſſion.

As he had not found examples in the ancient ſtatues of the claro-obſcuro, he was comparatively weak in this part; and if there was any thing remarkable in his diſtribution of light and ſhade, he owed it to the works of the Florentine painters. It cannot be ſaid, however, even with regard to the claro-obſcuro, that he imitated nature without taſte. He delighted in what are called *maſſes* of light; and diſpoſed the great lights in the moſt conſpicuous places of his figures, whether naked or in drapery. If this method did not produce effects highly illuſive, it gives his works that diſtinctneſs which makes his figures conſpicuous at a diſtance; and this muſt be allowed to be an eſſential part of the art of painting. He did not proceed beyond this; and content with that kind of claro-obſcuro which comprehends imitation, he never attempted that which is ideal.

The compoſition and the *enſemble* of his figures were the chief excellences of Raphael. His philoſophical mind could not be affected with objects which had not expreſſion. He had too high an idea of painting to conſider it as a mute art; he made it ſpeak to the heart and ſoul; and he could only do this in ſubjects which required expreſſion. If Raphael did not reach the Greek excellence, if he did not poſſeſs the art of embelliſhing nature in the ſame high degree, he ſaw at leaſt, and imitated her in whatever was expreſſive and beautiful. "The Greeks ſailed with majeſty (ſays Mengs) between earth and heaven: Raphael walked with propriety on the earth."

"Compoſition is in general (ſays the ſame author) of two kinds: Raphael's is the expreſſive kind; the other is the theatrical or pictureſque, which conſiſts of an agreeable diſpoſition of the figures. Lanfranc was the inventor of this laſt, and after him Pietro de Cortona. I give the preference to Raphael; becauſe reaſon preſides over all his works, or at leaſt the greateſt part of them. He never allowed himſelf in common ideas, and was never allured to give any thing in his acceſſory figures, which might turn the attention from the principle object of the piece."

A hiſtory of the ſchools is nothing more than a hiſtory of the painters who founded them. In thoſe two which we have already given, Michael Angelo and Raphael come readily forward to claim our attention; and therefore we cannot do better

than conclude the account by the maſterly contraſt of theſe eminent painters given by Sir Joſhua Reynolds. "If we put thoſe great artiſts (ſays he) in a light of compariſon with each other, Raphael had more taſte and fancy, Michael Angelo more genius and imagination. The one excelled in beauty, the other in energy. Michael Angelo has more of the poetical in operation; his ideas are vaſt and ſublime; his people are a ſuperior order of beings; there is nothing about them, nothing in the air of their actions, or their attitudes, or the ſtyle and caſt of their limbs or features, that puts one in mind of their belonging to our ſpecies. Raphael's imagination is not ſo elevated; his figures are not ſo much disjointed from our own diminutive race of beings, though his ideas are chaſte, noble, and of great conformity to their ſubjects. Michael Angelo's works have a ſtrong, peculiar, and marked character; they ſeem to proceed from his own mind entirely; and that mind ſo rich and abundant, that he never needed, or ſeemed to diſdain, to look abroad for foreign help. Raphael's materials are generally borrowed, though the noble ſtructure is his own. The excellency of this extraordinary man lay in the propriety, beauty, and majeſty of his characters; his judicious contrivance of compoſition, correctneſs of drawing, purity of taſte, and the ſkilful accommodation of other mens conceptions to his own purpoſe."

This ſchool is the child of nature. The Venetian painters, not having under their eyes like the Roman the remains of antiquity, were deſtitute of the means of forming a juſt idea of the beauty of forms and of expreſſion. They copied without choice the forms of nature; but they were chiefly delighted with the beauties which preſented themſelves in the mixture and the variety of natural colours. Their attention not being detached from this part by any thing of greater importance, colouring was their chief object, and they ſucceeded in it. They did not reſt contented with characterizing the objects by compariſon, in making the colour proper for one of more value by the colour more proper for another; but they endeavoured ſtill farther, by the agreement and oppoſition of the coloured objects, and by the contraſt of light and ſhade, to produce a vigorous effect, to demand and fix the attention. Dominic, who was ſaid to have periſhed at Florence by the jealouſy of André Caſtagna, and who was the ſecond Italian artiſt who painted in oil, had educated, before he quitted Venice, his native country, Jacques Bellin, who was remarkable for nothing but the picturesque education which he gave to Gentel and John his two ſons.

Gentel, who was the eldeſt, painted chiefly in water colours. John contributed much to the progreſs of his art in painting conſtantly in oil, and after nature. Although he always retained great ſtiffneſs in his manner, he had leſs than his father or brother. Great neatneſs of colouring, and an approach to harmony, are evident in his works. His taſte in deſign is Gothic, the air of his heads is ſufficiently noble, his attitudes are without judgment, and his figures without expreſſion. He had for ſcholars Giorgion and Titian, who deſerve to be conſidered as the founders of the Venetian ſchool.

Giorgion diſtinguiſhed himſelf by a deſign of a better taſte than that of his maſter; but he chiefly ſurpaſſed him in colouring. He died in his 32d year; and excited the emulation of Titian, who ſoon greatly excelled him.

Tiziano Vecelli, known beſt by the name of *Titian*, was inſtructed to copy nature in the moſt ſervile manner in the ſchool of John Bellin; but when he had ſeen the works of Giorgion, he began to ſtudy the ideal in colouring.

The truth of hiſtory is not to be expected in his hiſtorical paintings, or in thoſe of the artiſts of the ſame ſchool. He ſeems to have paid little attention to the conſiſtence of ſcene, to the coſtume, to expreſſion adapted to the ſubject, or finally, to the accommodation of parts which characteriſe the works of thoſe who have ſtudied the ancients. He was in ſhort a great painter, and nothing more.

But although he deſerves not to be placed among the moſt diſtinguiſhed artiſts in point of judgment, yet he is by no means deſtitute of great and noble conceptions. There is often to be found among his male figures a conſiderable degree of grandeur: but if he has ſometimes, like Michael Angelo, overcharged his deſign, it was more diſcovered in the ſwelling of the ſoft and fleſhy parts, than in vigour and muſcular ſtrength.

Almoſt entirely devoted to ſimple imitation, he had ſcarcely greater choice in the claro-obſcuro than in deſign. He cannot be juſtly reproached at the ſame time for weakneſs in this particular; becauſe in endeavouring to imitate the colours of nature, he was obliged to obſerve the degrees of light. And in proportion as he ſucceeded in the imitation of natural colours, he muſt be leſs defective in the claro obſcuro; but it is not in the knowledge of this part of the art that we are to ſeek for the beauties of his works. Theſe are to be found in the happy diſpoſitions of colours both proper and local, and he carries this to the higheſt point of perfection.

The artiſts in the Florentine and Roman ſchools painted moſt commonly in water colours or in freſco; and in the exerciſe of their profeſſion, inſtead of nature, they finiſhed their works from their firſt ſketches. Titian painted in oil, and finiſhed from the objects in nature; and this practice, joined to his exquiſite talents, gave the greateſt truth to his colours. His being a portrait painter was alſo of advantage to him as a colouriſt. In this department he was accuſtomed to the colours of nature in carnations and draperies. He was a landſcape-painter; and here alſo he took the colours from nature.

"As Titian perceived (ſays Mengs) that the objects which are beautiful in nature have often a bad effect in painting, he found it neceſſary to make a choice in the objects of imitation; and he obſerved, that theſe were objects of which the local colours were extremely beautiful, which nevertheleſs were in a great meaſure deſtroyed by the reflection of light, by the poroſity of the body, and by different luminous tints, &c. He perceived alſo, that in every object there was an infinite number of half tints, which conducted to the knowledge of harmony. In ſhort, he obſerved in the objects of nature a particular agreement of tranſparency, of opacity, of rudeneſs, and of poliſh, and that all objects differed in the degrees of their tints and their ſhades. It was in this diverſity he ſought the perfection of his art; and in the execution he moderated the effect of natural colours. For example, in a carnation which had many demi-tints, he confined himſelf to one; and he employed even leſs than a demi-tint, where there were few in the natural object. By theſe means he obtained a colouring exquiſitely fine; and in this part he was a great maſter, and deſerves to be carefully ſtudied."

Titian has in general little expreſſion in his pictures, and he ſometimes introduces figures which augment the coldneſs of the piece; for if it be true that the heads, even in hiſtorical painting, ought to be ſtudied after nature, it is true alſo that an individual nature ought not to be preſented, but one general and ideal. It is neceſſary that they ſhould be men, while they reſemble not men we are accuſtomed to ſee. The painter fails in the effect which he ought to produce, if, when he repreſents Achilles, Hector, and Cæſar, his perſonages are familiar to our obſervation.

The colours of his paintings are ſo mingled together, as to give no idea of the colours on his pallet; which diſtinguiſhes him from Rubens, who placed his colours one at the ſide of another. It is impoſſible to ſay, on the narroweſt inſpection, with what colours he produced his tints. This practice, which enabled him to imitate ſo exactly the colours of nature, gives a

marked diſtinction to his manner of painting. In the examination of his works, the critics looſe an ordinary ſource of pleaſure which ariſes from marking the freedom of hand; but they may conſole themſelves with the natural and exquiſite touches of this artiſt.

He is of hiſtorical painters one of thoſe who have ſucceeded in landſcape. His ſituations are well choſen; his trees are varied in their forms, and their foilage well conceived. He had a cuſtom of repreſenting ſome remarkable appearance in his landſcapes to render them more ſtriking.

The diſtinguiſhing characteriſtics of this ſchool are, grace, an agreeable taſte for deſign, without great correction, a mellowneſs of pencil, and a beautiful mixture of colours.

Antonio Allegri, called *Corregio*, was the father and greateſt ornament of this ſchool. He began like the painters of his time to imitate nature alone; but, as he was chiefly delighted with the graceful, he was careful to purify his deſign from all ſhort turnings and unneceſſary angles. He perceived that largeneſs contributed to grace; and therefore he not only rejected all ſmall figures, but enlarged as much as poſſible the outlines, avoided acute angles and ſtraight lines, and by theſe means gave an eaſy grandeur to his deſign. He made his figures elegant and large; he varied the outlines by frequent undulations; but he was not always pure and correct.

Corregio painted in oil, a kind of painting ſuſceptible of the greateſt delicacy and ſweetneſs; and as his character led him to cultivate the agreable, he gave a pleaſing captivating tone to all his pictures. He fought tranſparent colours to repreſent ſhades conformable to nature, and adopted a manner of glazing which actually rendered his ſhadows more obſcure. Obſcurity in painting cannot be fully obtained without tranſparent colours; for theſe abſorb the rays of light, and of conſequence give leſs reflection. He laid his colours very thick on the brighteſt parts of his pictures, to make them capable of receiving, by a proper touch, the greateſt degree of light. He perceived, that the reflections of light correſpond with the colour of the body from which they are reflected; and on theſe principles he founded his theory of colours with reſpect to light and ſhade and reflection. But it is chiefly in the colour of his ſhades that he deſerves to be imitated; for his lights are too clear, and ſomewhat heavy; and his fleſhy parts are not ſufficiently tranſparent.

Harmony and grace are connected together; and on this account Corregio excelled alſo in harmony. As the delicacy of his taſte ſuffered him not to employ ſtrong oppoſitions, he naturally became a great maſter in this part, which chiefly conſiſts of eaſy gradations from one extreme to another. He was harmonious in his deſign, by making the lines which formed the angles of the contour arched and undulated. Both in the lights and ſhades, he placed always between the two extremes a ſpace which ſerved to unite them, and to form a paſſage from the one to the other. The delicacy of his organs made him perceive, better than any other artiſt, what relief was neceſſary to the eye after a violent exertion; and he was therefore careful to follow a bold and prevailing colour with a demi-tint, and to conduct the eye of the ſpectator, by an inviſible gradation, to its ordinary ſtate of tenſion. In the ſame manner (ſays Mengs) does agreeable and melting muſic pull one ſo gently out of ſleep, that the awaking reſembles enchantment more than the diſturbing of repoſe. A delicate taſte in colours, a perfect knowledge of the claro-obſcuro, the art of uniting light to light, and ſhade to ſhade, together with that of detaching the objects from the ground, inimitable, grave, and perfect harmony, were the qualities which diſtinguiſhed Corregio from all the painters, and placed him near the head of his profeſſion.

The Carracci, Lewis, Auguſtin, and Hannibal, formed what is called the *ſecond Lombard ſchool*, which is frequently diſtinguiſhed by the name of the *ſchool of Bologna*.

Lewis was the maſter of the other two; he had ſtudied the works of Titian and Paul Veroneſe at Venice, thoſe of Andre del Sarte at Florence, thoſe of Correggio at Parma, and thoſe of Jules Romaen at Mantua; but he chiefly endeavoured to imitate the manner of Corregio. Hannibal fluctuated between Corregio and Titian. Auguſtin their rival in painting had his mind cultivated by learning, and devoted part of his time to poetry and muſic, to dancing and to other manly exerciſes. Theſe three painters often employed their talents on the ſame piece; and it was admirable that their united labours ſeemed to be animated with the ſame ſpirit.

They eſtabliſhed an academy at Bologna, which their zeal for the advancement of their art made them call *l'Academia degli Deſideroſi*; but it was afterwards called the *Academy of the Carracci*, becauſe the reputation which theſe artiſts acquired, permitted not a more illuſtrious name to be given to an eſtabliſhment of which they were the founders. In this ſchool were taught the art of conſtructing models, perſpective, and anatomy; leſſons were given on the beautiful proportions of nature, on the beſt manner of uſing colours, and on the principles of light and ſhade. They held frequent conferences, in which not only artiſts, but men of general knowledge, were permitted to elucidate points relative to the art of painting: but they were ſeparated upon Hannibal's going to Rome to adorn the gallery of the cardinal Farneſe.

The works of the Carracci are often, from the reſemblance of their manner, confounded together; eſpecially thoſe which were finiſhed previous to the reſidence of Hannibal at Rome. Meanwhile each of them has a decided character diſtinct from the other two. Lewis had leſs fire, but more of graceſulneſs and grandeur: Auguſtin had more ſpirit in his conception, and more pleaſantneſs in his execution: Hannibal is characterized by boldneſs, by a deſign more profound, by an expreſſion more lucky, and by an execution more ſolid.

Sir Joſhua Reynolds, who ſaw the works of Lewis at Bologna, holds him out in his diſcourſes as the beſt model for what is called *ſtyle* in painting; which is the faculty of diſpoſing colours in ſuch a manner as to expreſs our ſentiments and ideas. "Lodovico Carracci," ſays he, "(I mean in his beſt works) appears to me to approach the neareſt to perfection. His unaffected breadth of light and ſhadow, the ſimplicity of colouring, which, holding its proper rank, does not draw aſide the leaſt part of the attention from the ſubject, and the ſolemn effect of that twilight which ſeems diffuſed over his pictures, appears to me to correſpond with grave and dignified ſubjects better than the more artificial brillancy of ſunſhine which enlightens the pictures of Titian."

Hannibal is eſteemed by the beſt judges as a model for beauty and deſign. Thoſe who blame him for becoming leſs a colourift at Rome than he was at Bologna, ought to recollect that it is his performances at Rome which have chiefly ſecured his reputation. Severe critics have maintained that his deſign is too little varied in his figures; that he excels only in male beauty; that in imitating ancient ſtatues, he excites ſome reſemblance, but without arriving at the ſublimity of ideas and of ſtyle which characterize the ancients; or, in other words, that he hath ſucceſsfully imitated the exterior of their manner, but that he was incapable of reaching the interior and profound reaſonings which determined thoſe admirable artiſts.

The ſucceſs of Hannibal, and the reputation which he acquired, have been pernicious to the art. His ſucceſſors, deluded by theſe conſiderations, have made him the object of their imitation, without aſcending to the ſources from which he de-

rived his knowledge, and which he never could equal. The refult has been, that, inſtead of becoming equal to Hannibal, they have often copied his imperfections.

This ſchool has been ſo different under different maſters, that it is difficult to characterize it. Some of its artiſts have been formed on the Florentine and Lombard manner, others on the Roman, others on the Venetian, and a few of them have diſtinguiſhed themſelves by a manner which may be called their own. In ſpeaking in general terms of this ſchool, it appears to have no peculiar character; and it can only be diſtinguiſhed by its aptitude to imitate eaſily any impreſſion; and it may be added, ſpeaking ſtill in general terms, that it unites, in a moderate degree, the different parts of the art, without excelling in any one of them.

It is equally difficult to determine the progreſs of painting in France. Miniature painting, and painting on glaſs, were early cultivated in that country; and in theſe two kinds, the Italians had often recourſe to the French artiſts. When Francis I. encouraged Roſſo, a Florentine, and Primatice, a Bolognian, the painters in France were not remarkable for any ſuperior talent; but they were capable of working under theſe foreign artiſts.

Couſin, a painter on glaſs, and portrait-painter, was the firſt who eſtabliſhed any kind of reputation in France. He was correct, but poſſeſſed very little elegance of deſign.

Painting, for ſome time encourged by Francis I. fell into a ſtate of languor, from which it was not recovered till the reign of Louis XIII. Jacques Blanchard, formed at the Venetian ſchool, and called *the French Titian*, flouriſhed about this period. But as he died young, and without educating any pupils to perpetuate his manner, he muſt be regarded as a ſingle good artiſt, and not as a founder of the French ſchool.

In the ſame manner Pouſſin, one of the greateſt French painters, and whom they call *the Raphael of France*, educated no pupils, nor formed any ſchool. His ſtyle and character of painting are deſcribed by Sir Joſhua Reynolds as ſimple, careful, pure, and correct. No works of any modern (adds the ſame author) have ſo much of the air of antique painting as thoſe of Pouſſin. His beſt performances have a remarkable dryneſs of manner, which, though by no means to be recommended for imitation, yet ſeems perfectly correſpondent to that ancient ſimplicity which diſtinguiſhes his ſtyle.

In the latter part of his life he changed from this manner to one much ſofter and richer; where there is a greater union between the figures and the ground. His favourite ſubjects were ancient fables; and no painter was ever better qualified to paint ſuch ſubjects, not only from his being eminently ſkilled in the knowledge of the ceremonies, cuſtoms, and habits of the ancients, but from his being ſo well acquainted with the different characters which thoſe who invented them gave their allegorical figures.

If Pouſſin, in the imitation of the ancients, repreſents Apollo driving his chariot out of the ſea by way of repreſenting the ſun riſing, if he perſonifies lakes and rivers, it is no way offenſive in him, but ſeems perfectly of a piece with the general air of the picture. On the contrary, if the figures which people his pictures had a modern air or countenance, if they appeared like our countrymen, if the draperies were like cloth or ſilk of our manufacture, if the landſcape had the appearance of a modern view, how ridiculous would Apollo appear? inſtead of the ſun, an old man; or a nymph with an urn, inſtead of a river or a lake.

Pouſſin, however, more admired than imitated, had no manner of influence in forming the French ſchool. Simon Vouet, his enemy and perſecutor, had this honour, becauſe his pupils, in the happy age of the arts in France, conferred on it the greateſt ſplendor. Vouet was a man of diſtinguiſhed abilities; but the ſchool which he erected would have had no continuance if his ſcholars had purſued his manner of painting. He had a kind of grandeur and facility; but his deſign was falſe with regard to colours, and without any idea of expreſſion. It was ſaid of him, that he only needed to take the pencil in his hand to finiſh with one ſtroke the ſubject which he had conceived; and on this account one is tempted to be pleaſed, becauſe he is aſtoniſhed. He had the merit of deſtroying the inſipid manner which reigned in France, and of pointing the way to a better taſte.

If Vouet laid the foundation of the French ſchool, Le Brun finiſhed the edifice. When Le Brun was placed under the tuition of Vouet, he aſtoniſhed his maſter and the reſt of his pupils with the rapidity of his progreſs. At the age of 26 he finiſhed his piece called the *Horſes of Diomede*, which gained a place in the palace royal, beſide thoſe of the moſt eminent painters. He was afterwards recommended to Pouſſin; but the young artiſt was more diſpoſed by his natural inclinations to that modern part of the art which is called the *great machine*, than to the profound and ſtudied manner of the Greek artiſts. Pouſſin, at the ſame time was of great ſervice to him, in recommending to his ſtudy the monuments, the cuſtoms, the dreſs of the ancients; their architecture, their rites, their ſpectacles, their exerciſes, their combats, and their triumphs.

Le Brun had a noble conception and a fruitful imagination. He was on no occaſion inferior to the vaſt compoſitions which he undertook, and he chiefly excelled in rigorous coſtume and exact likeneſſes.

Few painters have united ſo great a number of eſſential qualities and acceſſories of the art; and if he had ſuperiors, it conſiſted in this, that they poſſeſſed ſome particular quality in a more eminent degree.—He was a good drawer, but his deſign was far from being ſo elegant as that of Raphael, or ſo pure as that of Domenique, and it was leſs lively than that of Hannibal Carracci, whom he had taken for a model. In drapery he followed the Roman ſchool: the clothes which he gave to his figures were not like thoſe of the Venetian ſchool, of ſuch and ſuch a ſtuff; they were draperies and nothing more, and this manner agreed with the heroic ſtyle of his works; but in this part he was not equal to the painter of Urbino. He had ſtudied the expreſſion of the affections of the ſoul, as is evident from his treatiſe on the character of the paſſions: but after obſerving the general characters, and eſtabliſhing the principal ſtrokes of expreſſion, he thought he reached the whole extent of this ſubject, which is ſo infinitely extended. He always employed the few characters which he had once found out, and neglected to ſtudy the prodigious variety of gradations by which the interior affections are manifeſted in the exterior appearance. He fell then into the manner of repeating always; and poſſeſſed neither the delicacy, nor the depth, nor the extreme juſtneſs, of Raphael's expreſſion. He loved and poſſeſſed in a high degree the grand machine of the art; he was delighted with great compoſitions; and he gave them life, and animation, and variety; but he wanted the vigour and inſpiration of Raphael. His compoſitions are formed on philoſophical principles, but thoſe of Raphael are created. Le Brun thought well; Raphael, Pouſſin, le Sueur, thought moſt profoundly.—Le Brun had elevation, but he was not elevated like Raphael, to the ſublime.

In colouring, Le Brun did not imitate the painters of the Venetian ſchool. The ſweet attractions and ſtrong and ſolid colours of the ſchools of Rome and Lombardy ſeem rather to have been the object of his imitation; and from them alſo he learned an eaſy, agreeable, and bold management of the pencil.

As Le Brun poſſeſſed a great ſhare of lively imagination, he delighted, in allegory which gives the greateſt ſcope for ingeni-

ous invention. The fecundity and refources of his imagination appeared ſtill farther, in his inventing ſymbols for his allegorical figures without reſting contended with thoſe employed by the ancients. But fanciful repreſentations of this kind are diſtant from the operations of true genius. Spirit and thought in the arts are very different from ſpirit and thought in literary productions. A painter of moderate abilities may introduce into his works a great deal of the invention which belongs to poetry without enriching his peculiar art. The true ſpirit of painting conſiſts in making the figures appear in the very circumſtances and attitudes in which they are ſuppoſed to act, and penetrated with the ſentiments with which they ought to be affected. By theſe means the ſpectator is more certainly intereſted than if the actions and thoughts were repreſented by allegorical ſymbols. Pouſſin appears to have leſs waſte of ſpirit and imagination than Le Brun, while at the ſame time he gives more delight to people of ſpirit and imagination.

Euſtach le Sueur was the contemporary and rival of Le Brun; and no painter approached nearer to Raphael in the art of drapery, and in diſpoſing the folds in the moſt artful and the nobleſt manner. His deſign was in general more ſlender than that of Raphael, but, like his, it was formed on the model of the ancients. Like Raphael he repreſented with art and preciſion the affections of the ſoul; like him, he varied the air of the head, according to the condition, the age, and the character of his perſonages; and, like him, he made the different parts of every figure contribute to the general effect. His intention in compoſing was to expreſs his ſubject, not to make ſhining contraſts or beautiful groups of figures, not to aſtoniſh and bewitch the ſpectator by the deceitful pomp of a theatrical ſcene, or the ſplendor of the great machine. His tones are delicate, his tints harmonious, and his colours, though not ſo attractive as thoſe of the ſchools of Venice and Flanders, are yet engaging. They ſteal peaceably on the ſoul, and fix it without diſtraction on the parts of the art, ſuperior to that of colouring.

His preaching of St. Paul, and the picture which he painted at St. Gervais, which the critics compare with the beſt productions of the Roman ſchool, and the 22 pictures which he painted for the Carthuſian monaſtery at Paris, and which were lately in poſſeſſion of the king, are eſteemed his beſt pieces. His contemporaries affirm, that he conſidered as ſketches merely thoſe excellent performances which are the glory of the French ſchool.

If Le Sueur had lived longer, or if, like Le Brun, he had been employed under a court, fond of the arts and of learning, to execute the great works of the age, the French ſchool would have adopted a different and a better manner. The noble beauty of his heads, the ſimple majeſty of his draperies, the lightneſs of his deſign, the propriety of his expreſſion and attitudes, and the ſimplicity of his general diſpoſition, would have formed the character of this ſchool. The deceitful pomp of theatrical decoration would have been more lately introduced, or perhaps would never have appeared, and Paris might have been the counterpart to Rome. But as Le Brun, by an accidental concurrence of favourable circumſtances, was the faſhionable painter, to be employed or rewarded it was neceſſary to imitate his manner; and as his imitators poſſeſſed not his genius, his faults became not only current but more deformed.

The French ſchool not long ago changed its principles; and if, when peace ſhall be reſtored to this unhappy nation, they continue to follow the road which, while the arts flouriſhed among them, they marked out for themſelves, they have the chance of becoming the moſt rigid obſervers of the laws impoſed on the Greek artiſts. The count de Ceyles, pupil of Bouchardion, who by his rank and fortune had the means of encouraging the imitators of the ancients, and of the maſters of the 15th century, firſt formed the deſign of reſtoring a pure taſte to the art of painting. He was ſeconded by the talents of M. Vien, an artiſt who had only occaſion to have his leſſons and his example laid before him.—In this manner commenced a revolution, ſo much the more wonderful, as it was ſcarcely ever known that any nation ſubſtituted a ſyſtem of ſimple and rigid excellence in place of a falſe and glittering taſte. The hiſtory of all nations, on the contrary, diſcovers a gradual progreſs from a rude beginning to perfection, and afterwards to irremediable decay. The French had the proſpect of ſtopping ſhort in this ordinary courſe. They began in a manner which promiſed ſucceſs; and the beſt conſequences may be expected, if the internal commotions of France do not deſtroy the taſte for the arts in that country.

In Germany there can hardly be ſaid to be a ſchool, as it is a continuation of ſingle artiſts, who derived their manner from different ſources of originality and imitation. There were ſome German painters of eminence, when the art, emerging from its barbarous ſtate, firſt began to be cultivated with ſucceſs in Europe. As they were totally unacquainted with the ancients, and had ſcarcely acceſs to the works of their contemporaries in Italy, they copied nature alone, with the exception of ſomewhat of that ſtiffneſs which forms the Gothic manner. It is this manner, if we ſpeak of the early German painters, which characterizes their ſchool. But this is by no means the caſe with their ſucceſſors, part of whom were educated in Flanders and part in Italy: For if Mengs or Dietrich were comprehended in this ſchool, there would be nothing peculiar to its manner diſcovered in their works. And it is therefore neceſſary to confine our obſervations to the more ancient German painters, in whom the Gothic ſtyle is conſpicuous.

Albert Durer was the firſt German who corrected the bad taſte of his countrymen. He excelled in engraving as well as painting. His genius was fertile, his compoſitions varied, his thoughts ingenious, and his colours brilliant. His works, though numerous, were finiſhed with great exactneſs; but as he owed every thing to his genius, and as works of inferior merit were by the falſe taſte of the times preferred to his, it was impoſſible for him altogether to avoid the faults of his predeceſſors. He is blamed for ſtiffneſs and aridity in his outlines, for little taſte or grandeur in his expreſſion, for ignorance of the coſtume, of aerial perſpective and of gradation of colours: but he had carefully ſtudied lineal perſpective, architecture, and fortification.

John Holbeen or Holbein, nearly contemporary with Albert Durer, painted in oil and water colours. He excelled chiefly in hiſtory and in portrait painting. His colours are freſh and brilliant, and his works are highly finiſhed; but in his hiſtorical ſubjects, his draperies are not in ſo good a taſte as thoſe of Albert Durer.

The Flemiſh ſchool is recommended to the lovers of the art by the diſcovery, or at leaſt the firſt practice of oil painting. Van Mander gives us the account of this wonderful diſcovery in the following words: "John Van Eyck was ſo excellent a chemiſt, that he diſcovered a method of varniſhing his diſtemper colours with a varniſh, which was made of ſome oils, and was very pleaſing on account of the gloſs and luſtre it gave them. Many artiſts in Italy had vainly attempted to find out that ſecret; they never hit on the true method. It happened once that John, in his uſual manner, having highly finiſhed one of his pictures on boards, and having varniſhed it with his new invented varniſh, expoſed it to dry in the ſun; but whether the boards were not well joined, or whether the heat of the ſun was too violent, the boards ſplit aſunder and opened in the junctures.

John ſaw with concern that his work was ſpoiled, and reſolved to contrive ſomething againſt future accidents of the ſame kind. Being diſguſted at diſtemper painting and varniſhing, he thought of a varniſh that might dry without ſunſhine; and having tried many oils and ſubſtances, he found that lintſeed and nut oil dried better than any other. He boiled them with ſome other drugs, and produced the beſt varniſh in the world. Ever bent on improvement, he found, after much inquiry, that colours mixed with theſe oils worked and dried extremely well, and when dried would be water-proof. He obſerved likewiſe, that theſe oils would animate and give them a gloſs and luſtre without any farther varniſhing." The truth, however, of this account is now very much queſtioned; and it is even proved by the manuſcripts of Theophilus Preſbyter, and alſo by ſome old oil paintings in England, that this method of painting was diſcovered long before the time of John Van Eyck. At the ſame time we admit, that John and his brother Hubert may have been the firſt who brought oil painting into general practice, not only by ſhowing the excellence of which it was ſuſceptible, but alſo by making ſeveral improvements on the art. And this is the more probable, from the great reputation which their pictures acquired over all Europe by the ſoftneſs and delicacy of their colours. The attention of the Italian painters was chiefly excited, inſomuch that Antoine de Meſſina performed a journey into Flanders for the expreſs purpoſe of acquiring the confidence of John Van Eyck, and of diſcovering the ſecret.

John de Bruges was the founder of painting as a profeſſion in Flanders; Peter Paul Rubens was the founder of the art. This extraordinary perſon produced an immenſe number of works. He excelled equally in hiſtorical, portrait, and landſcape painting; in fruits, flowers, and in animals. He both invented and executed with the greateſt facility; and to ſhow the extent of his powers, he frequently made a great number of ſketches of the ſame ſubject altogether different, without allowing any time to elapſe between them. The works of Rubens were deſtitute of that ſoft inſpiration, productive of ſweet and pleaſant effects, ſo conſpicuous in the works of Raphael; but he poſſeſſed that ſprightlineſs of genius and ſtrength of mind which is ever ready to burſt forth in wonderful and aſtoniſhing effects. His figures appear to be the exact counter-part of his conceptions, and their creation nothing more than a ſimple act of the will.

His talent for deſign is unjuſtly cenſured, for on every occaſion his deſign is noble and eaſy. He had great knowledge of anatomy, but he was hurried away by the impetuoſity of his imagination and the ardor for execution; he preferred ſplendor to the beauty of forms, and ſacrificed correctneſs of deſign too often to the magic of colours. In ſhort, his qualities ſuppoſe a mind full of fire and vigour, rather than accuracy or profound thought. His drapery may be conſidered rather as fine than properly adapted to his figures: for, in the language of the art, to *clothe* and to *give drapery* are not ſynonymous terms. A portrait painter may excel in clothing his perſonages, while he is totally incapable of giving good drapery to an hiſtorical painting. His chief merit conſiſts in colouring; though in this branch of the art he has not equalled Titian. He is the firſt among painters eminent for pomp and majeſty; the firſt among thoſe who ſpeak to the eye, and the power of the art is often carried by him almoſt to enchantment.

It is evident from the works of Rubens, that his method of painting was to lay the colours in their place, one at the ſide of another, and mix them afterwards by a ſlight touch of the pencil. Titian mingled his tints as they are in nature, in ſuch a manner as to make it impoſſible to diſcover where they began or terminated; the effect is evident, the labour is concealed. Thus Rubens is more dazzling, and Titian more harmonious. In this part, the firſt excites the attention, the ſecond fixes it. The carnations of Titian reſemble the bluſh of nature; thoſe of Rubens are brilliant and poliſhed like ſatin, and ſometimes his tints are ſo ſtrong and ſeparated as to appear like ſpots.

"Rubens (ſays Sir Joſhua Reynolds) is a remarkable inſtance of the ſame mind being ſeen in all the various parts of the art. The whole is ſo much of a piece, that one can ſcarce be brought to believe but that if any one of them had been more correct and perfect, his works would not be ſo complete as they appear. If we ſhould allow a greater purity and correctneſs of drawing, his want of ſimplicity in compoſition, colouring, and drapery, would appear more groſs."

In his compoſition his art is too apparent. His figures have expreſſion, and act with energy, but without ſimplicity or dignity. His colouring, in which he is eminently ſkilled, is notwithſtanding too much of what we call *tinted*. Throughout the whole of his works there is a proportionable want of that nicety of diſtinction and elegance of mind which is required in the higher walks of painting; and to this want it may be in ſome degree aſcribed, that thoſe qualities which make the excellency of this ſubordinate ſtyle appear in him with their greateſt luſtre. Indeed the facility with which he invented, the richneſs of his compoſition, the luxuriant harmony and brilliancy of his colouring, ſo dazzle the eye, that whilſt his works continue before us, we cannot help thinking that all his deficiences are fully ſupplied.

The Flemiſh ſchool, of which Rubens is the greateſt maſter, is remarkable for great brilliancy of colours and the magic of the *claro-obſcura*. To theſe may be joined a profound deſign, which is yet not founded on the moſt beautiful forms; a compoſition poſſeſſed of grandeur, a certain air of nobleneſs in the figures, ſtrong and natural expreſſions; in ſhort, a kind of national beauty, which is neither copied from the ancients nor from the Roman nor Lombard ſchools, but which deſerves to pleaſe, and is capable of pleaſing.

To ſpeak in general terms, and without regarding a great number of exceptions, the Dutch ſchool carries none of the above qualities to great perfection, except that of colouring. Far from excelling in the beauty of heads and forms, they ſeem chiefly to delight in the exact imitation of the loweſt and moſt ignoble. Their ſubjects are derived from the tavern, the ſmith's ſhop, and from the vulgar amuſements of the rudeſt peaſants. The expreſſions are ſufficiently marked; but it is the expreſſion of paſſions which debaſe inſtead of ennobling human nature. One would think that they practiſed the art of degrading the bodies and ſouls of men.

It muſt be acknowledged, at the ſame time, that the Dutch painters have ſucceeded in ſeveral branches of the art. If they have choſen low objects of imitation, they have repreſented them with great exactneſs; and truth muſt always pleaſe. If they have not ſucceeded in the moſt difficult parts of the claro-obſcuro, they at leaſt excel in the moſt ſtriking, ſuch as in light confined in a narrow ſpace, night illuminated by the moon or by torches, and the light of a ſmith's forge. The Dutch underſtand the gradations of colours; and by their knowledge of contraſt they have arrived at the art of painting light itſelf. They have no rivals in landſcape painting, conſidered as the faithful repreſentation or picture of a particular ſcene; but they are far from equalling Titian, Pouſſin, Claude Lorrain, &c. who have carried to the greateſt perfection the ideal landſcape, and whoſe pictures, inſtead of being the topographical repreſentation of certain places, are the combined reſult of every thing beautiful in their imagination or in nature. The Dutch, however, diſtinguiſh themſelves by their perſpective, by their clouds, ſea-ſcenes, animals, fruits, flowers, and inſects; and they excel in miniature

painting. In ſhort, every thing which requires a faithful imitation, colour, and a nice pencil, is well executed by the Dutch painters.

Holland has alſo produced hiſtory painters, as Octavius Van Been, and Vander Hilſt, the rival of Vandyke, and perhaps his ſuperior: but it is not in the works of thoſe artiſts that we find the character of the Dutch ſchool.

Neither is the origin of their ſtyle to be derived from the works of Lucas of Leyden, though, from the time he flouriſhed, viz. about the end of the 15th century, he may be conſidered as the patriarch of the Dutch ſchool. Lucas painted in oil, in water colours, and on glaſs; and the kinds of his painting were hiſtory, landſcape, and portrait. His picture of the Laſt Judgment is preſerved in the Hotel-de-ville of Leyden; it poſſeſſes vaſt merit in point of compoſition, and a great variety of figures.

If miniature painting be conſidered as a characteriſtic of the Dutch ſchool, Cornelius Polembourg may be regarded as the father of it. He poſſeſſed the colour, delicacy of touch, and diſpoſition of the claro-obſcuro, which chiefly diſtinguiſh this ſchool; and if any thing is to be added, it is want of correctneſs in his deſign.

But if the choice of low figures is its chief characteriſtic, this is to be found in the greateſt perfection in the works of the celebrated Rembrandt Vanryn; and it is the more offenſive in this artiſt, as his compoſitions frequently required an oppoſite choice of figures. As his father was a miller near Leyden, his education muſt altogether have depended on the exertion of great talents and the ſtudy of nature. He ſtudied the groteſque figure of a Dutch peaſant, or the ſervant of an inn with as much application as the greateſt maſters of Italy would have ſtudied the Appollo of Belvidere, or the Venus de Medicis. This was not the manner of elevating himſelf to the noble conceptions of Raphael; but it was acquiring the imitation of truth in vulgar painting.

"Rembrandt (ſays M. Deſcamps) may be compared to the great artiſts for colour and delicacy of touch and claro-obſcuro. It appears that he would have diſcovered the art, though he had been the firſt perſon that ever attempted it. He formed to himſelf rules and a method of colouring, together with the mixture of colours and the effect of the different tones. He delighted in the great oppoſitions of light and ſhade; and he ſeems to have been chiefly attentive to this branch of the art. His workſhop was occaſionally made dark, and he received the light by a hole, which fell as he choſe to direct it on the place which he deſired to be enlightened. On particular occaſions he paſſed behind his model a piece of cloth of the ſame colour with the ground he wanted; and this piece of cloth receiving the ſame ray which enlightened the head, marked the difference in a ſenſible manner, and allowed the painter the power of augmenting it according to his principles.

"Rembrandt's manner of painting is a kind of magic. No artiſt knew better the effects of different colours mingled together, nor could better diſtinguiſh thoſe which did not agree from thoſe which did. He placed every tone in its place with ſo much exactneſs and harmony, that he needed not to mix them, and ſo deſtroy what may be called the flower and freſhneſs of the colours. He made the firſt draught of his pictures with great preciſion, and with a mixture of colours altogether particular: he proceeded on his firſt ſketch with a vigorous application, and ſometimes loaded his lights with ſo great a quantity of colour, that he ſeemed to model rather than to paint. One of his heads is ſaid to have a noſe nearly as much projected as the natural noſe which he copied."

Such is the power of genius, that Rembrandt, with all his faults, and they are enormous, is placed among the greateſt artiſts by M. Deſcamps, who ſaw his works, and was himſelf an artiſt. It is neceſſary to obſerve, that if Rembrandt was ignorant of the eſſential parts of his art, or neglected them, he was yet acquainted with expreſſion, which alone was capable of giving animation to his works. His expreſſions are not noble, but they are juſt, lively, and executed with great judgment.

John de Laer, a miniature painter, and who made choice of his ſubjects from common life, deſerves a diſtinguiſhed place in the Dutch ſchool. He painted hunting-ſcenes, the attacks of robbers, public feſtivals, landſcapes, and ſea views; and he ornamented his pictures with old ruins, and enriched them with figures of men and animals. He had a correct deſign, and employed vigorous and lively colouring.

Van-Oſtade, although born at Lubeck, Gerard Dow, Metzu, Miris, Wouwermans, Berghem, and the celebrated painter of flowers Van-Huyſum, belonged to the Dutch ſchool.

The greater part of the ſchools of which we have treated have no longer any exiſtence. Italy alone had four ſchools, and there only remain at preſent a very few Italian artiſts known to foreigners. The ſchool of Rubens is in vain ſought for in Flanders. If the Dutch ſchool ſtill exiſts, it is not known beyond the precincts of Holland. Mengs a German artiſt has made himſelf famous in our days; but it was in Italy that he chiefly improved his talents and exerciſed his art. M. Dietrich, another German, has made himſelf known to ſtrangers; but two ſolitary artiſts do not form a ſchool.

A new ſchool is formed in our times and in our own country, called the *Engliſh ſchool*. It is connected with the academy in London, inſtituted in 1766, by letters patent from the king, and formed only in 1769. Sir Joſhua Reynolds is the undoubted founder of it. His works give him a diſtinguiſhed rank among the artiſts of the preſent age, and exhibit a genius in their author which has ſeldom been ſurpaſſed: but the effects which he has contrived to give to them by the formation of a new ſchool, and by the good principles which his diſcourſes to academicians, and his example as a painter, have diſſeminated, will ſecure his reputation as long as England ſhall eſteem the advantages and the worth of great abilities. The Engliſh taſte appears to be formed on the great maſters of the Italian and the Flemiſh ſchools. Sir Joſhua was a great admirer of Michael Angelo, and particularly recommends him to the attention of the academicians. "I feel (ſays Sir Joſhua) a ſelf-congratulation in knowing myſelf capable of ſuch ſenſations as he intended to excite. I reflect, not without vanity, that theſe diſcourſes bear teſtimony of my admiration of that truly divine man; and I ſhould deſire that the laſt words which I ſhould pronounce in this academy, and from this place, might be the name of—*Michael Angelo*." But though he thus enthuſiaſtically admired this very great man, yet he allows, what cannot indeed be denied, that he was capricious in his inventions; "and this (ſays he) may make ſome circumſpection neceſſary in ſtudying his works; for though they appear to become him, an imitation of them is always dangerous, and will prove ſometimes ridiculous. 'In that dread circle none durſt tread but he.' To me I confeſs, his caprice does not lower the eſtimation of his genius, even though it is ſometimes, I acknowledge, carried to the extreme; and however thoſe eccentric excurſions are conſidered, we muſt at the ſame time recollect, that thoſe faults, if they are faults, are ſuch as never could occur to a mean and vulgar mind; that they flowed from the ſame ſource which produced his greateſt beauties; and were therefore ſuch as none but himſelf was capable of committing; they were the powerful impulſes of a mind unuſed to ſubjection of any kind, and too high to be controuled by cold criticiſm."

The effect of Sir Joſhua's diſcourſes is viſible in the pictures of this ſchool. The Death of General Wolf, the Departure of Regulus for Carthage, the Arrival of Agrippina, and ſome other ſubjects, are decided proofs that the Engliſh ſchool is ac-

quainted with greatneſs of ſtyle, boldneſs of expreſſion, and the art of managing a great number of figures. It will be fortunate for the painters of this ſchool, if, more rigid with regard to their forms than ambitious of poignant and aſtoniſhing effects, they ſupport the character which they have already acquired. But although England had not enjoyed this brilliant ſucceſs in painting, ſhe would have immortalized herſelf by the excellency of her engravings.

It is eaſy to perceive in all thoſe ſchools the cauſe of the character which diſtinguiſhes them. In the Roman ſchool, it is the excellent education of its firſt maſters, together with the precious remains of antiquity found in the ruins of ancient Rome. In the Venetian ſchool, the magnificence derived from the commerce of the eaſt, the frequency of feaſts and maſquerades, and the neceſſity of painting to the rich and luxurious, who were accuſtomed to behold theſe magnificent objects, were the cauſes of its gaudy taſte. In the Dutch ſchool, the peculiarity of its grovelling manner may be accounted for from the habits of the artiſts. Accuſtomed to viſit taverns and workſhops, and having moſt commonly expoſed to their view low and groteſque figures, they repreſent in their pictures the objects which were moſt familiar to them in life.

"Beauty (ſays a French writer) ought to be the characteriſtic of the Engliſh ſchool, becauſe the artiſts have it often expoſed to their view. If this beauty is not preciſely ſimilar to that among the ancients, it is not inferior to it. The Engliſh ſchool ſhould alſo diſtinguiſh itſelf for truth of expreſſion; becauſe the liberty enjoyed in that country gives to every paſſion its natural and unbiaſſed operation. It will probably long preſerve its ſimplicity unpolluted by the pomp of theatrical taſte and the conceit of falſe graces, becauſe the Engliſh manners will long preſerve their ſimplicity.

"Examine the picture of a Frenchwoman (continues he) painted by an artiſt of that nation, and you will generally find, in place of expreſſion, a forced grin, in which the eyes and the forehead does not partake, and which indicates no affection of the ſoul. Examine the picture of an Engliſhwoman done by one of their painters, and you obſerve an elegant and ſimple expreſſion, which makes you at once acquainted with the character of the perſon repreſented."

Principles of PAINTING, and the Order of the Artiſt's STUDIES.

WE have joined theſe together, becauſe they are like cauſe and effect; and comprehend both on what parts in the execution of the art the painter is to employ his chief attention, and alſo the manner in which he is to employ it. We ſhall not therefore be confined to the dry and abſtract, and as it were unembodied principles, but connect them with the uſeful and agreeable branches of the art, in that order in which it appears to us they ſhould be ſtudied.

SECT. I. *Of Anatomy.*

To aſk if the ſtudy of anatomy is requiſite to a painter, is the ſame thing as to aſk if, in order to learn any ſcience, a man muſt firſt make himſelf acquainted with the principles of it. It would be an uſeleſs waſte of time to cite, in confirmation of this truth, the authorities of the ancient maſters, and the moſt celebrated ſchools. A man, who is unacquainted with the form and conſtruction of the ſeveral bones which ſupport and govern the human frame, and does not know in what manner the muſcles moving theſe bones are fixed to them, can make nothing of what appears of them through the integuments with which they are covered; and which appearance is, however, the nobleſt object of the pencil. It is impoſſible for a painter to copy faithfully what he ſees, unleſs he thoroughly underſtand it. Let him employ ever ſo much time and ſtudy in the attempt, it cannot but be attended with many and great miſtakes: juſt as it muſt happen to a man, who undertakes to copy ſomething in a language which he does not underſtand; or to tranſlate into his own, what has been written in another, upon a ſubject with which he is not acquainted.

It ſeldom happens that nothing more is required of a painter than to copy exactly an object which he has before him. In ſtill and very languid attitudes, in which every member is to appear motionleſs and dead, a living model may, no doubt, yield for a long time a faithful image, and prove an uſeful pattern to him. But in regard to geſtures any way ſudden, motions any way violent, or thoſe momentary attitudes which it is more frequently the painter's buſineſs to expreſs, the caſe is quite different. In theſe a living model can hold but an inſtant or two; it ſoon grows languid, and ſettles into a fixed attitude, which is produced by an inſtantaneous concourſe of the animal ſpirits. If, therefore, a painter poſſeſs not ſo thoroughly all the principles of anatomy, as to be at all times able to have immediate recourſe to them; if he know not the various manners in which the ſeveral parts of the human body play, according to their various poſitions; living models, far from proving an uſeful pattern to him, will rather tend to lead him aſtray, and make him loſe ſight of truth and nature, by exhibiting the very reverſe of what is required, or at leaſt exhibiting it in a very faint and imperfect manner. In living models, we often behold thoſe parts ſlow, which ſhould be very quick; thoſe cold and torpid, which ſhould have the greateſt ſhare of life and ſpirit in them.

Nor is it, as ſome may be apt to imagine, merely to repreſent athletic and vigorous bodies, in which the parts are moſt bold and determined, that anatomy is requiſite: it ſhould be underſtood to repreſent perſons of the moſt delicate frame and condition, even women and children, whoſe members are ſmootheſt and roundeſt, though the parts made known by it are not to be ſtrongly expreſſed in ſuch objects; juſt as logic is equally requiſite under the poliſhed inſinuations of the orator and the rough arguments of the philoſopher.

But it is needleſs to ſpend much time in proving, that a painter ſhould be acquainted with anatomy; or in ſhowing, how far his acquaintance with it ſhould extend. For inſtance, it is unneceſſary for him to enter into the different ſyſtems of the nerves, blood veſſels, bowels, and the like; parts which are removed from the ſight, and which therefore may be left to the ſurgeon and the phyſician, as being a guide in the operations of the former, and in the preſcriptions of the latter. It is enough for the painter, to be acquainted with the ſkeleton; in other words, with the figure and connection of the bones, which are, in a manner, the pillars and props of the human body; the origin, progreſs, and ſhape, of the muſcles, which cover theſe bones; as alſo the different degrees in which nature has clothed the muſcles with fat, for this ſubſtance lies thicker upon them in ſome places than in others. Above all, he ſhould know in what manner the muſcles effect the various motions and geſtures of the body. A muſcle is compoſed of two tendinous and ſlender parts, one called the *head*, the other the *tail*, both terminating at the bones; and of an intermediate part, called the *belly*. The action of a muſcle conſiſts in an extraordinary ſwelling of this intermediate part, while the head remains at reſt, ſo as to bring the tail nearer the head, and conſequently the part, to which the tail of the muſcle is fixed, nearer to that part into which the head is inſerted.

There are many motions, to effect which ſeveral of the muſcles (for this reaſon called *co-operating muſcles*) muſt ſwell and operate together, while thoſe calculated to effect a contrary motion (and therefore called *antagoniſt muſcles*) appear ſoft and flaccid. Thus, for example, the biceps and the brachiæus internus labour when the arm is to be bent, and become more prominent than uſual; while the gemellus, the brachiæus externus, and the anconæus, whoſe office is to extend the arm, continue, as it were, flat and idle. The ſame happens reſpectively in all the other motions of the body. When the antagoniſt muſcles of any part operate at one and the ſame time, ſuch part becomes rigid and motionleſs. This action of the muſcle is called *tonic*.

Michael Angelo intended to give the public a complete treatiſe upon this ſubject; and it is no ſmall misfortune, that he never accompliſhed ſo uſeful a deſign. This great man, having obſerved, as we are told in his life by Condivi, that Albert Durer was deficient on the ſubject, as treating only of the various meaſures and forms of bodies, without ſaying a word of their attitudes and geſtures, though things of much greater importance, reſolved to compoſe a theory, founded upon his long practice, for the ſervice of all future painters and ſtatuaries. And, certainly, no one could be better qualified to give anatomical precepts for that purpoſe, than he who, in competition with Da Vinci, deſigned that famous cartoon of naked bodies, which was ſtudied by Raphael himſelf, and afterwards obtained the approbation of the Vatican, the greateſt ſchool of the art we are now treating of.

The want of Michael Angelo's precepts may, in ſome meaſure be ſupplied by other books written on the ſame ſubject by Moro, Ceſio, and Tortebat; and lately by Boucherdon, one of the moſt famous ſtatuaries in France. But nothing can be of equal ſervice to a young painter, with the leſſons of ſome able diſſector; under whom, in a few months, he may make himſelf maſter of every branch of anatomy which he need to be acquainted with. A courſe of oſteology is of no great length; and of the infinite number of muſcles diſcovered by curious myologiſts, there are not above 80 or 90, with which nature ſenſibly operates all thoſe motions which he can ever have occaſion to imitate or expreſs. These, indeed, he ſhould cloſely ſtudy, theſe he ſhould carefully ſtore up in his memory, ſo as never to be at the leaſt loſs for their proper figure, ſituation, office, and motion.

But there is another thing, beſides the diſſection of dead bodies, by which a young painter may profit greatly; and that is anatomical caſts. Of theſe we have numbers by ſeveral authors; nay ſome which paſs under the name of *Buonarroti* himſelf. But there is one in which, above all the reſt, the parts are moſt diſtinctly and lively expreſſed. This is the performance of Hercules Lelli, who has perhaps gone greater lengths in this kind of ſtudy than any other maſter. We have, beſides, by the ſame able hand, ſome caſts of particular parts of the human body, ſo curiouſly coloured for the uſe of young painters, as to repreſent theſe parts exactly as they appear on removing the integuments; and thus, by the difference in their colour as well as configuration, render the tendinous and the fleſhy parts, the belly and the extremities, of every muſcle ſurpriſingly diſtinct: at the ſame time that, by the various direction of the fibres, the motion and play of theſe muſcles become very obvious; a work of the greateſt uſe, and never enough to be commended! Perhaps, indeed, it would be an improvement, to give the muſcles various tints; thoſe muſcles eſpecially which the pupil might be apt to miſtake for others. For example, though the maſtoides, the deltoides, the ſartorius, the faſcia lata, the gaſterocnemii, are, of themſelves, ſufficiently diſtinguiſhable, it is not ſo with regard to the muſcles of the arm and of the back, the right muſcles of the belly, and ſome others, which, either on account of the many parts into which they branch, or of their being interwoven one with another, do not ſo clearly and fairly preſent themſelves to the eye. But let the cauſe of confuſion to young beginners be what it will, it may be effectually removed, by giving, as already hinted, different colours to the different muſcles, and illumining anatomical figures; in the ſame manner that maps are coloured, in order to enable us readily to diſtinguiſh the ſeveral provinces of every kingdom, and the ſeveral dominions of every prince.

The better to underſtand the general effect, and remember the number, ſituation, and play of the muſcles, it will be proper to compare, now and then, the anatomical caſts, and even the dead body itſelf, with the living body covered with its fat and ſkin; and above all things, with the Greek ſtatues ſtill in being. It was the peculiar happineſs of the Greeks, to be able to characterize and expreſs the ſeveral parts of the human body much better than we can pretend to do; and this, on account of their particular application to the ſtudy of naked figures, eſpecially the fine living ones which they had continually before their eyes. It is well known, that the muſcles moſt uſed are likewiſe the moſt protuberant and conſpicuous; ſuch as, in thoſe who dance much, the muſcles of the legs; and in boatmen, the muſcles of the back and arms. But the bodies of the Grecian youth, by means of their conſtant exertion of them in all the gymnaſtic ſports, were ſo thoroughly exerciſed, as to ſupply the ſtatuary with much more perfect models than ours can pretend to be.

There are a great many exerciſes, which a young painter ſhould go through while engaged in the ſtudy of anatomy, in order to make himſelf more thoroughly maſter of that ſcience. For example: The thighs of any figure, a Laocoon for inſtance, being given, he ſhould add to them legs ſuitable to that ſtate in which the muſcles of the thighs are repreſented, that is, the muſcles which ſerve to bend and extend the legs, and to effectuate in them ſuch a preciſe poſition and no other. To the ſimple contour of an anatome, or a ſtatue, he ſhould add the parts included by it, and give it a ſyſtem of muſcles conformable to the quality of that particular contour; for every contour denotes ſome one certain attitude, motion, exertion, and no other. Exerciſes of this kind would ſoon eſtabliſh him in the moſt fundamental principles of painting, eſpecially if he had an opportunity of comparing his drawings with the ſtatue or caſt from which the parts given him to work upon were taken, and thereby diſcovering and correcting his miſtakes. This method is very like that uſed by thoſe who teach the Latin tongue; when, having given their ſcholars a paſſage of Livy or Cæſar already tranſlated into their mother-tongue, to tranſlate back into Latin, they make them compare their work with the original text.

Sect. II. *Of Perſpective.*

The ſtudy of perspective ſhould go hand in hand with that of anatomy, as not leſs fundamental and neceſſary. In fact, the contour of an object drawn upon paper or canvas, repreſents nothing more than ſuch an interſection of the viſual rays ſent from the extremities of it to the eye, as would ariſe on a glaſs put in the place of the paper or canvas. Now, the ſituation of an object at the other ſide of a glaſs being given, the delineation of it on the glaſs itſelf depends entirely on the ſituation of the eye on this ſide of the glaſs; that is to ſay, on the rules of perſpective: a ſcience which, contrary to the opinion of moſt people, extends much farther than the painting of ſcenes, floors, and what generally goes under the name of *quadratura*. Perſpective, according to that great maſter da Vinci, is to be conſidered as the reins and rudder of painting. It teaches in what proportion the parts fly from, and leſſon upon, the eye; how figures are to be marſhalled upon a plain ſurface,

and fore-ſhortened. It contains, in ſhort, the whole rationale of deſign.

Such are the terms which the maſters beſt grounded in their profeſſion have employed to define and commend perſpective: ſo far were they from calling it a *fallacious art*, and an *inſidious guide*; as ſome amongſt the moderns have not bluſhed to do, inſiſting that it is to be followed no longer than it keeps the high road, or leads by eaſy and pleaſant paths. But theſe writers plainly ſhow, that they are equally ignorant of the nature of perſpective, which, founded as it is on geometrical principles, can never lead its votaries aſtray; and of the nature of their art, which, without the aſſiſtance of perſpective, cannot, in rigour, expect to make any progreſs, nay, not ſo much as to delineate a ſimple contour.

When a painter has formed a ſcene in his mind, and ſuppoſed, as it is cuſtomary, that the capital figures of this ſcene lie cloſe, or almoſt cloſe, to the back of his canvas, he is, in the next place, to fix upon ſome point on this ſide of the canvas, from which he would chooſe his piece ſhould be ſeen. But in chooſing this point, which is called the *point of ſight*, regard ſhould be had to its ſituation to the right or left of the middle of the canvas: but, above all things, to its diſtance and its height with reſpect to the lower edge of the canvas; which edge is called the *baſe line*, and is parallel with the horizontal line that paſſes through the eye. For by aſſuming the point of ſight, and conſequently the horizontal line, too low, the planes upon which the figures ſtand will appear a great deal too ſhallow; as, by aſſuming it too high, they will appear too ſteep, ſo as to render the piece far leſs light and airy than it ought to be. In like manner, if the point of ſight is taken at too great a diſtance from the canvas, the figures will not admit of degradation enough to be ſeen with ſufficient diſtinctneſs; and if taken too near it, the degradation will be too quick and precipitate to have an agreeable effect. Thus, then, it appears, that no ſmall attention is requiſite in the choice of this point.

When a picture is to be placed on high, the point of ſight ſhould be aſſumed low, and *vice verſa*; in order that the horizontal line of the picture may be, as near as poſſible, in the ſame horizontal plane with that of the ſpectator; for this diſpoſition has an amazing effect. When a picture is to be placed very high, as, amongſt many others, that of the Purification by Paolo Veroneſe, engraved by Le Fevre, it will be proper to aſſume the point of ſight ſo low, that it may lie quite under the picture, no part of whoſe ground is, in that caſe, to be viſible; for, where the point of ſight to be taken above the picture, the horizontal ground of it would appear ſloping to the eye, and both figures and buildings as ready to tumble headforemoſt. It is true, indeed, that there is ſeldom any neceſſity for ſuch extraordinary exactneſs; and that, unleſs in ſome particular caſes, the point of ſight had better be rather high than low: the reaſon of which is, that, as we are more accuſtomed to behold people on the ſame plane with ourſelves, than either higher or lower, the figures of a piece muſt ſtrike us moſt when ſtanding on a plane nearly level with that upon which we ourſelves ſtand. To this it may be added, that by placing the eye low, and greatly ſhortening the plane, the heels of the back figures will ſeem to bear againſt the heads of the foremoſt, ſo as to render the diſtance between them far leſs perceptible than otherwiſe it would be.

The point of ſight being fixed upon according to the ſituation in which the picture is to be placed, the point of diſtance is next to be determined. In doing doing this, a painter ſhould carefully attend to three things: firſt, that the ſpectator may be able to take in, at one glance, the whole and every part of the compoſition; ſecondly, that he may ſee it diſtinctly, and thirdly, that the degradation of the figures and other objects of the picture be ſufficiently ſenſible. It would take up too much time to lay down certain and preciſe rules for doing all this, conſidering the great variety in the ſizes and ſhapes of pictures; for which reaſon we muſt leave a great deal to the diſcretion of the painter.

But there is a point ſtill remaining, which will not admit of the leaſt latitude. This is the delineation of the picture, when once the point of ſight has been fixed upon. The figures of a picture are to be conſidered as ſo many columns erected on different ſpots of the ſame plane; and the painter muſt not think of deſigning any thing, till he has laid down, in perſpective, all thoſe columns which are to enter his compoſition, with the moſt ſcrupulous exactneſs. By proceeding in this manner, he may not only be ſure of not committing any miſtake in the diminution of his figures according to their different diſtances, but may flatter himſelf with the thoughts of treading in the ſteps of the greateſt maſters. It is to the punctual obſervance of theſe laws, that we are to attribute the grand effect of ſome paintings by Carpazio and Mantegna, ſo careleſs in other reſpects; whereas a ſingle fault againſt them is often ſufficient entirely to ſpoil the works of a Guido, in ſpite of the ſublimity and beauty of his ſuperior ſtyle.

Now, as the demonſtration of the rules of perſpective depends on the doctrine of proportions, on the properties of ſimilar triangles, and on the interſection of planes, it will be proper to put an abridgement of Euclid into the hands of the young painter, that he may may underſtand theſe rules fundamentally, and not ſtand confined to a blind practice of them; but, then, there is nothing in this author relative to the art of painting, which may not be eaſily acquired in a few months. For, as it would be of no uſe to a painter to launch out into the anatomical depths of a Monro or an Albinus, it would be equally ſuperfluous to perplex himſelf with the intricacies of the higher geometry with a Taylor, who has handled perſpective with that rich profoundneſs, which we cannot help thinking does a great deal more honour to a mathematician, than it can poſſibly bring advantage to a ſimple artiſt.

But though a much longer time were requiſite to become a perfect maſter of perſpective, a painter, ſurely ought not to grudge it; as no time can be too long to acquire that knowledge, without which he cannot poſſibly expect to ſucceed. Nay, we may boldly affirm, that the ſhorteſt road in every art is that which leads through theory to practice. From theory ariſes that great facility, by means of which a man advances the quicker, in proportion as he is ſurer of not taking a wrong ſtep: whilſt thoſe, who are not grounded in the ſcience, labour on in perpetual doubt; obliged, as a certain author expreſſes it, to feel out their way with a pencil, juſt as the blind, with their ſticks, feel for the ſtreets and turnings, with which they are not acquainted.

As practice, therefore ought in every thing to be built upon principle, the ſtudy of Optics, as far as it is requiſite to determine the degree in which objects are to be illuminated or ſhaded, ſhould proceed hand in hand with that of perſpective: and this, in order that the ſhades, caſt by figures upon the planes on which they ſtand, may fall properly, and be neither too ſtrong nor too light; in a word, that thoſe moſt beautiful effects of the chiaro-ſcuro may run no riſk of ever receiving the lie from truth, which ſooner or later diſcovers itſelf to every eye.

Sect. III. *Of Symmetry.*

The ſtudy of ſymmetry, it is obvious, ſhould immediately follow that of anatomy: for it would avail us little to be acquainted with the different parts of the human body, and their ſeveral offices, were we at the ſame time ignorant of the order and proportion of thoſe parts in regard to the whole in general, and to each other in particular. The Greek ſtatuaries diſtinguiſhed themſelves above all others, as much by the juſt ſymmetry of their members, as by their ſkill in anatomy; but Poly-

cletes ſurpaſſed them all by a ſtatue, called the *Rule*, from which, as from a moſt accurate pattern, other artiſts might take meaſures for every part of the human body. Theſe meaſures, to ſay nothing of the books which treat profeſſedly of them, may now be derived from the Apollo of Belvedere, the Laocoon, the Venus of Medicis, the Faunus, and particularly the Antinous, which laſt was the rule of the learned Pouſſin.

It is the general opinion of painters, that the ancients were not as happy in repreſenting the bodies of children, as they are allowed to have been in repreſenting thoſe of women and men; eſpecially thoſe of their gods; in which they excelled to ſuch a degree, that with theſe gods, were often worſhipped the artiſts who had carved them. Yet the Venus of Gnidus by Praxiteles was not more famous than her Cupid, on whoſe account alone people flocked to Theſpiæ. To children, ſay they, the ancients knew not how to impart that ſoftneſs and effeminacy which Fiammingo has ſince contrived to give them, by repreſenting their cheeks, hands, and feet, ſwelled, their heads large, and with ſcarce any belly. But ſuch critics ſeem to forget, that theſe firſt ſketches of nature very ſeldom come in the painter's way, and that this puny and delicate ſtate has not in its form even the leaſt glimmering of perfection. The ancients never undertook to repreſent children leſs than four or five years old; at which age the ſuperfluous humours of the body being in ſome meaſure digeſted, their members begin to aſſume ſuch a contour and proportion as may ſerve to point out what they are afterwards likely to be. This obſervation is confirmed by the children which we meet with in ancient baſſo-relievos and paintings: for they are all doing one thing or another; like thoſe moſt beautiful little Cupids in a picture at Venice, who are playing with the arms of Mars, and lifting up the ponderous ſword of that deity; or that little urchin in the Danäe of Caracci, who empties a quiver of its arrows in order to fill it with the golden ſhower. Now, what can be a greater blunder in point of coſtume, than to attribute actions, which require ſome degree of ſtrength and judgment, to infancy, to that raw and tender age ſo totally unable to govern and ſupport itſelf?

Let a young painter conſider the Greek ſtatues ever ſo often, of whatever character or age they may be repreſented, it is impoſſible he ſhould ever conſider them without diſcovering new beauties in them. It is therefore impoſſible he ſhould copy them too often, according to that judicious motto placed by Maratti on his print called *The School*. This truth was acknowledged by Rubens himſelf; for though, like one bred, as he was, in the foggy climate of the Low Countries, he generally painted from the life; in ſome of his works he copied the ancients; nay, he wrote a treatiſe on the excellency of the ancient ſtatues, and on the duty of a painter to ſtudy and imitate them. As to the ſatirical print, or rather paſquinade, of the great Titian, in which he has repreſented a parcel of young monkeys aping the group of Laocoon and his ſons; he intended nothing more by it than to laſh the dulneſs and poverty of thoſe artiſts who cannot ſo much as draw a figure without having a ſtatue before them as a model.

In fact, reaſon requires, that an artiſt ſhould be ſo much maſter of his art, as ſeldom to ſtand in need of a pattern. To what other purpoſe is he to ſweat and toil from his infancy, and ſpend ſo many days and nights in ſtudying and copying the beſt models; eſpecially the fineſt faces of antiquity, which we are ſtill poſſeſſed of; ſuch as the two Niobes, mother and daughter; the Ariadne, the Alexander, the young Nero, the Silenus, the Nile: and likewiſe the fineſt figures; for inſtance, the Apollo, the Gladiator, the Venus, and others; all which (as was ſaid of Pietro Feſta), he ſhould have, as it were, perfectly by heart? With a ſtock of excellencies like theſe, treaſured up in his memory, he may one day hope to produce ſomething of his own without a model; form a right judgment of thoſe natural beauties which fall in his way; and, when occaſion offers, avail himſelf properly of them.

It is very injudicious to ſend boys to an academy to draw after naked figures, before they have imbibed a proper reliſh for beautiful proportions, and have been well grounded in the true principles of ſymmetry. They ſhould firſt learn, by ſtudying the precious remains of antiquity, to improve upon life; and diſcern where a natural figure is faulty, through ſtiffneſs in the members, or clumſineſs in the trunk, or in any other reſpect; ſo as to be able to correct the faulty part, and reduce it to its proper bounds. Painting, in this branch, is, like medicine, the art of taking away and adding.

It muſt not, however, be diſſembled, that the methods hitherto laid down are attended with ſome danger: for by too ſlaviſh an attention to ſtatues, the young painter may contract a hard and dry manner; and by ſtudying anatomies too ſervilely, a habit of repreſenting living bodies as ſtripped of their ſkin: for, after all, there is nothing but what is natural, that, beſides a certain peculiar grace and livelineſs, poſſeſſes that ſimplicity, eaſe, and ſoftneſs, which is not to be expected in the works of art, or even in thoſe of nature when deprived of life. Pouſſin himſelf has now and then given into one of theſe extremes, and Michael Angelo very often into the other: but from this we can only infer, that even the greateſt men are not infallible. It is, in ſhort, to be conſidered as one inſtance, among a thouſand, of the ill uſe thoſe are wont to make of the beſt things, who do not know how to temper and qualify them properly with their contraries.

But no ſuch danger can ariſe to a young painter from confining himſelf for a long time to mere deſign, ſo as not to attempt colouring till he has made himſelf maſter of that branch. If, according to Pouſſin, colours in painting are in regard to the eye what numbers in poetry are in regard to the ear, ſo many charms to allure and captivate that ſenſe; may we not affirm, that deſign is in the ſame art what propriety of language is in writing, and a juſt utterance of ſounds in muſic? Whatever ſome people may think, a picture deſigned according to the rules of perſpective and the principles of anatomy, will ever be held in higher eſteem by good judges, than a picture ill deſigned, let it be ever ſo well coloured. Hannibal Caracci ſet ſo great a value upon the art of contour, that, according to ſome expreſſions of his which have reached us, he conſidered almoſt every thing elſe as nothing in compariſon with it. And this his judgment may be juſtified, by conſidering, that Nature, though ſhe forms men of various colours and complexions, never operates in the motions contrary to the mechanical principles of anatomy, nor, in exhibiting theſe motions to the eye, againſt the geometrical laws of perſpective: a plain proof, that, in point of deſign, no miſtake is to be deemed trifling. Hence we are enabled to feel all the weight of thoſe words in which Michael Angelo, after he conſidered a picture drawn by a prince of the Venetian ſchool, addreſſed Vaſari: "What a pity it is," ſaid he, "that this man did not ſet out by ſtudying deſign!" As the energy of nature ſhines moſt in the ſmalleſt ſubjects, ſo the energy of art ſhines moſt in imitating them.

Sect. IV. *Of Imitation.*

When you conſider art as the imitation of nature (ſays Mengs), it is not to be underſtood that nature, which is the object, is more perfect than art which imitates it. Nature, it is confeſſed, offers ſome views of which the imitation muſt for ever remain imperfect, as in the inſtance of the claro obſcuro; but, on the other hand, in every thing relative to beauty of form, imitation may even ſurpaſs nature. Nature, in her productions, is ſubject to many accidents. Art, labouring on

paſſive and obedient materials, renders perfect the objects of its creation, chooſes every thing in nature the moſt excellent, and collects the different parts and the different beauties of many individual into one whole. It is ſeldom that we find in the ſame man greatneſs of ſoul and the due proportions of body, vigour, ſuppleneſs, firmneſs, and agility, joined together. Art conſtantly repreſents what is rarely or never to be met with in human nature; regularity in the outlines, grandeur in the forms, grace in the attitudes, beauty in the members, force in the breaſt, agility in the limbs, addreſs in the arms, frankneſs in the forehead, ſpirit in the eyes, and affability over the whole countenance. Let an artiſt give force and expreſſion to all the parts of his ſubject, let him vary this force and expreſſion as different circumſtances make it neceſſary, and he will ſoon perceive that art may ſurpaſs nature. But although this be granted, the artiſt is not to imagine that art is *actually* arrived at this ſupreme degree of perfection, and can proceed no farther. The moderns ſeem never to have perceived the tract pointed out by the ancient Greeks: for, ſince the revival of painting, the true and the agreeable, inſtead of the beautified, have been the objects of cultivation. Still, however, imitation is the firſt part of the art of painting, though not the moſt excellent or beautiful. It is a neceſſary ſtep in the progreſs which leads forward to greater perfection.

A painter ought attentively to conſider, compare together, and weigh in the balance of reaſon and truth, all the different ſtyles of the great maſters; but he ought likewiſe carefully to guard againſt too great a fondneſs for any one of them in particular that he may think proper to adopt; otherwiſe, to uſe the expreſſion of a firſt rate maſter, inſtead of the child, he would become the grand-child of nature.

Beſides, his imitation muſt be of generals, and not of particulars. Whatever a young painter's natural diſpoſition may be, whether to paint boldly and freely like Tintoret and Rubens, or to labour his works like Titian or Da Vinci, let him follow it. This kind of imitation is very commendable. It is thus that Dante, at the ſame time that he carefully avoided adopting the particular expreſſions of Virgil, endeavoured to ſeize his bold and free manner, and at laſt caught from him that elegance of ſtyle which has done him ſo much honour.

As to the reſt, nothing ſhould hinder an able maſter from making uſe now and then of any antique, or even modern figure, which he may find his account in employing. Sanzio, in a *St. Paul at Lyſtra*, ſcrupled not to avail himſelf of an ancient ſacrifice in baſſo-relievo; nor did Buonarroti himſelf diſdain to uſe, in his paintings of the Sextine chapel, a figure taken from that famous cornelian which tradition tells us he wore on his fingers, and which was lately in the poſſeſſion of the moſt Chriſtian king. Men like theſe avail themſelves of the productions of others in ſuch a manner as to make us apply to them, what La Bruyere ſaid of Deſpreaux, that one would imagine the thoughts of other men had been of his own creation.

In general, a painter ſhould have his eye conſtantly fixed on nature, that inexhauſtible and varied ſource of every kind of beauty; and ſhould ſtudy to imitate her in her moſt ſingular effects. As beauty, ſcattered over the whole univerſe, ſhines brighter in ſome objects than in others, he ſhould never be without his little book and crayon, in order to make drawings of every beautiful or uncommon object that may happen to preſent itſelf; and take ſketches of every fine building, every ſituation, every effect of light, every flight of clouds, every flow of drapery, every attitude, every expreſſion of the paſſions, that may happen to ſtrike him. He may afterwards employ theſe things as occaſion offer; and in the mean time will have the advantage of acquiring a grand taſte.

It is by carefully ſtudying the beſt maſters, and imitating nature, that a painter arrives at the ſtyle of perfection which the Italians call *guſto grando*, the French *le beau ideal*, and the Engliſh *the great ſtyle*.

"A mind (ſays ſir Joſhua Reynolds), enriched by an aſſemblage of all the treaſures of ancient and modern art, will be more elevated and fruitful in reſources in proportion to the number of ideas which have been carefully collected and thoroughly digeſted.

"The addition of other mens judgment is ſo far from weakening, as is the opinion of many, our own, that it will faſhion and conſolidate thoſe ideas of excellence which lay in their birth feeble, ill-ſhaped, and confuſed; but which are finiſhed and put in order by the authority and practice of thoſe, whoſe works may be ſaid to have been conſecrated by having ſtood the teſt of ages.

"When we ſpeak of the habitual imitation and continued ſtudy of maſters, it is not to be underſtood that I adviſe any endeavour to copy the exact peculiar colour and complexion of another man's mind; the ſucceſs of ſuch an attempt muſt always be like his who imitates exactly the air, manner, and geſtures of him whom he admires. His model may be excellent, but he himſelf will be ridiculous; and this ridicule ariſes not from his having imitated, but from his not having choſen the right mode of imitation.

"It is a neceſſary warrantable pride to diſdain to walk ſervilely behind any individual, however elevated his rank. The true and liberal ground of imitation is an open field, where, though he who precedes has had the advantage of ſtarting before you, yet it is enough to purſue his courſe: you need not tread in his footſteps; and you certainly have a right to outſtrip him if you can.

"Nor, whilſt I recommend ſtudying the art from artiſts, can I be ſuppoſed to mean that nature is to be neglected: I take this ſtudy in aid, and not in excluſion of the other. Nature is, and muſt be, the fountain, which alone is inexhauſtible; and from which all excellencies muſt originally flow.

"The great uſe of ſtudying our predeceſſors is to open the mind, to ſhorten our labour, and to give us the reſult of the ſelection made by thoſe great minds of what is grand or beautiful in nature: her rich ſtores are all ſpread out before us; but it is an art, and no eaſy art, to know how or what to chooſe, and how to attain and ſecure the object of our choice.

"Thus the higheſt beauty of form muſt be taken from nature; but it is an art of long deduction and great experience to know how to find it. I cannot avoid mentioning here an error which ſtudents are apt to fall into.

"He that is forming himſelf muſt look with great caution and warineſs on thoſe peculiarities or prominent parts which at firſt force themſelves on view, and are the marks, or what is commonly called the manner, by which that individual artiſt is diſtinguiſhed.

"Peculiar marks I hold to be generally, if not always, defects, however difficult it may be wholly to eſcape them.

"Peculiarities in the works of art are like thoſe in the human figure; it is by them that we are cognizable and diſtinguiſhed one from another; but they are always ſo many blemiſhes, which, however, both in the one caſe and in the other, ceaſe to appear deformities to thoſe who have them continually before their eyes. In the works of art, even the moſt enlightened mind, when warmed by beauties of the higheſt kind, will by degrees find a repugnance within him to acknowledge any defects; nay, his enthuſiaſm will carry him ſo far as to transform them into beauties and objects of imitation.

"It muſt be acknowledged, that a peculiarity of ſtyle, either from its novelty, or by ſeeming to proceed from a peculiar turn of mind, often eſcapes blame; on the contrary, it is ſometimes

ſtriking and pleaſing; but it is vain labour to endeavour to imitate it, becauſe novelty and peculiarity being its only merit, when it ceaſes to be new, it ceaſes to have value.

"A manner, therefore, being a defect, and every painter, however excellent, having a manner, it ſeems to follow, that all kinds of faults as well as beauties may be learned under the ſanction of the greateſt authorities."

Sect. V. *Of Colouring.*

Colouring, though a ſubject greatly inferior to many others which the painter muſt ſtudy, is yet of ſufficient importance to employ a conſiderable ſhare of his attention; and to excel in it, he muſt be well acquainted with that part of optics which has the nature of light and colours for its object. Light, however ſimple and uncompounded it may appear, is nevertheleſs made up, as it were, of ſeveral diſtinct ſubſtances; and the number, and even doſe, of theſe ingredients, has been happily diſcovered by the moderns. Every undivided ray, let it be ever ſo fine, is a little bundle of red, orange, yellow, green, azure, indigo and violet rays, which, while combined, are not to be diſtinguiſhed one from another, and form that kind of light called *white*; ſo that white is not a colour *per ſe*, as the learned Da Vinci (ſo far, it ſeems, the precurſor of Newton) expreſsly affirms, but an aſſemblage of colours. Now, theſe colours, which compoſe light, although immutable in themſelves, and endued with various qualities, are continually, however, ſeparating from each other in their reflection from and paſſage through other ſubſtances, and thus become manifeſt to the eye. Graſs, for example, reflects only green rays, or rather reflects green rays in greater number than it does thoſe of any other colour; one kind of wine tranſmits red rays, and another yellowiſh rays: and from this kind of ſeparation ariſes that variety of colours with which nature has diverſified her various productions. Man, too, has contrived to ſeparate the rays of light by making a portion of the ſun's beams paſs through a glaſs priſm; for after paſſing through it, they appear divided into ſeven pure and primitive colours, placed in ſucceſſion one by the other, like ſo many colours on a painter's pallet.

Now, though Titian, Correggio, and Vandyke, have been excellent colouriſts, without knowing any thing of theſe phyſical ſubtleties, that is no reaſon why others ſhould neglect them. For it cannot but be of great ſervice to a painter to be well acquainted with the nature of what he is to imitate, and of thoſe colours with which he is to give life and perfection to his deſigns; not to ſpeak of the pleaſure there is in being able to account truly and ſolidly for the various effects and appearances of light. From a due tempering, for example, and degrading, of the tints in a picture; from making colours partake of each other, according to the reflection of light from one object to another; there ariſes, in ſome meaſure, that ſublime harmony which may be conſidered as the true muſic of the eye. And this harmony has its foundation in the genuine principles of optics. Now this could not happen in the ſyſtem of thoſe philoſophers, who held, that colours did not originally exiſt in light, but were, on the contrary, nothing elſe than ſo many modifications which it underwent in being reflected from other ſubſtances, or in paſſing through them; thus ſubject to alterations without end, and every moment liable to periſh. Were that the caſe, bodies could no more receive any hues one from another, nor this body partake of the colour of that, than ſcarlet, for example; becauſe it has the power of changing into red all the rays of the ſun or ſky which immediately fall upon it, has the power of changing into red all the other rays reflected to it from a blue or any other colour in its neighbourhood. Whereas, allowing that colours are in their own nature immutable one into another, and that every body reflects, more or leſs, every ſort of coloured rays, though thoſe rays in the greateſt number which are of the colour it exhibits, there muſt neceſſarily ariſe, in colours placed near one another, certain particular hues or temperaments of colour: nay, this influence of one colour upon another may be ſo far traced, that three or four bodies of different colours, and likewiſe the intenſeneſs of the light falling upon each, being aſſigned, we may eaſily determine in what ſituations and how much they would tinge each other. We may thus, too, by the ſame principle of optics, account for ſeveral other things practiſed by painters; inſomuch that a perſon, who has carefully obſerved natural effects with an eye directed by ſolid learning, ſhall be able to form general rules, where another can only diſtinguiſh particular caſes.

But after all, the pictures of the beſt coulouriſts are, it is univerſally allowed, the books in which a young painter muſt chiefly look for the rules of colouring; that is, of that branch of painting which contributes ſo much to expreſs the beauty of objects, and is ſo requiſite to repreſent them as what they really are. Giorgio and Titian ſeem to have diſcovered circumſtances in nature which others have entirely overlooked; and the laſt in particular has been happy enough to expreſs them with a pencil as delicate as his eye was quick and piercing. In his works we behold that ſweetneſs of colouring which is produced by union; that beauty which is conſiſtent with truth; and all the inſenſible tranſmutations, all the ſoft tranſitions, in a word, all the pleaſing modulations of tints and colours. When a young painter has, by cloſe application, acquired from Titian, whom he can never ſufficiently dwell upon, that art which, of all painters, he has beſt contrived to hide, he would do well to turn to Baſſano and Paolo, on account of the beauty, boldneſs, and elegance of their touches. That richneſs, ſoftneſs, and freſhneſs of colouring, for which the Lombard ſchool is ſo juſtly cried up, may likewiſe be of great ſervice to him. Nor will he reap leſs benefit by ſtudying the principles and practice of the Flemiſh ſchool; which, chiefly by means of her varniſhes, has contrived to give a moſt enchanting luſtre and tranſparency to her colours.

But whatever pictures a young painter may chooſe to ſtudy the art of colouring upon, he muſt take great care that they are well preſerved. There are very few pieces which have not ſuffered more or leſs by the length, not to ſay the injuries of time; and perhaps that precious patina, which years alone can impart to paintings, is in ſome meaſure akin to that other kind which ages alone impart to medals; inaſmuch as, by giving teſtimony to their antiquity, it renders them proportionably beautiful in the ſuperſtitious eyes of the learned. It muſt indeed be allowed, that if, on the one hand, this patina beſtows, as it really does, an extraordinary degree of harmony upon the colours of a picture, and deſtroys, or at leaſt greatly leſſons, their original rawneſs, it, on the other hand, equally impairs the freſhneſs and life of them. A piece ſeen many years after it has been painted, appears much as it would do, immediately after painting, behind a dull glaſs. It is no idle opinion, that Paolo Veroneſe, attentive above all things to the beauty of his colours, and what is called *ſtrepito*, left entirely to time the care of harmonizing them perfectly, and (as we may ſay) mellowing them. But moſt of the old maſters took that taſk upon themſelves; and never expoſed their works to the eyes of the public, until they had ripened and finiſhed them with their own hands. And who can ſay whether the *Chriſt* of Moneta, or the *Nativity* of Baſſano, have been more improved or injured (if we may ſo ſpeak) by the touchings and retouchings of time, in the courſe of more than two centuries? It is indeed impoſſible to be determined. But the ſtudious pupil may make himſelf ample amends for any injuries which his originals may have received from the hands of time, by turning to truth, and to Nature which never grows old, but conſtantly retains its primitive flower of youth, and was itſelf the model of the models before him. As ſoon therefore as a

young painter has laid a proper foundation for good colouring, by ſtudying the beſt maſters, he ſhould turn all his thoughts to truth and nature. And it would perhaps be well worth while to have, in the academies of painting, models for colouring as well as deſigning; that as from the one the pupils learn to give their due proportion to the ſeveral members and muſcles, they may learn from the other to make their carnations rich and warm, and faithfully copy the different local hues which appear quite diſtinct in the different parts of a fine body. To illuſtrate ſtill farther the uſe of ſuch a model, let us ſuppoſe it placed in different lights; now in that of the ſun, now in that of the ſky, and now again in that of a lamp or candle; one time placed in the ſhade, and another in a reflected light. Hence the pupil may learn all the different effects of the complexion in different circumſtances, whether the livid, the lucid, or tranſparent; and, above all, that variety of tints, and half tints, occaſioned in the colour of the ſkin by the epidermis having the bones immediately under it in ſome places, and in others a greater or leſs number of blood-veſſels or quantity of fat. An artiſt who had long ſtudied ſuch a model, would run no riſk of degrading the beauties of nature by any particularity of ſtyle, or of giving into that prepoſterous fulneſs and floridneſs of colour which is at preſent ſo much the taſte. He would not feed his figures with roſes, as an ancient painter of Greece ſhrewdly expreſſed it, but with good beef; a difference, which the learned eye of a modern writer could perceive between the colouring of Barrocci and that of Titian. To practiſe in that manner, is, according to a great maſter, no better than inuring one's ſelf to the commiſſion of blunders. What ſtatues are in deſign, nature is in colouring; the fountain head of that perfection to which every artiſt, ambitious to excel, ſhould conſtantly aſpire: and accordingly the Flemiſh painters, in conſequence of their aiming ſolely to copy nature are in colouring as excellent as they are wont to be aukward in deſigning. The beſt model for the tone of colours and the degradation of ſhades is furniſhed by means of the *camera-obſcura*. See DIOPTRICS, Sect. 6th and 9th.

SECT. VI. *Of Drapery.*

DRAPERY is one of the moſt important branches of the whole art, and accordingly demands the greateſt attention and ſtudy. It ſeldom happens that a painter has nothing but naked figures to repreſent: nay, his ſubjects generally conſiſt of figures clothed from head to foot. Now the flowing of the folds in every garment depends chiefly upon the relief of the parts that lie under it. A certain author, we forget his name, obſerves, that as the inequalities of a ſurface are diſcoverable by the inequalities in the water that runs over it, ſo the poſture and ſhape of the members muſt be diſcernible by the folds of the garment that covers them. Thoſe idle windings and gatherings, with which ſome painters have affected to cover their figures, make the clothes made up of them look as if the body had fled from under them, and left nothing in its place but a heap of empty bubbles, fit emblems of the brain that conceived them. As from the trunk of a tree there iſſue here and there boughs of various forms, ſo from one miſtreſs fold, there always flow many leſſer ones: and as it is on the quality of the tree that the elegance, compactneſs, or openneſs of its branches chiefly depends; it is, in like manner by the quality of the ſtuff of which a garment is made, that the number, order, and ſize of its folds muſt be determined. To ſum up all in two words, the drapery ought to be natural and eaſy, ſo as to ſhow what ſtuff it is, and what parts it covers. It ought, as a certain author expreſſes it, to cover the body, as it were merely to ſhow it.

It was formerly the cuſtom with ſome of our maſters to draw all their figures naked, and then drape them; from the ſame principle that they firſt drew the ſkeletons of their figures, and afterwards covered them with muſcles. And it was by proceeding in this manner that they attained to ſuch a degree of truth in expreſſing the folds of their drapery, and the joints and direction of the principal members that lay under it, ſo as to exhibit in a moſt ſtriking manner the attitude of the perſon to whom they belonged. That the ancient ſculptors clothed their ſtatues with equal truth and grace, appears from many of them that are ſtill in being; particularly a Flora lately dug up in Rome, whoſe drapery is executed with ſo much judgment, and in ſo grand and rich a ſtyle, that it may vie with the fineſt of their naked ſtatues, even with the Venus of Medicis. The ſtatues of the ancients had ſo much beauty when naked, that they retained a great deal when clothed. But here it muſt conſidered, that it was uſual with them to ſuppoſe their originals clothed with wet garments, and of an extreme fineneſs and delicacy, that, by lying cloſe to the parts, and in a manner clinging to them, they might the better ſhow what theſe parts were. For this reaſon a painter is not to confine himſelf to the ſtudy of the ancient ſtatues, leſt he ſhould contract a dry ſtyle, and even fall into the ſame faults with ſome great maſters who, accuſtomed to drape with ſuch light ſtuffs as fit cloſe to the body, have afterwards made the coarſeſt lie in the ſame manner, ſo as plainly to exhibit the muſcles underneath them. It is therefore proper to ſtudy nature herſelf, and thoſe modern maſters who have come neareſt to her in this branch; ſuch as Paolo Veroneſe, Andrea del Sarto, Rubens, and above all, Guido Reni. The flow of their drapery is ſoft and gentle; and the gatherings and plaits are ſo contrived, as not only not to hide the body, but to add grace and dignity to it. Their gold, ſilk, and woollen ſtuffs, are ſo diſtinguiſhable one from another, by the quality of their ſeveral luſtres, and the peculiar light and ſhade belonging to each, but above all by the form and flow of their folds, that the age and ſex of their figures are hardly more diſcoverable by their faces. Albert Durer is another great maſter in this branch, inſomuch that Guido himſelf was not aſhamed to ſtudy him. There are ſtill extant ſeveral drawings made with the pen by this great man, in which he has copied whole figures from Albert, and ſcrupulouſly retained the flow of his drapery as far as his own peculiar ſtyle, leſs harſh and ſharp, but more eaſy and graceful would allow. It may be ſaid that he made the ſame uſe of Albert that our modern writers ought to make of the beſt authors of the 13th century.

To drape a figure well, it is neceſſary that the folds be large and few in number; becauſe large folds produce great maſſes of light and ſhadow, while ſmall ones multiply the objects of view and diſtract the attention. But if the character of the drapery or kind of ſtuff require ſmall folds, they ſhould at leaſt be diſtributed in groups, in ſuch a manner that a great number of ſmall folds ſhall be ſubordinate to an equal maſs formed by a principal fold.

It is alſo proper to obſerve, that the colour of the drapery contributes to the harmony of the whole, and produces effects, which the claro-obſcura cannot do alone. At the ſame time the principles of the claro-obſcuro ſhould preſide over, or at leaſt regulate the art of drapery. If the folds of the ſtuff which cover the members expoſed to the light are too ſtrongly ſhaded, they will appear to enter into the members, and cut them.

Drapery contributes to the life, to the character, to the expreſſion of the figures, provided all the movements of the folds announce the lively or more tranquil movement of thoſe figures. The colour, and the kind of ſtuff, concur alſo to promote the general expreſſion; brilliant or fine drapery cannot be properly introduced in a mournful ſubject, nor the oppoſite in a gay one.

The drapery muſt alſo agree with the age and character of the figures: And if nature in any inſtance is found to contradict thoſe principles, it is becauſe they relate to the idea

of the art; and it is this ideal which carries it to the greateſt perfection.

Great attention is alſo neceſſary to the ſituation in which the figures are placed, and the actions from which they are employed. If they are in the act of aſcending, a column of air weighs down the drapery; if, on the contrary, they are deſcending, the drapery is ſupported and ſpread out. The folds placed on every member, and the general play of the drapery, ſhould indicate whether the figure is in action or about to be ſo, whether action be beginning or ending; and whether it be ſlow, or quick, or violent. All this is agreeable to nature, but it alſo partakes of the ideal, ſince nature never can be copied in ſuch fluctuating ſituations. The practice of the Roman ſchools, firſt to draw after nature, and then to paint after the drawing, cannot be adopted by colouriſts; becauſe nature, according to the kind of the ſtuffs, produces tones and lights which give more perfection and truth to the work. Meanwhile Raphael, who followed this practice, enjoys the firſt reputation for giving play to his drapery, and diſpoſing the folds in the beſt order. In this part he has even attained the height of ideal beauty. He is the greateſt painter of drapery, as the Venetians are the greateſt in painting ſtuffs.

Raphael, ſays Mengs, imitated at firſt his maſter Perugin's manner of drapery; and he brought this manner to perfection, by ſtudying the works of Maſaccio and of Bartholemew: but he departed entirely from the taſte of the ſchool in which he was educated when he had ſeen the works of the ancients. It was the baſſo-relievo of antiquity which pointed out to him the true flowing of drapery, and he was not backward to introduce it. He diſcovered, by attending to the principles of the ancients, that the naked is the principal part; that drapery is to be regarded altogether as an acceſſory, and that it is intended to cover, not to conceal; that it is employed from neceſſity, not caprice; that of conſequence the clothes ſhould not be ſo narrow as to conſtrain the members, nor ſo ample as to embarraſs them; but that the artiſt ſhould adapt them to the ſize and attitude of the figures intended to wear them.

He underſtood that the great folds ſhould be placed at the large places of the body; and where the nature of the drapery required ſmall folds, that it was neceſſary to give them a projection, which indicates a ſubordination to the principal parts. He made his ample draperies without uſeleſs folds, and with bendings at the articulations. It was the form of the naked figure which pointed out to him the form of his folds, and on the great muſcles he formed great maſſes. When any part required to be foreſhortened, he covered it with the ſame number of folds as if it had been ſtraight; but then he crowded them in proportion to the foreſhortening.

He frequently diſcovered the border of his drapery, to ſhow that his figures were not dreſſed in a ſimple ſack. The form of the principal parts, and the ſpecific weight of the air, were always the cauſes of his folds. It was eaſy to diſcover in his works, by the folds of his drapery, the attitude of the figure previous to the one in which it was placed; and whether, for example, the arm was extended or otherwiſe, immediately before the action. This was an expreſſion which he had careſully ſtudied on all occaſions, becauſe he found it in nature.

When the drapery was to cover the leg or arm but half, or in an imperfect manner, he made it cut obliquely the member which was partly to be covered. His folds were of a triangular form. The reaſon of the form is in nature: for all drapery has a tendency to enlarge itſelf and be extended; and at the ſame time its own weight obliges it to fall back on itſelf, it is naturally formed into triangles.

He knew perfectly, that the movements of the body and of its members are the cauſes of the actual ſituation of drapery, and of the formation of its folds. All his practice is nothing elſe but the unfolding and demonſtrating of this theory; and drapery executed in any other manner muſt be in a falſe and vicious taſte.

Sect. VII. *Of Landſcape and Architecture.*

When our young painter has made a ſufficient progreſs in thoſe principal branches of his art, the deſigning, perſpective, colouring, and drapery of human figures, he ſhould turn his thoughts to landſcape and architecture: for, by ſtudying them, he will render himſelf univerſal, and qualified to undertake any ſubject; ſo as not to reſemble certain literati, who, though great maſters in ſome articles, are mere children in every thing elſe.

The moſt eminent landſcape painters are Pouſſin, Loreneſe, and Titian. Pouſſin was remarkable for his great diligence, His pieces are quite exotic and uncommon; being ſet off with buildings in a beautiful but ſingular ſtyle; and with learned epiſodes, ſuch as poets reciting their verſes to the woods, and youths exerciſing themſelves in the ſeveral gymnaſtic games of antiquity, by which it plainly appears, that he was more indebted for his ſubjects to the deſcriptions of Pauſanias than to nature and truth.

Loroneſe applied himſelf chiefly to expreſs the various phenomena of light, eſpecially thoſe perceivable in the heavens. And, thanks to the happy climate of Rome, where he ſtudied and exerciſed his talents, he has left us the brighteſt ſkies, and the richeſt and moſt glorioufly cloud-tipt horizons, that can be well conceived. Nay, the ſun himſelf, which, like the Almighty, can be repreſented merely by his effects, has ſcarce eſcaped his daring and ambitious pencil.

Titian, the great confident of nature, is the Homer of landſcape. His ſcenes have ſo much truth, ſo much variety, and ſuch a bloom in them, that it is impoſſible to behold them, without, wiſhing, as if they were real, to make an excurſion into them. And perhaps the fineſt landſcape that ever iſſued from mortal hands, is the back ground of his *Martyrdom of St. Peter*; where by the difference between the bodies and the leaves of his trees, and the diſpoſition of their branches, one immediately diſcovers the difference between the trees themſelves; where the different ſoils are ſo well expreſſed, and ſo exquiſitely cloth-ed with their proper plants, that a botaniſt has much ado to keep his hands from them. See Part II. Sect. ii.

Paolo Veroneſe is in architecture what Titian is in landſcape. To excel in landſcape, we muſt, above all things, ſtudy nature. To excel in architecture, we muſt chiefly regard the fineſt works of art; ſuch as the fronts of ancient edifices, and the fabrics of thoſe moderns who have beſt ſtudied and beſt copied antiquity. Next to Brunelleſchi and Alberti, who were the firſt revivers of architecture, came Bramante, Giulio Romano, Sanſovino, Sanmicheli, and laſtly Palladio, whoſe works the young painter ſhould above all the reſt diligently ſtudy, and imprint deeply on his mind. Nor is Vignola to be forgot; for ſome think he was a more ſcrupulous copier of antiquity, and more exact than Palladio himſelf, inſomuch that moſt people conſider him as the firſt architect among the moderns. For our part, to ſpeak of him, not as fame, but as truth ſeems to require, we cannot help thinking, that rather than break through the generality of the rules contrived by him to facilitate practice, he has in ſome inſtances deviated from the moſt beautiful proportions of the antique, and is rather barren in the diſtribution and diſpoſition of certain members. Moreover, the extraordinary height of his pedeſtals and cornices hinders the column from ſhowing in the orders deſigned and employed by him, as it does in thoſe of Palladio. Amongſt that great variety of proportions to be met with in ancient ruins, Palladio has been extremely happy in chooſing the beſt. His profiles are well contraſted, yet eaſy. All the parts of his buildings hang well together. Grandeur, elegance, and

beauty, walk hand in hand them. In ſhort, the very blemiſhes of Palladio, who was no ſlave to conveniency, and ſometimes perhaps was too profuſe in his decorations, are pictureſque. And we may reaſonably believe, that it was by following ſo great a maſter, whoſe works he had continually before his eyes, that Paolo Veroneſe formed that fine and maſterly taſte which enabled him to embelliſh his compoſitions with ſuch beautiful ſtructures.

The ſtudy of architecture cannot fail, in another reſpect, of being very uſeful to the young painter, inaſmuch as it will bring him acquainted with the form of the temples, thermæ, baſilics, theatres, and other buildings of the Greeks and Romans. Beſides, from the baſſo-relievos with which it was cuſtomary to adorn theſe buildings, he may gather, with equal delight and profit, the nature of their ſacrifices, arms, military enſign, and dreſs. The ſtudy of landſcape, too, will render familiar to him the form of the various plants peculiar to each ſoil and climate, and ſuch other things as ſerve to characteriſe the different regions of the earth. Thus by degrees he will learn what we call *coſtume*, one of the chief requiſites in a painter; ſince by means of it he may expreſs with great preciſion the time and place in which his ſcenes are laid.

Sect. VIII. *Of the Expreſſion of the Paſſions.*

That language which above all others a painter ſhould carefully endeavour to learn, and from nature herſelf, is the language of the paſſions. Without it the fineſt works muſt appear lifeleſs and inanimate. It is not enough for a painter to be able to delineate the moſt exquiſite forms, give them the moſt graceful attitudes, and compoſe them well together; it is not enough to dreſs them out with propriety, and in the moſt beautiful colours; it is not enough, in fine, by the powerful magic of light and ſhade, to make the canvas vaniſh. No; he muſt likewiſe know how to clothe his figures with grief, with joy, with fear, with anger; he muſt, in ſome ſort, write on their faces what they think and what they feel; he muſt give them life and ſpeech. It is indeed in this branch that painting truly ſoars, and in a manner riſes ſuperior to itſelf; it is in this branch ſhe makes the ſpectator apprehend much more than what ſhe expreſſes.

The means employed in her imitations by painting, are the circumſcription of terms, the chiaro-ſcuro, and colours; all which appear ſolely calculated to ſtrike the viſual faculty. Notwithſtanding which, ſhe contrives to repreſent hard and ſoft, rough and ſmooth ſurfaces, which are objects of the touch; and this by means of certain tints, and a certain chiaro-ſcuro, which has a different look in marble, in the bark of trees, in downy and delicate ſubſtances. Nay, ſhe contrives to expreſs ſound and motion, by means of light and ſhade, and certain particular configurations. In ſome landſcapes of Diderich, we almoſt hear the water murmur, and ſee it tremble along the ſides of the river and of the boats upon it. In the *Battle* of Burgogne, we are really apt to fancy that the trumpet ſounds; and we ſee the horſe, who has thrown his rider, ſcamper along the plain. But what is ſtill more wonderful, painting, in virtue of her various colours and certain particular geſtures, expreſſes even the ſentiments and moſt hidden affections of the ſoul, and renders her viſible ſo as to make the eye not only touch and hear, but even kindle into paſſion and reaſon.

Many have written, and amongſt the reſt the famous Le Brun, on the various changes that, according to the various paſſions, happen in the muſcles of the face, which is, as it were, the dumb tongue of the ſoul. They obſerve, for example, that in fits of anger the face reddens, the muſcles of the lips puff out, the eyes ſparkle; and that on the contrary, in fits of melancholy, the eyes grow motionleſs and dead, the face pale, and the lips ſink in. It may be of ſervice to read theſe and ſuch other remarks; but it will be of infinitely more ſervice to ſtudy them in nature itſelf, from which they have been borrowed, and which exhibits them in that lively manner which neither tongue nor pen can expreſs.

Upon Le Brun's Treatiſe on the Paſſions, we have the following juſt, though ſevere, criticiſm by Winckelmann. "Expreſſion, though precarious in its nature (ſays he), has been reduced into a ſyſtem, in a Treatiſe on the Paſſions by Charles le Brun, a work generally put into the hands of young artiſts. The plates which accompany this treatiſe do not only give to the face, the affections of the ſoul in too high a tone, but there are many of the heads in which the paſſions are repreſented in an outrageous manner. He appears to give inſtructions in expreſſion, as Diogenes gave examples of morality: I act like muſicians, ſaid that cynic who give a high tone, in order to indicate a true one. But the fervour of youth has naturally more inclination to ſeize the extreme than the middle; and hence it is difficult for the young artiſt, in copying after Le Brun, to ſeize the true tone. Youth in general may be ſuppoſed to have that regard for the calm and moderate in the arts, which they have for the precepts of wiſdom and virtue."

Other French writers have given inſtructions reſpecting the expreſſion of the paſſions, equally exceptionable with thoſe of Le Brun. All of them whom we have conſulted make ſo many diviſions and ſubdiviſions of paſſions, that a philoſopher cannot follow them in metaphyſical theory, nor a painter exhibit their effects upon canvaſs. Nature therefore muſt be his guide, particulary in treating thoſe very minute and almoſt imperceptible differences, by which, however things very different from each other are often expreſſed. This is particularly the caſe with regard to the paſſions of laughing and crying; as in theſe, however contrary, the muſcles of the face operate nearly in the ſame manner. As the famous Pietro de Cortona, was one day finiſhing the face of a crying child in a repreſentation of the Iron Age, with which he was adorning the floor called the *Hot-bath* in the royal palace of Pitti, Ferdinand II. who happened to be looking over him for his amuſement, could not forbear expreſſing his approbation, by crying out, "Oh how well that child cries!" To whom the artiſt,—"Has your majeſty a mind to ſee how eaſy it is to make children laugh? Behold, I'll prove it in an inſtant." And taking up his pencil, by giving the contour of the mouth a concave turn downwards, inſtead of the convex upwards which it before had, and with little or no alteration in any other part of the face, he made the child, who a little before ſeemed ready to burſt its heart with crying, appear in equal danger of burſting its ſides with immoderate laughter; and then, by reſtoring the altered features to their former poſition, he ſoon ſet the child a-crying again."

The different expreſſions of laughter and weeping are thus deſcribed by Le Brun. "The movements of laughter are expreſſed by the eye-brows elevated towards the middle of the eye, and lowered towards the ſides of the noſe: the eyes almoſt ſhut, appear ſometimes moiſtened with tears: the mouth a little open, allows the teeth to be ſeen: the extremities of the mouth drawn back, make a dimple in the cheeks, which appear to be ſwelled: the noſtrils are open: and the face becomes red. The changes which weeping occaſions are equally viſible. The eye-brow is lowered on the middle of the forehead; the eyes are almoſt ſhut, moiſtened and lowered towards the ſides of the cheeks: the noſtrils are ſwelled, and the veins of the forehead very apparent: the mouth ſhut, by the lowneſs of its ſides, occaſions wrinkles in the cheeks; the under lip is turned down, and preſſes at the ſame time the upper lip: the whole countenance is wrinkled and becomes red: eſpecially the eye-brows, the eyes, the noſe, and the cheeks."

According to Leonardo da Vinci, the beſt maſters that a painter can have recourſe to in this branch are thoſe dumb men who have found out the method of expreſſing their ſentiments by the motion of their hands, eyes, eye-brows, and in ſhort

every other part of the body. If this advice be at all proper, ſuch geſtures muſt be imitated with great ſobriety and moderation, leſt they ſhould appear too ſtrong and exaggerated; and the piece ſhould ſhow nothing but pantomimes, when ſpeaking figures alone are to be exhibited; and ſo become theatrical and ſecond-hand, or, at beſt, look like the copy of a theatrical and ſecond-hand nature.

The artiſt will reap greater benefit from ſtudying ſuch fine ancient heads as thoſe of Mithridates, Seneca, Alexander dying, Cleopatra, Niobe, &c. and above all, from attentively obſerving ſuch movements of nature as we daily meet with in the world. But let him chiefly conſult his looking-glaſs, and ſtudy after his own face, what, in certain expreſſions, are the muſcles, the lineaments, the tints, and the accidental circumſtances which characteriſe the ſituation of the ſoul. It rarely happens that a model, which is affected with no ſentiment, preſents that to us which we ourſelves feel, and which we are capable of expreſſing when we are our own model. Puget executed the legs of his Milo after his own; and many ingenious artiſts have had recourſe to a ſimilar expedient. In ſhort, to be affected ourſelves is the true ſecret of affecting the ſpectator.

We muſt not neglect, at the ſame time, to ſecure the fleeting characters which nature preſents to us on a thouſand occaſions. We muſt diſtruſt our memory, and all the reſources which are not eaſily employed when we happen to ſtand in need of them. It is neceſſary to watch the circumſtances from which we can derive any uſeful hint; to ſeize them when they preſent themſelves; and to be careful never to loſe, by an irreparable negligence, the fruit of a happy incident.

Let us alſo endeavour to poſſeſs the feeling of what we are to expreſs; whether it be by forming the image of a thing abſent as if it were preſent, or by being affected with the lively idea of a ſituation which we have either experienced, or with which we have ſeen another perſon remarkably affected. We muſt never forget, that all the terrible or agreeable, the violent or ſlight movements, are to be treated in a natural manner, and bear a relation to the age, condition, ſex, and dignity of the perſon. Thoſe gradations, which art varies according to the nature of the ſituation, and the character of men, compoſe the principal ingredients of diſcernment, knowledge, and taſte. They have been the objects of attention and inquiry to the moſt eminent painters of every age; and they were of the laſt importance in aſſiſting them to arrive at that degree of excellence to which they have carried expreſſion.

We are told ſtrange things of the ancient painters of Greece in regard to expreſſion; eſpecially of Ariſtides; who, in a picture of his, repreſenting a woman wounded to death at a ſiege, with a child crawling to her breaſt, makes her appear afraid, leſt the child, when ſhe was dead, ſhould, for want of milk, ſuck her blood. *A Medea murdering her children*, by Timomachus, was likewiſe much cried up, as the ingenious artiſt contrived to expreſs, at once, in her countenance, both the fury that hurried her on to the commiſſion of ſo great a crime, and the tenderneſs of a mother that ſeemed to with-hold her from it. Rubens attempted to expreſs ſuch a double effect in the face of Mary of Medicis, ſtill in pain from her paſt labour, and at the ſame time full of joy at the birth of a Dauphin. And in the countenance of Sancta Polonia, painted by Tiepolo for St. Anthony's church at Padua, one may clearly read a mixture of pain from the wound given her by the executioner, and of pleaſure from the proſpect of paradiſe opened to her by it.

Few, to ſay the truth, are the examples of ſtrong expreſſion afforded by the Venetian, Flemiſh, or Lombard ſchools. Deprived of that great happineſs, the happineſs of being able to contemplate, at leiſure, the works of the ancients, the pureſt ſources of perfection in point of deſign, expreſſion, and character; and having nothing but nature conſtantly before their eyes; they made ſtrength of colouring, blooming complexions, and the grand effects of the chiaro ſcuro, their principal ſtudy: they aimed more at charming the ſenſes than at captivating the underſtanding. The Venetians, in particular, ſeem to have placed their whole glory in ſetting off their pieces with all that rich variety of perſonages and dreſs, which their capital is continually receiving by means of its extenſive commerce, and which attracts ſo much the eyes of all thoſe who viſit it. It is much to be doubted, if, in all the pictures of Paolo Veroneſe, there is to be found a bold and judicious expreſſion, or one of thoſe attitudes which, as Petrarch expreſſes it, ſpeak without words; unleſs, perhaps, it be that remarkable one in his *Marriage Feaſt of Cana of Galilee*. At one end of the table, and directly oppoſite to the bridegroom, whoſe eyes are fixed upon her, there appears a woman in red, holding up to him the ſkirt of her garment; as much as to ſay, we may ſuppoſe, that the wine miraculouſly produced was exactly of the colour with the ſtuff on her back. And in fact it is red wine we ſee in the cups and pitchers. But all this while the faces and attitudes of moſt of the company betray not the leaſt ſign of wonder at ſo extraordinary a miracle. They all, in a manner, appear intent upon nothing but eating, drinking, and making merry. Such, in general, is the ſtyle of the Venetian ſchool. The Florentine, over which Michael Angelo preſided, above all things curious of deſign, was moſt minutely and ſcrupulouſly exact in point of anatomy. On this ſhe ſet her heart, and took ſingular pleaſure in diſplaying it. Not only elegance of form, and nobleneſs of invention, but likewiſe ſtrength of expreſſion, triumph in the Roman ſchool, nurſed as it were amongſt the works of the Greeks, and in the boſom of a city which had once been the ſeminary of learning and politeneſs. Here it was that Domenichino and Pouſſin, both great maſters of expreſſion, refined themſelves, as appears more particularly by the *St. Jerome* of the one, and the *Death of Germanicus*, and the *Slaughter of the Innocents*, by the other. Here it was that Raphael aroſe, the ſovereign maſter of them all. One would imagine, that pictures, which are generally conſidered as the books of the ignorant, and of the ignorant only, he had undertaken to make the inſtructors even of the learned. One would imagine, that he intended, in ſome meaſure, to juſtify Quintilian, who affirms, that painting has more power over us than all the arts of rhetoric. There is not, indeed, a ſingle picture of Raphael's, from the ſtudy of which thoſe who are curious in point of expreſſion may not reap great benefit; particularly his *Martyrdom of St. Felicitas*, his *Transfigurations*, his *Joſeph explaining to Pharoah his dream*, a piece ſo highly rated by Pouſſin. His *School of Athens*, in the Vatican, is, to all intents and purpoſes, a ſchool of expreſſion. Among the many miracles of art with which this piece abounds, we ſhall ſingle out that of the four boys attending on a mathematician, who, ſtooping to the ground with his compaſſes in his hand, is giving them the demonſtration of a theorem. One of the boys, recollecting within himſelf, keeps back, with all the appearance of profound attention to the reaſoning of the maſter; another, by the briſkneſs of his attitude, diſcovers a greater quickneſs of apprehenſion; while the third, who has already ſeized the concluſion, is endeavouring to beat it into the fourth, who, ſtanding motionleſs, with open arms, a ſtaring countenance, and an unſpeakable air of ſtupidity in his looks, will never perhaps be able to make any thing of the matter. And it is probably from this very group that Albani, who ſtudied Raphael ſo cloſely, drew the following precept of his: "That it behoves a painter to expreſs more circumſtances than one by every attitude; and ſo to employ his figures, that, by barely ſeeing what they are actually about, one may be able to gueſs, both what they have been already doing, and are next going to do." This is indeed a difficult precept: but it is only by a due obſervance of

it that the eye and the mind can be made to hang in ſuſpenſe on a painted piece of canvas. It is expreſſion that a painter, ambitious to ſoar in his profeſſion, muſt, above all things, labour to perfect himſelf in. It is the laſt goal of his art, as Socrates proves to Parrhaſius. It is in expreſſion that dumb poetry conſiſts, and what the prince of our poets calls a viſible language.

Sect. IX. *Of Invention.*

As the operations of a general ſhould all ultimately tend to battle and conqueſt, ſo ſhould all the thoughts of a painter to perfect invention. Now, the ſtudies which we have been hitherto recommending, will prove ſo many wings by which he may raiſe himſelf, as it were, from the ground, and ſoar on high, when deſirous of trying his ſtrength this way, and producing ſomething from his own fund. Invention is the finding out probable things, not only ſuch as are adapted to the ſubject in hand, but ſuch, beſides, as by their ſublimity and beauty are moſt capable of exciting ſuitable ſentiments in the ſpectator, and of making him, when they happen to be well executed, fancy that it is the ſubject itſelf in its greateſt perfection, and not a mere repreſentation of it, that he has before him. We do not ſay true things, but probable things: becauſe probability or veriſimilitude is, in fact, the truth of thoſe arts which have the fancy for their object. It is, indeed, the buſineſs and duty of both naturaliſts and hiſtorians to draw objects as they find them, and repreſent them with all thoſe imperfections and blemiſhes, to which, as individuals, they are ſubject. But an ideal painter, and ſuch alone is a true painter, reſembles the poet: inſtead of copying, he imitates; that is, he works with his fancy, and repreſents objects endued with all that perfection which belongs to the ſpecies, and may be conceived in the archetype. "*'Tis nature all, but nature methodis'd*;" ſays an eminent poet, ſpeaking of poetry: And the ſame may be ſaid of painting; it is nature methodized, and made perfect. Inſomuch, that the circumſtances of the action, exalted and ſublimed to the higheſt degree of beauty and boldneſs they are ſuſceptible of, may, though poſſible, have never happened exactly ſuch as the painter fancies and thinks proper to repreſent them. Thus, the piety of Æneas, and the anger of Achilles, are things ſo perfect in their kind, as to be merely probable. And it is for this reaſon that poetry, which is only another word for invention, is more philoſophical, more inſtructive, and more entertaining, than hiſtory.

Here it is proper to obſerve, what great advantages the ancient had over the modern painters. The hiſtory of the times they lived in, fraught with great and glorious events, was to them a rich mine of the moſt noble ſubjects, which, beſides, often derived no ſmall ſublimity and pathos from the mythology upon which their religion was founded. So far were their gods from being immaterial, and placed at an infinite diſtance above their worſhippers; ſo far was their religion from recommending humility, penance, and ſelf-denial, that, on the contrary, it appeared calculated merely to flatter the ſenſes, inflame the paſſions, and poiſon the fancy. By making the gods partake of our nature, and ſubjecting them to the ſame paſſions, it gave man hopes of being able to mix with thoſe who, though greatly above him, reſembled him, notwithſtanding, in ſo many reſpects. Beſides, thoſe deities of theirs were in a manner viſible, and to be met at every ſtep. The ſea was crowded with Tritons and Nereids, the rivers with Naiads, and the mountains with Dryads. The woods ſwarmed with Fauns and Nymphs, who, in theſe obſcure retreats, ſought an aſylum for their ſtolen embraces. The moſt potent empires, the moſt noble families, the moſt celebrated heroes, all derived their pedigree from the greater divinities. Nay, gods intereſted themſelves in all the concerns of mankind. Apollo, the god of long arrows, ſtood by the ſide of Hector in the fields of Troy, and inſpired him with new ſtrength and courage to batter down the walls and burn the ſhips of the Greeks. Theſe, on the other hand, were led on to the fight and animated by Minerva, preceded by Terror, and followed by Death. Jove nods, his divine locks ſhake on his immortal head; Olympus trembles. With that countenance, which allays the tempeſt, and reſtores ſerenity to the heavens, he gathers kiſſes from the mouth of Venus, the delight of gods and of men. Among the ancients, every thing ſported with the fancy; and in thoſe works which depend entirely on the imagination, ſome of our greateſt maſters have thought they could not do better than borrow from the Pagans, if we may be allowed to ſay it, their pictures of Tartarus, in order to render their own drawings of hell more ſtriking.

After all, there have not been wanting able inventors in painting among the moderns. Michael Angelo, notwithſtanding the depth and boldneſs of his own fancy, is not aſhamed, in ſome of his compoſitions, to *Dantize*, as Phidias and Apelles may be ſaid formerly to have *Homerized*. Raphael, too, tutored by the Greeks, has found means, like Virgil, to extract the quinteſſence of truth; has ſeaſoned his works with grace and nobleneſs, and exalted nature, in a manner, above herſelf, by giving her an aſpect more beautiful, more animating, and more ſublime, than ſhe is in reality accuſtomed to wear. In point of invention, Domenichino and Hannibal Carracci come very near Raphael, eſpecially in the pieces painted by them in Rome; nor does Pouſſin fall very ſhort of him in ſome of his pictures, particularly in his *Eſther before Ahaſuerus*, and his *Death of Germanicus*, the richeſt jewel belonging to the Barberine family. Of all the painters who have acquired any extraordinary degree of reputation, no one ſtudied leſs to ſet off his pieces by bold and beautiful circumſtances, or was more a ſtranger to what is called *poetical perfection*, than Jacopo Baſſano. Among the numberleſs inſtances we could produce of his careleſſneſs this way, let it ſuffice to mention a *Preaching of St. Paul* painted by him in a place, near that of his birth, called *Maroſtega*. Inſtead of repreſenting the apoſtle full of a divine enthuſiaſm, as Raphael has done, and thundering againſt the ſuperſtitions of the heathen in an aſſembly of Athenians; inſtead of exhibiting one of his auditors ſtruck to the quick, another perſuaded, a third inflamed; he makes him hold forth, in a village of the Venetian ſtate, to a parcel of poor peaſants and their wives, who take not the leaſt notice of him; the women eſpecially, who ſeem to mind nothing but the country labours in which he had found them employed.

With regard to invention, painting and poetry reſemble each other ſo much in many other reſpects, beſides that of combining in every action all the beauty and elegance it will admit, that they well deſerve the name of *ſiſter arts*. They differ, however, in one point, and that too of no ſmall importance. It is this. The poet, in the repreſentation of his ſtory, relates what has already happened, prepares that which is ſtill to come, and ſo proceeds, ſtep by ſtep, through all the circumſtances of the action; and to produce the greater effect on his hearers, avails himſelf of the ſucceſſion of time and place. The painter, on the contrary, deprived of ſuch helps, muſt be content to depend upon one ſingle moment. But what a moment! A moment, in which he may conjure up, at once, to the eyes of the ſpectator, a thouſand objects; a moment teeming with the moſt beautiful circumſtances that can attend the action; a moment, equivalent to the ſucceſſive labours of the poet. This the works of the greateſt maſters, which are everywhere to be ſeen, ſufficiently evince; among others, the *St. Paul at Lyſtra*, by Raphael, whom it is impoſſible not to praiſe as often as this picture is mentioned. In order to give the ſpectator a thorough inſight into the ſubject of this piece, the painter has placed, in the front of it, the cripple already reſtored to his limbs by the

apoſtle, fired with gratitude towards his benefactor, and exciting his countrymen to yield him all kinds of honour. Round the cripple are ſome figures lifting up the ſkirts of his coat, in order to look at the legs reduced to their proper ſhape, and acknowledging by geſtures full of aſtoniſhment the reality of the miracle; an invention, ſays a certain author, a profeſſed admirer of antiquity, which might have been propoſed as an example in the happieſt age of Greece.

We have another ſhining inſtance of the power of painting to introduce a great variety of objects on the ſcene at the ſame time, and of the advantage it has in this reſpect over poetry, in a drawing by the celebrated La Fage. This drawing repreſents the deſcent of Æneas into hell. The field is the dark caverns of Pluto's kingdom, through the middle of which creeps ſlowly the muddy and melancholy Acheron. Nearly in the centre of the piece appears Æneas with the golden bough in his hand, and with an air of aſtoniſhment at what he ſees. The Sybil, who accompanies him, is anſwering the queſtions which he aſks her. The perſonage there is the ferryman of the pitchy lake, by which even the gods themſelves are afraid to ſwear. Thoſe who, crowding in to the banks of the river, numberleſs as the leaves ſhaken off the trees by autumnal blaſts, expreſs, with outſtretched hands, an impatience to be ferried to the oppoſite ſhore, are the unhappy manes, who, for want of burial, are unqualified for that happineſs. Charon accordingly is crying out to them, and with his lifted up oar driving them from his boat, which has already taken in a number of thoſe who had been honoured with the accuſtomed funeral rites. Behind Æneas and the Sybil we diſcover a confuſed group of wretched ſouls, lamenting bitterly their misfortune in being denied a paſſage; two of them wrapped up in their clothes, and, in a fit of deſpair, ſunk upon a rock. Upon the firſt lines of the piece ſtands a third group of uninhumed ſhades, Leucaſpes, Orontes, and, in the midſt of them, the good old Palinurus, formerly maſter and pilot of the hero's own veſſel, who with joined hands moſt earneſtly deſires to be taken along with him into the boat, that, after death, at leaſt, he may find ſome repoſe, and his dead body no longer remain the ſport of winds and waves. Thus, what we ſee ſcattered up and down in many verſes by Virgil is here, as it were, gathered into a focus, and concentered by the ingenious pencil of the painter, ſo as to form a ſubject well worthy of being expoſed, in more ſhapes than one, to the eyes of the public.

When a painter takes a ſubject in hand, be it hiſtorical, be it fabulous, he ſhould carefully peruſe the books which treat of it, imprint well on his mind all the circumſtances that attend it, the perſons concerned in it, and the paſſions with which they muſt have been ſeverally animated; not omitting the particulars of time and place. His next buſineſs is to create it, as it were, anew, obſerving the rules already laid down for that purpoſe: From what is true, chooſing that which is moſt ſtriking; and clothing his ſubject with ſuch acceſſory circumſtances and actions, as may render it more conſpicuous, pathetic, and noble, and beſt diſplay the powers of the inventive faculty. But, in doing this, great diſcretion is requiſite; for, let his imagination grow ever ſo warm, his hand is never to execute any thing that is not fully approved by his judgment. Nothing low or vulgar ſhould appear in a loſty and noble argument; a fault, of which ſome of the greateſt maſters, even Lampieri and Pouſſin, have been now and then guilty.

The action muſt be one, the place one, the time one. We need not ſay any thing of thoſe painters, who, like the writers of the Chineſe and Spaniſh theatre, cram a variety of actions together, and ſo give us, at once, the whole life of a man. Such blunders, it is preſumed, are too groſs to be feared at preſent. The politeneſs and learning of the age ſeem to demand conſiderations of a more refined nature; ſuch as, that the epiſodes introduced in the drama of a picture, the better to fill and adorn it, ſhould be not only beautiful in themſelves, but indiſpenſably requiſite. The games celebrated at the tomb of Anchiſes, in Sicily, have a greater variety in them, and more ſources of delight, than thoſe that had been before celebrated at the tomb of Patroclus under the walls of Troy. The arms forged by Vulcan for Æneas, if not better tempered, are at leaſt better engraved, than thoſe which the ſame god had forged ſeveral ages before for Achilles. Nevertheleſs, in the eyes of judges, both the games and the arms of Homer are more pleaſing than thoſe of Virgil, becauſe the former are more neceſſary in the Iliad than the latter in the Æneid. Every part ſhould agree with, and have a relation to, the whole. Unity ſhould reign even in variety; for in this beauty conſiſts. This is a fundamental maxim in all the arts whoſe object it is to imitate the works of nature.

Pictures often borrow no ſmall grace and beauty from the fictions of poetry. Albani has left us, in ſeveral of his works, ſufficient proofs of the great ſhare the belles letters had in refining his taſte. But Raphael, above all others, may in this branch too be conſidered as a guide and maſter. To give but one inſtance out of many; what a beautiful thought was it to repreſent the river himſelf, in a *Paſſage of Jordan*, ſupporting his waters with his own hands, in order to open a way to the army of the Iſraelites! Nor has he diſplayed leſs judgment in reviving, in his deſigns engraved by Agoſtino of Venice, the little loves of Aëtius playing with the arms of Alexander, conquered by the beauty of Roxana.

Among the ancients, Apelles and Parrhaſius were thoſe who diſtinguiſhed themſelves moſt in allegorical ſubjects, in which the inventive faculty ſhows itſelf to the greateſt advantage; the firſt by his picture of *Calumny*, the ſecond by that of the *Genius of the Athenians*. The ancient painter called *Galaton* gave likewiſe a fine proof of his genius in this branch, by repreſenting a great number of poets greedily quenching their thirſt in the waters guſhing from the mouth of the ſublime Homer. And to this allegory, according to Guigni, Pliny has an eye, when he calls that prince of poets the *fountain of wits*. But it is, after all, no way ſurpriſing that we ſhould often meet ſuch fine flights of fancy in the ancient artiſts. They were not guided in their works by a blind practice: they were men of polite education; converſant with the letters of the age in which they lived; and the companions, rather than the ſervants, of the great men who employed them. The fineſt allegorical painter among the moderns was Rubens; and he was accordingly much celebrated for it. The beſt critics, however find fault with his uniting in the Luxemburg gallery, the queen-mother, in council, with two cardinals and Mercury. Nor is there leſs impropriety in his making Tritons and Nereids, in another piece of the ſame gallery, ſwim to the queen's veſſel through the galleries of the knights of St. Stephen. Such freedoms are equally diſguſting with the prophecies of Sannazaro's Proteus, concerning the myſtery of the incarnation, or the Indian kings of Camoens, reaſoning with the Portugueſe on the adventures of Ulyſſes.

The beſt modern performances in picturesque allegory are certainly thoſe of Pouſſin; who availed himſelf, with great diſcretion and judgment, of the vaſt treaſures with which, by a cloſe ſtudy of the ancients, he had enriched his memory. On the other hand, Le Brun, his countryman, has been very unhappy this way. Ambitious to have every thing his own, inſtead of allegories, he has filled the gallery of Verſailles with enigmas and riddles, of which none but himſelf was qualified to be the Œdipus. Allegory muſt be ingenious it is true; but then it muſt be equally perſpicuous; for which reaſon, a painter ſhould avoid all vague and indeterminate alluſions, and likewiſe thoſe to hiſtory and heathen mythology, which are too abſtruſe to be underſtood by the generality of ſpectators. The beſt way, perhaps, to ſymbolize moral and abſtract things, is to repreſent particular events: as Caracci did, by advice of Monſignore

Agucchi, in the Farneſian palace. For example, what can better expreſs a hero's love towards his country, than the virtuous Decius conſecrating himſelf boldly to the infernal gods, in order to ſecure victory to his countrymen over their enemies? What finer emblems can we deſire of emulation, and an inſatiable thirſt for glory, than Julius Cæſar weeping before the ſtatue of Alexander in the temple of Hercules at Gades? of the inconſtancy of fortune, than Marius ſitting on the ruins of Carthage, and receiving, inſtead of the acclamations of an army joyfully ſaluting him imperator, orders from a lictor of Sextilius to quit Africa? of indiſcretion, than Candaules, who, by ſhowing the naked beauties of his wife to his friend Giges, kindled a paſſion that ſoon made him repent his folly? Such repreſentations as theſe require no comment; they carry their explanation along with them. Beſides, ſuppoſing, and it is the worſt we can ſuppoſe, that the painter's aim in them ſhould happen not to be underſtood, his piece would ſtill give delight. It is thus that the fables of Arioſto prove ſo entertaining, even to thoſe who underſtand nothing of the moral couched under them; and likewiſe the Æneis, though all do not comprehend the alluſions and double intent of the poet.

Sect. X. *Of Diſpoſition.*

So much for invention. *Diſpoſition*, which may be conſidered as a branch of invention, conſiſts in the proper ſtationing of what the inventive faculty has imagined, ſo as to expreſs the ſubject in the moſt lively manner. The chief merit of diſpoſition may be ſaid to conſiſt in that diſorder, which, wearing the appearance of mere chance, is in fact the moſt ſtudied effect of art. A painter, therefore, is equally to avoid the dryneſs of thoſe ancients who always planted their figures like ſo many couples in a proceſſion, and the affectation of thoſe moderns who jumble them together as if they were met merely to fight and ſquabble. In this branch Raphael was happy enough to chooſe the juſt medium, and attain perfection. The diſpoſition of his figures is always exactly ſuch as the ſubject requires. In the *Battle of Conſtantine*, they are confuſedly cluſtered with as much art, as they are regularly marſhalled in *Chriſt's commitment of the keys to St. Peter* and conſtituting him prince of the apoſtles.

Let the inferior figures of a piece be placed as they will, the principal figure ſhould ſtrike the eye moſt, and ſtand out, as it were, from among the reſt. This may be effected various ways, as by placing it on the foremoſt lines, or in ſome other conſpicuous part of the piece; by exhibiting it, in a manner, by itſelf; by making the principal light fall upon it; by giving it the moſt reſplendent drapery; or, indeed, by ſeveral of theſe methods, nay, by all of them together. For, being the hero of the picturesque fable, it is but juſt that it ſhould draw the eye to itſelf, and lord it, as it were, over all the other objects.

According to Leon Batiſta Alberti, painters ſhould follow the example of comic writers, who compoſe their fable of as few perſons as poſſible. For, in fact, a crowded picture is apt to give as much pain to the ſpectator, as a crowded road to the traveller.

Some ſubjects, it muſt be granted, require a number, nay, a nation, as it were, of figures. On theſe occaſions, it depends entirely on the ſkill of the painter to diſpoſe of them in ſuch a manner, that the principal ones may always make the principal appearance; and contrive matters ſo, that the piece be not overcrowded, or want convenient reſts and pauſes. He muſt, in a word, take care that his piece be full, but not charged. In this reſpect, the *Battles of Alexander* by Le Brun are maſter-pieces which can never be ſufficiently ſtudied; whereas nothing, on the other hand, can be more unhappy than the famous *Paradiſe* of Tintoret, which covers one entire ſide of the great council-chamber at Venice. It appears no better than a confuſed heap of figures, a ſwarm, a cloud, a chaos, which pains and fatigues the eye. What a pity it is that he did not diſpoſe this ſubject after a model of his own, now in the gallery of Bevilacqua at Verona! In this laſt, the ſeveral choirs of martyrs, virgins, biſhops, and other ſaints, are judiciouſly thrown into ſo many cluſters, parted here and there by a fine fleece of clouds; ſo as to exhibit the innumerable hoſt of heaven drawn up in a way that makes a moſt agreeable and glorious appearance. There goes a ſtory, to our purpoſe, of a celebrated maſter, who in a drawing of the Univerſal Deluge, the better to expreſs the immenſity of the waters that covered the earth, left a corner of his paper without figures. Being aſked, if he did not intend to fill it up: No, ſaid he; do not you ſee that my leaving it empty is what preciſely conſtitutes the picture?

The reaſon for breaking a compoſition into ſeveral groups is, that the eye, paſſing freely from one object to another, may the better comprehend the whole. But the painter is not to ſtop here; for theſe groups are, beſides, to be ſo artfully put together, as to form rich cluſters, give the whole compoſition a ſingular air of grandeur, and afford the ſpectator an opportunity of diſcerning the piece at a diſtance, and taking the whole in, as it were, at a ſingle glance. Theſe effects are greatly promoted by a due regard to the nature of colours, ſo as not to place together thoſe which are apt to pain by their oppoſition, or diſtract by their variety. They ſhould be ſo judiciouſly diſpoſed as to temper and qualify each other.

A proper uſe of the chiaro-ſcuro is likewiſe of great ſervice on this occaſion. The groups are eaſily parted, and the whole picture acquires a grand effect, by introducing ſome ſtrong falls of ſhade, and, above all, one principal beam of light. This method has been followed with great ſucceſs by Rembrandt in a famous picture of his, repreſenting the Virgin at the foot of the croſs on mount Calvary; the principal light darting upon her through a break of the clouds, while the reſt of the figures about her ſtand more or leſs in the ſhade. Tintoret, too, acquired great reputation, as well by that briſkneſs with which he enlivened his figures, as by his maſterly manner of ſhading them; and Polidoro de Caravaggio, though he ſcarce painted any thing but baſſo-relievos, was particularly famous for introducing with great ſkill the effects of the chiaro ſcuro, a thing firſt attempted by Mantegna in his *Triumph of Julius Cæſar*. It is by this means that his compoſitions appear ſo ſtrikingly divided into different groups, and, among their other perfections, afford ſo much delight through the beautiful diſpoſition that reigns in them.

In like manner, a painter, by the help of perſpective, eſpecially that called *ærial*, the oppoſition of local colours, and other contrivances which he may expect to hit upon by ſtudying nature, and thoſe who have beſt ſtudied her before him, will be able not only to part his groups, but make them appear at different diſtances, ſo as to leave ſufficient paſſages between them.

But the greateſt caution is to be uſed in the purſuit of the methods here laid down; eſpecially in the management of the chiaro-ſcuro, that the effects attributed to light and ſhade, and to their various concomitants, may not run counter to truth and experience. This is a capital point. For this purpoſe, a painter would do well to make, in little figures, as Tintoret and Pouſſin uſed to do, a model of the ſubject that he intends to repreſent, and then illuminate it by lamp or candle light. By this means he may come to know with certainty, if the chiaro-ſcuro, which he has formed in his mind, does not claſh with the reaſon of things. By varying the height and direction of his light, he may eaſily diſcover ſuch accidental effects as are moſt likely to recommend his performance, and ſo eſtabliſh a proper ſyſtem for the illuminating it. Nor will he afterwards find it a difficult matter to modify the quality of his ſhades, by ſoftening or ſtrengthening them, according to the ſituation of his ſcene, and the quality of the light falling upon it. If it ſhould happen to be a

candle or lamp light ſcene, he would then have nothing to do but conſider his model well, and faithfully copy it.

In the next place, to turn a group elegantly, the beſt pattern is that of a bunch of grapes adopted by Titian. As, of the many grains that compoſe a bunch of grapes, ſome are ſtruck directly by the light, and thoſe oppoſite to them are in the ſhade, whilſt the intermediate ones partake of both light and ſhade in a greater or leſs degree; ſo, according to Titian, the figures of a group ſhould be ſo diſpoſed, that, by the union of the chiaro-ſcuro, ſeveral things may appear as it were but one thing. And in fact it is only from his having purſued this method, that we can account for the very grand effect of his pieces this way, in which it is impoſſible to ſtudy him too much.

The manneriſts, who do not follow nature in the track of the maſters juſt mentioned, are apt to commit many faults. The reaſon of their figures caſting their ſhades in this or that manner ſeldom appears in the picture, or at leaſt does not appear ſufficiently probable. They, are, beſides, wont to treſpaſs all bounds in ſplaſhing their pieces with light, that is, in enlivening thoſe parts which we uſually term the deafs of a picture. This method, no doubt, has ſometimes a very fine effect; but it is, however, to be uſed with no ſmall diſcretion, as otherwiſe the whole loſes that union, that pauſe, that majeſtic ſilence, as Carracci uſed to call it, which affords ſo much pleaſure. The eye is not leſs hurt by many lights ſcattered here and there over a picture, than the ear is by the confuſed noiſe of different perſons ſpeaking all together in an aſſembly.

Guido Reni, who has imparted to his paintings that gaiety and ſplendor in which he lived, ſeems enamoured with a bright and open light; whereas Michael Angelo da Caravaggio, who was of a ſullen and ſavage diſpoſition, appears fondeſt of a gloomy and clouded ſky: ſo that neither of them were qualified to handle indifferently all objects. The chiaro-ſcuro may likewiſe prove of great ſervice to a painter in giving his compoſition a grand effect; but, nevertheleſs, the light he chooſes muſt be adapted to the ſituation of the ſcene where the action is laid: nor would he be leſs faulty, who in a grotto or cavern, where the light entered by a chink, ſhould make his ſhades ſoft and tender, than he who ſhould repreſent them ſtrong and bold in an open ſky-light.

But this is by no means the only fault which manneriſts are apt to be guilty of in hiſtorical pieces, and particularly in the diſpoſition of their figures. To ſay nothing of their favourite group of a woman lying on the ground with one child at her breaſt, and another playing about her, and the like, which they generally place on the firſt lines of their pieces; nor of thoſe half-figures in the back ground peeping out from the hollows contrived for them: they make a common practice of mixing naked with clothed figures; old men with young; placing one figure with its face towards you, and another with its back; they contraſt violent motions with languid attitudes, and ſeem to aim at oppoſition in every thing; whereas oppoſitions never pleaſe, but when they ariſe naturally from the ſubject, like antitheſes in a diſcourſe.

As to foreſhortened figures, too much affectation in uſing or avoiding them is equally blameable. The attitudes had better be compoſed than otherwiſe. It very ſeldom happens that there is any occaſion for making them ſo impetuous as to be in danger of loſing their equilibrium; a thing too much practiſed by ſome painters.

In regard to drapery, equal care ſhould be taken to avoid that poverty, which makes ſome maſters look as if, through mere penury, they grudged clothes to their figures; and that profuſion which Albani imputed to Guido, ſaying, that he was rather a tailor than a painter. The ornaments of dreſs ſhould be uſed with great ſobriety; and it will not be amiſs to remember what was once ſaid to an ancient painter: "I pity you greatly; unable to make Helen handſome, you have taken care to make her fine."

Let the whole, in a word, and all the different parts of the diſpoſition, poſſeſs probability, grace, coſtume, and the particular character of what is to be repreſented. Let nothing look like uniformity of manner; which does not appear leſs in the compoſition than it does in colouring, drapery, and deſign; and is, as it were, that kind of accent, by which painters may be as readily diſtinguiſhed as foreigners are, by pronouncing in the ſame manner all the different languages they happen to be acquainted with.

Sect. XI. *Of Illuſion.*

Among painters, and the writers on painting, there is one maxim univerſally admitted and continually inculcated; it is, that *nature ought to be imitated*, and objects are ſaid to be repreſented naturally, when they have ſuch relief that they may ſeem real. If we inquire to what degree painting may carry this illuſion, we ſhall find that it deceives the eye, and obliges the ſpectator to employ the touch in mouldings and in baſſo-relievos where they are a little projected; but that it is weakened and the effect partly deſtroyed where the projection is one or two feet. It is poſſible alſo to make it in the higheſt degree complete in pictures of flowers, fruits, and other repreſentations of ſtill life, provided they be ſeen in a certain point of view, and at a conſiderable diſtance; but there is no example of a picture containing a number of figures, and placed in a proper light, being miſtaken for real life. We are told, indeed, of a buſt of an abbé painted by Charles Coypel, which, placed in a certain direction behind a table, and in a certain light, deceived ſeveral perſons ſo completely as to induce them to ſalute it: but, without admitting any thing very extraordinary in the projection or illuſion of this painting, it is evident, from the circumſtances attending the relation, that the deception aroſe from ſurpriſe and inattention, which might happen to a production of an inferior artiſt. And hence we may conclude, that it is vain to pretend to perfect the illuſion, eſpecially in pictures conſiſting of a number of figures, and with conſiderable diſtances ſuppoſed between them.

Among the obſtacles which are oppoſed to the perfection of this branch of the art, we ſhall chiefly attend to thoſe which naturally proceed from our habits of thinking and judging on all occaſions. Theſe, together with the experience we daily have of light on all kinds of ſurfaces, and of all colours, are ſufficient to demonſtrate the want of reality in the mere repreſentation of any ſcenes.

It has been elſewhere ſhown, that diſtance, figure, and magnitude, are not naturally objects of perception by the ſenſe of ſight; that we judge of theſe things by the eye only, in conſequence of aſſociations early formed between the perceptions of touch and the correſponding impreſſions on the retina and optic nerve by the rays of light; and that a painter makes his picture reſemble the original, merely by laying his colours on a plain ſurface in ſuch a manner, as that they reflect the ſame rays of light with the convex or concave original, when the ſpectator ſtands at the proper diſtance (ſee Metaphysics). But if this be admitted, illuſion in painting can never be made perfect, on account of the inevitable falſity of the ſhades which mark the moſt diſtant parts of the picture. The painter can only imitate thoſe ſhades by obſcure colours, laid on a plain ſurface, and ſuſceptible of reflecting the light with a degree of force relative to the real diſtance. Now our eyes give us the true plane of this ſurface, oppoſed to the idea of deepening which the painter wiſhes to produce, a contrariety which prevents the deception. On this account, the faults found in the works of the greateſt maſters, with regard to the effects produced by the whole, moſt frequently

relate to their manner of ſhading, which is ſufficient to prove, that the want of illuſion in painting depends chiefly on the imperfection of the ſhades.

This defect, though it cannot be wholly avoided, may yet be rendered leſs perceptible. There has yet, indeed, been no painter able to imitate ſhadow, nor is it probable that any one will ever perfectly accompliſh this taſk. Shadow in nature is not a body, but the privation of light, which deſtroys colours in a greater or leſs degree, in proportion as it is more or leſs complete. Now the painter can only imitate this privation and real darkneſs, by colours which muſt from their very nature be capable of reflecting light.—The colours may be more or leſs obſcure, but they preſerve always ſomething which gives a mixture of reflection. To carry the imitation of ſhadow to the higheſt degree of perfection, it would be neceſſary to apply a colour capable of darkening all others, more or leſs as there ſhould be occaſion, and which might have no viſible trace of its exiſtence, that is, no one part of it which reflected one coloured ray more ſtrongly than another. Perhaps this kind of negative colour might be found in practice to be of ſervice to the art; but it would not render the ſurface totally inviſible, for it would be neceſſary, farther, that it ſhould have the property of not reflecting a ſingle ray of light when expoſed to it; which is altogether impoſſible, as there is no colour or body in nature without reflection in ſuch a ſituation.

We ſhall be further convinced of the impoſſibility of painting ſhadow, if we attend to the pictures of the greateſt maſters, with regard to the imitation of truth. Every part, when taken by itſelf, connected with light, or with demi-tints, preſents a perfect imitation. Even the different degrees of light or the objects are ſufficiently exact; but notwithſtanding this aſſemblage of circumſtances correſponding with truth, and of which the reſult ſhould be perfect *illuſion*, yet in conſidering the whole, we are never ſo completely deceived, as to take a picture for a reality; from which we may conclude, that the want of illuſion proceeds almoſt entirely from the imperfection of ſhading.

Illuſion then, in the ſtricteſt ſenſe, cannot exiſt in painting; but there is another kind of illuſion, perhaps improperly ſo called, which is one of the principal parts of the art, and worthy of the greateſt attention: It is, that the picture ſhall reſemble truth to ſuch a degree by the juſtneſs of its forms, by the combination of colours, and by all its general effects, that the image ſhall give all the pleaſure to be expected from the imitation of truth. This is not illuſion in the proper ſenſe of the word, ſince it exiſts as well in pictures on a ſmall ſcale as in thoſe of equal dimenſions with the original; but it is that truth of imitation of which painting is ſuſceptible, even in pictures containing any number of figures at any reaſonable diſtance from each other.

But it remains to be conſidered whether this imitation of truth, taken by itſelf, be the higheſt attainable perfection in painting. It is generally granted, that the greateſt beauty is that which not only pleaſes at firſt view, but on the neareſt and moſt critical examination. But if illuſion, ſuch as we have deſcribed it, were the ſole merit of the art, it would follow, that the perſon who was leaſt acquainted with its beauties would experience the ſame pleaſure as he who had ſtudied them moſt. Farther, in examining the works of the greateſt maſters, it is eaſy to perceive, that it is not their illuſion which has excited the attention and admiration of the critic. Even the works of the divine Raphael do not deceive the eye in any point of view more completely than thoſe of an ordinary painter. Raphael, pure in his character and deſign, is, without doubt, very deficient in this part of the art. Meanwhile the grandeur of his ideas in compoſition, and the choice of his forms; the beauty of his heads, wherein one does not admire ſimply the imitation of any known truth; his ingenious and noble manner in drapery, which yet does not reſemble any known ſtuff, or the garb of any nation; in ſhort, all his beauties are ſuperior to the ſimple imitation of truth, and contradict the ſentiment of the greateſt pleaſure ariſing from illuſion.

If we paſs to thoſe who have purſued colouring with the greateſt ſucceſs, we ſhall find them, doubtleſs, approach nearer to illuſion than thoſe who have neglected it; and it is alſo a fact, that their works have been more univerſally admired.

At the ſame time it is not the illuſion occaſioned by colours which has altogether excited this admiration. The exquiſite demi-tints and the freſhneſs of Correggio and Titian, which excel the ordinary beauties of nature, and even imitate her moſt perfect productions, may perhaps not be conſidered as deſtroying illuſion; but it is no leſs a fact, that weaker and leſs precious colouring would carry it to greater perfection. Beſides, this large, eaſy, and exquiſite, manner of painting, this harmony, of which they have given us the beſt examples, are owing to qualities in them much more excellent than what would be ſufficient to produce the ſimple imitation of truth. Guido, Cortona, and ſome others, appear to approach nearer to illuſion. But even thoſe maſters prove by their works, that the moſt eſtimable beauties in painting do not all tend to this branch of the art; for notwithſtanding the high character which they have gained, they are much inferior to Raphael, Correggio, and Titian, although the firſt failed in colouring and in the knowledge of the claro-obſcuro, the ſecond in point of correctneſs, and the third in the choice of noble ſubjects.

From this we may conclude, that the neareſt reſemblance to truth is not the ſole object in painting: that it acquires a ſuperior degree of elevation by the art of adding beauty and perfection to the moſt exact reſemblance; and that it is this art which diſtinguiſhes and characterizes extraordinary men.

If we run over the great branches of painting, we ſhall find a number of eſſential beauties different from thoſe which are capable of carrying illuſion to the greateſt poſſible height. In compoſition, we principally admire the extent of genius, the choice of pictureſque and graceful attitudes, the ingenious combination of groups, whether in uniting the light and ſhade in order to obtain the greateſt effect, or in diſpoſing a whole in ſuch a manner as to make no part ſuperfluous; and finally, that kind of practical talent by which the mind takes poſſeſſion of nature, and forces it to produce all the beauties of which the art is ſuſceptible. In this enumeration of particulars it is eaſy to perceive that the beauties of compoſition are very diſtant from thoſe of illuſion.

To obtain illuſion in deſign, there is no occaſion for correctneſs nor taſte beyond what is perceived in nature by the moſt ignorant ſpectator. And with regard to colouring, that is not always moſt admired which is moſt natural. What departs widely from truth, indeed, is not of conſequence beautiful, but many qualities are required beſides the ſimple imitation of truth. Freſhneſs, eaſe, and tranſparency in certain tones, are deemed abſolutely requiſite; and the moſt eſteemed colouriſts have carried their beauties in all theſe reſpects beyond what they have ſeen in nature. If ſome tones in the fleſhy parts have approached towards vermilion, to a light-blue, or a ſilver-grey, they have made them more apparent; not only to point them out to the ſpectator, but to ſhow their knowledge in the diſcovery and their art in painting them. This would have been going beyond the limits of perfection, if theſe had conſiſted in ſimple illuſion.

The oppoſition of colour, of light, and of ſhade, would have been in this caſe alſo ſuperfluous; for nature is always true, without any pointed attempt to make her more engaging. The ſuppreſſion of certain lights, which truth would require, and which art extinguiſhes, in order to augment the harmony

of effect, would be alſo worthy of cenſure, whatever pleaſure would reſult from it.

Finally, one of the greateſt beauties of the art, namely the peculiar manner of a great maſter, has no relation to illuſion. This is not even founded in nature, but depends on the genius or ſingularity of the artiſt. It is this manner which diſtinguiſhes the original of a great maſter from the moſt exact copy; and which characterizes the talents of the artiſts ſo well, that the ſmalleſt part of the picture, and even the leaſt intereſting, is ſufficient to diſcover the painter. The diſtinction between the beautiful and illuſive in painting has made Sir Joſhua Reynolds, in expreſs terms, recommend a perfection ſuperior to the imitation of nature. "The principle now laid down (ſays he), that the perfection of the art does not conſiſt in mere imitation, is far from being new or ſingular. It is, indeed, ſupported by the general opinion of the enlightened part of mankind. The poets, orators, and rhetoricians of antiquity, are continually enforcing this poſition, that all the arts receive their perfection from an ideal beauty, ſuperior to what is to be found in individual nature. They are ever referring to the practice of the painters and ſculptors of their times, particularly Phidias the favourite artiſt of antiquity, to illuſtrate their aſſertions. As if they could not ſufficiently expreſs their admiration of his genius by what they knew, they have recourſe to poetical enthuſiaſm. They call it inſpiration; a gift from heaven. The artiſt is ſuppoſed to have aſcended the celeſtial regions to furniſh his mind with this perfect idea of beauty. 'He (ſays Proclus) who takes for his model ſuch forms as nature produces, and confines himſelf to an exact imitation of them, will never attain to what is perfectly beautiful. For the works of nature are full of diſproportion, and fall ſhort of the true ſtandard of beauty. So that Phidias, when he formed his Jupiter, did not copy any object ever preſented to his ſight; but contemplated only that image which he had conceived in his mind from Homer's deſcription.'

"It is not eaſy to define in what this great ſtyle conſiſts, nor to deſcribe by words the proper means of acquiring it, if the mind of the ſtudent ſhould be at all capable of ſuch an acquiſition. Could we teach taſte or genius by rules, they would be no longer taſte and genius. But though there neither are nor can be any preciſe invariable rules for the exerciſe or the acquiſition of theſe great qualities; yet we may truly ſay that they always operate in proportion to our attention in obſerving the works of nature, to our ſkill in ſelecting, and to our care in digeſting, methodiſing, and comparing our obſervations. There are many beauties in our art that ſeem at firſt to lie without the reach of precept, and yet may eaſily be reduced to practical principles. Experience is all in all; but it is not every one that profits by experience: and moſt people err not ſo much from want of capacity to find their object, as from not knowing what object to purſue. This great ideal perfection and beauty are not to be ſought in the heavens, but upon the earth. They are about us, and upon every ſide of us: But the power of diſcovering what is deformed in nature, or, in other words, what is particular or uncommon, can be acquired only by experience; and the whole beauty and grandeur of the art conſiſts in being able to get above all ſingular forms, local cuſtoms, particularities, and details of every kind.

After theſe opinions, however, derived from the practice of the art, and this high authority, it may not be improper to hazard a few obſervations. Although illuſion can be diſtinguiſhed from many of the moſt excellent parts of the art taken ſeparately, yet it does not follow that it ſhall not add in every picture to the beauty of the whole. It is impoſſible to ſtate it in oppoſition to deſign, to compoſition, to colouring, or to the peculiar manner of a great artiſt; becauſe all theſe may exiſt where there alſo exiſts the moſt perfect illuſion. This is evident from the works of art; which have real relievo, and which at the ſame time are capable of perfection in all thoſe branches, and of ſhowing the peculiar manner of the artiſt. Again, it appears evident, that *illuſion*, properly ſo called, ſhould be a proper object of attention in painting. We may rate the ideal beauty very high, and with great juſtice; but it ſtill conſiſts in overcoming the defects in individual objects in nature, and not in departing from the truth of repreſentation. And perhaps it may be alleged, that the impoſſibility of giving perfect illuſion on a plain ſurface has puſhed the greateſt maſters too far, and made them crowd artificial beauties into their pictures to conceal their want of power to give real ones. It is not improbable, that on this very account the art is leſs perfect than otherwiſe it might have been: For in all ſubjects thought to be impoſſible, there is not only great room for exertion, but the perſon carries the art to greater perfection as he comes nearer to ſhow that it may not be impoſſible. And if the works of Raphael, in point of illuſion, are not ſuperior to an ordinary artiſt, we may be permitted to ſay that there is great room for improvement in this branch.

Sect. XII. *Of the Coſtume.*

The coſtume in painting correſponds with the unities of time, place, and action, in tragedy and in epic poetry. It is chiefly confined to hiſtory-painting; and regards the cuſtoms of different periods, the manners, the dreſs, and the colour, of different nations. Great exactneſs in the coſtume is ſcarcely practicable; but too ſenſible a departure from it denotes unpardonable negligence. It frequently happens that a piece compoſed of pictureſque figures derives conſiderable advantage from certain liberties which are calculated to pleaſe both the artiſt and the ſpectator; for the judges of painting are not habitually occupied with the details of ancient and modern hiſtory, or profoundly verſed in all the circumſtances which make a departure from the coſtume conſpicuous. On the other hand, if they were ſo ignorant as not to underſtand, or ſo indifferent as not to regard thoſe circumſtances, this branch of the art would be altogether arbitrary. The road of the painter is between theſe two extremes, not to deſpiſe beauty on the one hand, nor probability on the other. But, in purſuing this part of the art, it is in vain to ſeek for perfect models in ancient or modern painting.

"When Raphael in his cartoons introduces monks and Swiſs guards; when he puts into a boat more figures than it is evident the boat could actually contain; when in the chaſtiſement of Heliodorus, who attempted to deſpoil the temple of Jeruſalem, Pope Julius II. is depicted as being preſent; when, in the donation of Conſtantine in the Vatican, a naked boy is placed conſpicuous in the fore-ground, aſtride upon a dog in the immediate preſence of the pope and the emperor; when Venetian ſenators are introduced while Pope Alexander excommunicates Barbaroſſa; when Ariſtotle, Plato, Dante, and Petrarch, are brought together in the ſchool of Athens, to omit the leſſer improprieties of ſhoeleſs apoſtles, &c.—every perſon muſt acknowledge that ſuch offences as theſe againſt truths ſo obvious, if they do not ariſe from a defect of underſtanding, are inſtances of inexcuſable careleſsneſs.

"In like manner, when the ſame great maſter paints the dreams of Joſeph and his fellow priſoner in circles over their heads; when ſimilar contrivances to expreſs future events are uſed by Albani, Parmeggiano, and Fuſeli—is it not evident that no poſſibility can make the fiction true; and that real and feigned exiſtences are unnaturally introduced in one narration?

"When Polydore chooſes to repreſent the death of Cato, and expoſes to the ſpectator the hero of the piece with his bowels guſhing out; when Paul Veroneſe, at a banquet painted with his uſual magnificence, places before us a dog gnawing a bone,

and a boy making water: however ſuch diſguſting circumſtances may be forgiven in the *chef d'œuvre* of a Michael Angelo, had he repreſented theſe inſtead of the horrible figures of his Day of Judgment, the performance of an inferior artiſt cannot atone for them.

"So alſo, when one of the firſt rate among the modern painters, we mean Paul Veroneſe, introduces Benedictine monks at the marriage of Cana; when, in a picture of the crucifixion, he puts the Roman ſoldiers in the jerkins of the 16th century, and adorns their heads with turbans; when Guido, in a painting of Jeſus appearing to his mother after his reſurrection, places St. Charles Borromèe in a kind of deſk in the back-ground as witneſs to the interview; when Tintoret, at the miraculous fall of manna, arms the Iſraelites with fuſils; and Correggio appoints St. Jerome as the inſtructor of the child Jeſus—common ſenſe revolts at the impropriety; and we are compelled to exclaim, *Quicquid oſtendas mihi ſic, incredulus odi!*

"The mythological taſte of the learned Pouſſin is well known; but Rubens ſeems to claim the merit of having preſented to the world a ſtill greater number of ſupreme abſurdities in this learned ſtyle: nor is it eaſy to conceive a more heterogeneous mixture of circumſtances, real and imaginary, ſacred and profane, than the Luxembourg gallery, and the other works of that great maſter, perpetually exhibit.

"When ſo great an authority as ſir Joſhua Reynolds contends for the rejection of common ſenſe in favour of ſomewhat he terms a *higher ſenſe*; when he laments, indirectly, that art is not in ſuch high eſtimation with us, as to induce the generals, lawgivers, and kings of modern times, to ſuffer themſelves to be repreſented naked, as in the days of ancient Greece; when he defends even the ridiculous abberrations from poſſibility, which the extravagant pencil of Rubens has ſo plentifully produced—it is not ſurpriſing that the artiſts of the preſent day ſhould be led to reject the company of common ſenſe; or that ſir Joſhua's performances ſhould furniſh examples of his own precepts.

"Mrs. Siddons is repreſented by ſir Joſhua in the character (as it is ſaid) of the tragic muſe: ſhe is placed in an old-faſhioned arm chair; this arm chair is ſupported by clouds, ſuſpended in the air; on each ſide of her head is a figure not unapt to ſuggeſt the idea of the attendant imps of an enchantreſs: of theſe figures, one is ſuppoſed to repreſent Comedy, and the other Tragedy; Mrs. Siddons herſelf is decently attired in the faſhionable habiliments of 20 or 30 years ago.

"If this be a picture of the tragic muſe, ſhe ought not to appear in a modern dreſs, nor ought ſhe to be ſeated in an old arm chair. If this be a portraiture of Mrs. Siddons, ſhe has no buſineſs in the clouds, nor has ſhe any thing to do with aerial attendants. If this be Mrs. Siddons in the character of the tragic muſe, the firſt ſet of objections apply; for ſhe is placed in a ſituation where Mrs. Siddons could never be.

"In the death of Dido, ſir Joſhua Reynolds introduces her ſiſter, lamenting over the corpſe of the unfortunate queen. This is poſſible; but he has alſo introduced Atropos cutting Dido's hair with a pair of ſciſſars, a being equally real and apparent in the painting with Dido or her ſiſter. This (continues our author) appears to me a groſs offence againſt mythological probability; nor is it the only offence againſt the coſtume with which that picture is chargeable.

"There is one other breach of the coſtume, however common among painters, more groſs and offenſive than any of the inſtances hitherto alleged; we mean the perpetual and unneceſſary diſplay of the naked figure. We ſhall not ſtay to enquire whether more ſkill can be ſhown in painting the human body clothed or unclothed. If the perſonages introduced in any picture are more naked in the repreſentation than can be juſtified by the probability of the times, perſons, places, or circumſtances, it is a breach of the coſtume proportionate to the deviation. *This* fault, however, is ſo common, as hardly to be noticed; ſo ſlight indeed, when compared with that general taſte for voluptuous imagery and obſcene repreſentation, which has ſo long diſgraced the art of painting in every ſtage of its progreſs, that ſcience and morality are callous to the *ſlight* offence.

"This depravity of imagination, this proſtitution of the pencil to the baſe purpoſes of laſcivious inclination, was a ſubject of much complaint among the ancients. Nor is there leſs reaſon to complain in modern times, that this delightful art, which might be employed in exciting the nobleſt ſentiments, and become ſubſervient to the beſt intereſts of ſociety, ſhould ſo often be exerciſed upon ſubjects ſolely calculated to pleaſe the eye of the voluptuary and debauchee. It is hardly poſſible to paſs through any admired collection without meeting with ſome of theſe; of which, however excellent the performance may be, the common feelings of decency and morality (if we are neither profeſſed artiſts nor connoiſſeurs) prevent us from viewing them without a mixture of diſguſt." *Et pudor averſos texit velamine vultus.*

It is impoſſible to expreſs how much a picture ſuffers by ſuch looſeneſs of fancy, and ſinks as a baſtard of the art in the eſteem of good judges. Some people, indeed, are of opinion, that ſo ſcrupulous an obſervance of the coſtume is apt to hurt pictures, by depriving them of a certain air of truth ariſing, they think, from thoſe features and habits to which we are accuſtomed; and which are therefore apt to make a greater impreſſion, than can be expected from things drawn from the remote ſources of antiquity; adding withal, that a certain degree of licence has ever been allowed thoſe artiſts who in their works muſt make themſelves fancy their chief guide. See, ſay they, the Greeks; that is, the maſters of Raphael and Pouſſin. Do they ever trouble their heads about ſuch niceties? The Rhodian ſtatuaries, for example, have not ſcrupled to repreſent Laocoon naked; that is, the prieſt of Apollo naked in the very act of ſacrificing to the gods, and that too in preſence of a whole people, of the virgins and matrons of Ilium. Now, continue they, if it was allowable in the ancient ſtatuaries to neglect probability and decency to ſuch a degree, to have a better opportunity of diſplaying their ſkill in the anatomy of the human body; why may it not be allowable in modern painters, the better to attain the end of their art, which is deception, to depart now and then a little from the ancient manners and the too rigorous laws of the coſtume? But theſe reaſons, we beg leave to obſerve, are more abſurd than they are ingenious. What! are we to draw concluſions from an example, which, far from deciding the diſpute gives occaſion to another? The learned are of opinion, that thoſe Rhodian maſters would have done much better had they looked out for a ſubject in which, without offending ſo much againſt truth, and even probability, they might have had an equal opportunity of diſplaying their knowledge of the naked. And certainly no authority or example whatever ſhould tempt us to do any thing contrary to what both decency and the reaſon of things require, unleſs we intend, like Carpioni, to repreſent

Sogni d'infermi, e folè di romanzi.
The dreams of ſick men, and the tales of fools.

No: a painter, the better to attain the end of his art, which is deception, ought carefully to avoid mixing the antique with the modern, the domeſtic with the foreign; things, in ſhort, repugnant to each other, and therefore incapable of gaining credit. A ſpectator will never be brought to conſider himſelf as actually preſent at the ſcene, the repreſentation of which he has before him, unleſs the circumſtances which enter it perfectly agree among themſelves; and the field of action, if we may uſe the expreſſion, in no ſhape belies the action itſelf.

For inſtance, the circumſtances, or, if you pleaſe, the acceſſories, in a *Finding of Moſes*, are not, ſurely, to repreſent the borders of a canal planted with rows of poppies, and covered with country-houſes in the European taſte; but the banks of a great river ſhaded with cluſters of palm trees, with a Sphinx or an Anubis in the adjacent fields, and here and there in the back-ground a towering pyramid. And indeed the painter, before he takes either canvaſs or paper in hand, ſhould on the wings of fancy tranſport himſelf to Egypt, to Thebes, or to Rome; and ſummoning to his imagination the phyſiognomy, the dreſs, the plants, the buildings, ſuitable to his ſubject, with the particular ſpot where he has choſen to lay his ſcene, ſo manage his pencil, as, by the magic of it, to make the enraptured ſpectators fancy themſelves there along with him.

Sect. XIII. *Of the Painter's Balance.*

The celebrated De Piles, who by his writings has thrown ſo much light upon painting, in order to aſſiſt young painters in forming a right judgment of thoſe maſters who hold the firſt rank in the profeſſion, and to reduce ſuch judgment to the greater preciſion, bethought himſelf of a pictorical balance, by means of which a painter's merit may be weighed with the greateſt exactneſs. This merit he divides into Compoſition, Deſign, Colouring, and Expreſſion; and in each of theſe branches he has aſſigned to every painter that ſhare to which he thought him intitled, according as he approached more or leſs the higheſt degree of excellence and ſummit of perfection; ſo that, by ſumming up the numbers which, ſtanding againſt each maſter's name, expreſs his ſhare of merit in each of theſe branches, we have his total merit or value in the art, and may hence gather what rank one painter holds in regard to another. Several objections, it is true, have been ſtarted to this method of calculation, by a famous mathematician of our days, who, among other things, inſiſts, that it is the product of the above numbers multiplied by each other, and not the ſum of them, that gives the merit of the artiſt. But this is not a place to enter into ſuch niceties, nor indeed would the doing of it be of any ſervice to the art. The only thing worth our notice is, whether the original numbers ſtanding for the painter's merit in the ſeveral branches of his art, are ſuch as he is really intitled to, without ſuffering ourſelves to be biaſſed by any partiality, as De Piles has been, in favour of the prince of the Flemiſh ſchool; the conquence of which, ſtrange as it may appear, is, that in his balance Raphael and Rubens turn out exactly of the ſame weight.

The idea of the painter's balance is doubtleſs curious, and therefore deſerved to be mentioned; but as the merits of the moſt eminent painters have been already appretiated under the ſecond ſection of the hiſtorical part of our article, to which we refer, it is needleſs to be more particular here, or to repeat what has been already treated of at ſufficient length.

Sect. XIV. *Practical Obſervations.*

Having thus laid down the principles of the art, and ventured to give the ſtudent ſome directions with reſpect to his ſtudies, we ſhall conclude this part of the ſubject with a few obſervations relative wholly to practice.

And, 1. The young painter muſt be careful not to be led aſtray by the ambition of compoſing eaſily, or attaining what is called a *maſterly handling* of the chalk or the pencil; a pernicious attempt, by which ſtudents are excluded from all power of advancing in real excellence. To this attempt, however, young men have not only the frivolous ambition of being thought maſterly, inciting them on the one hand, but alſo their natural ſloth tempting them on the other. They are terrified at the proſpect before them, and of the toil required to obtain exactneſs; whilſt the lives of the moſt eminent painters furniſh us with examples of the moſt unceaſing induſtry. When they conceived a ſubject, they firſt made a variety of ſketches; then a finiſhed drawing of the whole; after that a more correct drawing of every ſeparate part, heads, hands, feet, and pieces of drapery; they then painted the picture, and after all retouched it from the life. The pictures thus wrought with ſuch care, now appear like the effects of enchantment, and as if ſome mighty genius had ſtruck them off at a blow.

But a ſtudent is not always advancing becauſe he is employed; he muſt apply his ſtrength to that part of the art where the real difficulties lie; to that part which diſtinguiſhes it as a liberal art, and not by miſtaken induſtry looſe his time in that which is merely ornamental. The ſtudents, inſtead of vying with each other who ſhall have the readieſt hand, ſhould be taught to labour who ſhall have the pureſt and moſt correct outline; inſtead of ſtriving who ſhall produce the brighteſt tint, or endeavouring to give the gloſs of ſtuffs ſo as to make them appear real, let their ambition be directed to contend, who ſhall diſpoſe his drapery in the moſt graceful folds, and give the greateſt dignity to the human form.

He who endeavours to copy accurately the figure before him, not only acquires a habit of exactneſs and preciſion, but is continually advancing in his knowledge of the human figure; and though he ſeems to ſuperficial obſervers to make a ſlower progreſs, he will be found at laſt capable of adding (without running into capricious wildneſs) that grace and beauty which is neceſſary to be given to his more finiſhed works, and which cannot be got by the moderns, as it was not acquired by the ancients, but by an attentive and well-directed ſtudy of the human form.

2. It is, in the next place, a matter of great importance, that the drawings on which the young artiſt firſt exerciſes his talents be of the moſt excellent kind. Let the profiles, the hands, and the feet given him to copy, be of the beſt maſters, ſo as to bring his eye and his hand early acquainted with the moſt elegant forms and the moſt beautiful proportions. A painter who has early acquired a fine taſte, finds it an eaſy matter to give dignity to the meaneſt features, while even the works of a Praxiteles or a Glycon are ſeen to ſuffer in the hands of another. A veſſel will ever retain the ſcent which it has firſt contracted.

3. It would be proper alſo to make the pupil copy ſome fine heads from the Greek and Roman medals; not ſo much for the reaſon juſt laid down, as to make him acquainted, if we may uſe the expreſſion, with thoſe perſonages which in time he may have occaſion to introduce into his pieces, and, above all, to improve him early in the art of copying from relief. Hence he will learn the rationale of light and ſhade, and the nature of that chiaro-ſcuro by which it is, properly ſpeaking, that the various forms of things are diſtinguiſhed.

There is no danger of ſtudying too much the works of the greateſt maſters, either in painting or ſculpture; but how they may be ſtudied to advantage is an inquiry of great importance. "Some (ſays Sir Joſhua Reynolds), who have never raiſed their minds to the conſideration of the real dignity of the art; and who rate the works of an artiſt in proportion as they excel or are defective in the mechanical parts, look on theory as ſome thing that may enable them to talk, but not to paint better; and, confining themſelves entirely to mechanical practice, very aſſiduouſly toil in the drudgery of copying, and think they make a rapid progreſs, while they faithfully exhibit the minuteſt part of a favourite picture. This appears to me a very tedious, and, I think, a very erroneous method of proceeding. Of every large compoſition, even of thoſe which are moſt admired, a great part may be truly ſaid to be common place. This, though it takes up much time in copying, conduces little to improve-

ment. I conſider general copying as a deluſive kind of induſtry: the ſtudent ſatisfies himſelf with the appearance of doing ſomething; he falls into the dangerous habit of imitating without ſelecting, and of labouring without any determinate object: as it requires no effort of the mind, he ſleeps over his work; and thoſe powers of invention and compoſition which ought particularly to be called out, and put in action, lie torpid, and loſe their energy for want of exerciſe.

"However, as the practice of copying is not entirely to be excluded, ſince the mechanical practice of painting is learned in ſome meaſure by it, let thoſe choice parts only be ſelected which have recommended the work to notice. If its excellence conſiſts in its general effect, it would be proper to make ſlight ſketches of the machinery and general management of the picture. Thoſe ſketches ſhould be kept always by you, for the regulation of your ſtyle. Inſtead of copying the touches of thoſe great maſters, copy only their conceptions. Inſtead of treading in their footſteps, endeavour only to keep the ſame road. Labour to invent on their general principles and way of thinking. Poſſeſs yourſelf with their ſpirit. Conſider with yourſelf how a Michael Angelo or a Raphael would have treated this ſubject, and work yourſelf into a belief that your picture is to be ſeen and criticiſed by them when completed. Even an attempt of this kind will rouſe your powers."

The ſame great maſter recommends to ſtudents to keep their minds fixed on the higheſt excellencies.—"If you compaſs them, and compaſs nothing more, you are ſtill in the firſt claſs. We may regret the innumerable beauties which you may want: you may be very imperfect; but ſtill you are an imperfect perſon of the higheſt order.

"I inculcate as frequently as I can your forming yourſelves upon great principles and great models.—Your time will be much miſpent in every other purſuit. Small excellencies ſhould be viewed, not ſtudied; they ought to be viewed, becauſe nothing ought to eſcape a painter's obſervation, but for no other reaſon.

"There is another caution which I wiſh to give you. Be as ſelect in thoſe whom you endeavour to pleaſe, as in thoſe whom you endeavour to imitate. Without the love of fame you can never do any thing excellent; but by an exceſſive and undiſtinguiſhing thirſt after it, you will come to have vulgar views; you will degrade your ſtyle; and your taſte will be entirely corrupted. It is certain that the loweſt ſtyle will be the moſt popular, as it falls within the compaſs of ignorance itſelf, and the vulgar will always be pleaſed with what is natural in the confined and miſunderſtood ſenſe of the word."

Genius he conſiders as an improveable talent, never to be deſtroyed by the moſt exceſſive, if well directed, application, and diſplaying the elegancies of the art in proportion to the number of ideas which have been carefully collected and digeſted in the mind.

He cautions painters, therefore, in every ſtage of their progreſs, to beware of that falſe opinion, but too prevalent among artiſts, of the imaginary power of native genius, and its ſufficiency in great works.

This opinion, according to the temper of mind it meets with, almoſt always produces, either a vain confidence or a ſluggiſh deſpair, both equally fatal to all proficiency. "Study, therefore, the great works of the great maſters for ever. Study, as nearly as you can, in the order, in the manner, on the principles on which they ſtudied. Study nature attentively, but always with thoſe maſters in your company; conſider them as models which you are to imitate, and at the ſame time as rivals whom you are to combat."

Sect. XV. *General Enumeration of the Different Claſſes of Painting.*

As all the objects in nature are ſuſceptible of imitation by the pencil, the maſters of this art have applied themſelves to different ſubjects, each one as his talents, his taſte, or inclination, may have led him.—From whence have ariſen the following claſſes.

I. *Hiſtory-painting:* which repreſents the principal events in hiſtory ſacred and profane, real or fabulous; and to this claſs belongs *allegorical expreſſion.* Theſe are the moſt ſublime productions of the art; and in which Raphael, Guido, Rubens, Le Brun, &c. have excelled.

II. *Rural hiſtory*; or the repreſentation of a country life, of villages and hamlets, and their inhabitants. This is an inferior claſs; and in which Teniers, Breughel, Watteau, &c. have great reputation, by rendering it at once pleaſing and graceful.

III. *Portrait-painting*; which is an admirable branch of this art, and has engaged the attention of the greateſt maſters in all ages, as Apelles, Guido, Vandyke, Rembrandt, Regauds, Peſne, Knneller, La Tour, &c.

IV. *Groteſque hiſtories*; as the nocturnal meetings of witches; ſorceries and incantations; the operations of mountebanks, &c. a ſort of painting in which the younger Breughel, Teniers, and others, have exerciſed their talents with ſucceſs.

V. *Battle-pieces*; by which Huchtemberg, Wouwerman, &c. have rendered themſelves famous.

VI. *Landſcapes*; a charming ſpecies of painting, that has been treated by maſters of the greateſt genius in every nation.

VII. *Landſcapes diverſified with waters*, as rivers, lakes, cataracts, &c.; which require a peculiar talent, to expreſs the water ſometimes ſmooth and tranſparent, and at others foaming and ruſhing furiouſly along.

VIII. *Sea-pieces*; in which are repreſented the ocean, harbours, and great rivers; and the veſſels, boats, barges, &c. with which they are covered; ſometimes in a calm, ſometimes with a freſh breeze, and at others in a ſtorm. In this claſs Backhuyſen, Vandervelde, Blome, and many others, have acquired great reputation.

IX. *Night-pieces*; which repreſent all ſorts of objects, either as illuminated by torches, by the flames of a conflagration, or by the light of the moon. Schalck, Vanderneer, Vanderpool, &c. have here excelled.

X. *Living Animals:* A more difficult branch of painting than is commonly imagined; and in which Roſa, Carré, Vandervelde, and many others, have ſucceeded marvellouſly well.

XI. *Birds of all kinds*; a very laborious ſpecies, and which requires extreme patience minutely to expreſs the infinite variety and delicacy of their plumage.

XII. *Culinary pieces*; which repreſent all ſorts of proviſions, and animals without life, &c. A ſpecies much inferior to the reſt, in which nature never appears to advantage, and which requires only a ſervile imitation of objects that are but little pleaſing. The painting of fiſhes is naturally referred to this claſs.

XIII. *Fruit-pieces*, of every kind, imitated from nature.

XIV. *Flower pieces*; a charming claſs of painting, where Art in the hands of Huyzum, P. Segerts, Merian, &c. becomes the rival of Nature. *Plants* and *inſects* are uſually referred to the painters of flowers, who with them ornament their works.

XV. *Pieces of architecture*; a kind of painting in which the Italians excel all others. Under this claſs may be comprehended the repreſentations of ruins, ſea ports, ſtreets, and public places; ſuch as are ſeen in the works of Caneletti, and other able maſters.

XVI. *Inſtruments of muſic pieces of furniture*, and other inanimate objects; a trifling ſpecies, and in which able painters only accidentally employ their talents.

XVII. *Imitations of bas reliefs*; a very pleaſing kind of painting, and which may be carried by an able hand to a high degree of excellence.

XVIII. *Hunting-pieces*; theſe alſo require a peculiar talent,

as they unite the painting of men, horſes, dogs, and game, to that of landſcapes.

It will not be expected that we ſhould here give the rules that the painter is to obſerve in handling each particular ſubject. What has been ſaid on hiſtorical painting may throw ſome light on the reſt, and the particular rules muſt be learned from the ſtudy of the art itſelf. Good maſters, academies of reputation, and a rational practice, are the only true ſources from whence the young painter muſt derive the detail of his art, and for this reaſon we ſhall avoid enlarging on that part of painting which words are incompetent to convey an idea of.

Houſe Painting.

THE art of laying on various mixtures with a view to colour and preſerve the walls of houſes, wainſcoting, furniture, &c. This extends to every part of architecture. The whole building becomes the workſhop of the artiſt: the ſtairs, the baluſtrades, the ſaſhes, the doors, and the railing of all kinds, occupying his firſt care, and then the cielings and wainſcoting. He gives to all his ſubjects a choſen and uniform tint; but he has it in his power to vary the colours on different parts of the building in ſuch a manner as to produce the moſt pleaſing effect.

Among the utenſils of a painter, it is needleſs to mention bruſhes and the ſupply of colours in the neceſſary veſſels. With regard to the preparation of colours, however, the following cautions ſhould be obſerved.

All the veſſels employed to hold the colours ſhould be varniſhed; a precaution neceſſary to prevent their drying too quickly.

To *grind*, is to reduce to powder the colouring ſubſtances on a piece of marble or any hard ſtone by means of water, oil, or eſſence. To *dilute*, is to impregnate a liquid with a tint in ſuch a manner as to make it capable of being applied by a bruſh.

When the materials are grinded in water, it is proper to dilute them in ſize made from parchment. If they are diluted in ſpirit-of-wine, there muſt be no more diluted than what ſerves the immediate occaſion, as colours prepared in this manner dry very rapidly. Colours grinded in oil are ſometimes diluted with pure oil, more frequently with oil mixed with eſſence, and commonly with the pure eſſence of turpentine; the eſſence makes the colours eaſy to work. Thoſe prepared in this manner are more ſolid, but they require more time to dry.

When colours are grinded with oil of turpentine, and diluted in varniſh, as they require to be immediately applied, it is neceſſary to prepare a ſmall quantity at a time. This preparation of colours gives greater brilliancy, and dries more ſpeedily, than thoſe prepared in oil; but they require more art to manage them.

They grind colours or coloured ſubſtances with a mullet, which is employed on the ſtone till they become a very fine powder. The operation is facilitated by moiſtening them from time to time with a little water, and by collecting them under the mullet with a knife. They are afterwards laid in ſmall heaps on a ſheet of white paper, and allowed to dry in a ſituation not expoſed to duſt. Thoſe who grind white lead have a ſtone for the purpoſe, as this colour is very eaſily tarniſhed. In executing this part well, it is neceſſary to grind the colours equally and moderately; to grind them ſeparately, and not to produce a tint by mixture till the colours are well prepared.

In grinding the colours, put in no more liquid than what is neceſſary to make the ſolid ſubſtances yield eaſily to the mullet: the more the colours are grinded, they mix better, and give a ſmoother and more agreeable painting. It is alſo neceſſary to give all attention to the grinding and diluting of colours, that they may be neither too thick nor too thin.

In the application of oil colours the following circumſtances muſt be attended to: 1. Prepare only the quantity neceſſary for the work you undertake, becauſe they do not keep long; and thoſe which are newly mixed are more vivid and beautiful. 2. Hold the bruſh ſtraight before you, and allow only the ſurface to be applied to the ſubject: if you hold it inclined in any other direction, you will run the hazard of painting unequally. 3. It is neceſſary to lay on the colours boldly, and with great ſtrokes; taking care at the ſame time to ſpread them equally over the ſurface, and not filling up the moulding and carved work. If this accident ſhould happen, you muſt have a little bruſh to clean out the colours. 4. Stir them frequently in the veſſel, that they may preſerve always the ſame tint, and that no ſediment may remain at the bottom. 5. Take care not to overcharge the bruſh with the colour. 6. Never apply a ſecond layer till the firſt or preceding one be perfectly dry; which it is eaſily known to be when, in bearing the hand gently over it, it does not adhere. 7. In order to render this drying more ſpeedy and uniform, make always the layers as thin as poſſible. 8. Before painting, it is neceſſary to prime the ſubject; that is, to give it a layer of ſize, or of white colouring oil, to fill up the pores, and render the ſurface ſmooth: by this means fewer layers of colour or of varniſh are afterwards neceſſary. 9. Every ſubject to be painted or gilded ought to have firſt a white ground; this preſerves the colours freſh and vivid, and repairs the damage which they occaſionally receive from the air.

Theſe inſtructions are applicable, with little variation, to painting the ſurfaces of bodies with water colours.

PAI

PAIRING, the uniting or joining in couples. The inſtinct of pairing is beſtowed on every ſpecies of animals to which it is neceſſary for rearing their young; and on no other ſpecies. All wild birds pair; but with a remarkable difference between ſuch as place their neſts on trees and ſuch as place them on the ground. The young of the former, being hatched blind, and without feathers, require the nurſing care of both parents till they be able to fly. The male feeds his mate on the neſt, and cheers her with a ſong. As ſoon as the young are hatched, ſinging yields to a more neceſſary occupation, that of providing food for a numerous iſſue; a taſk that requires the exertions of both parents.

Eagles and other birds of prey build on trees, or on other inacceſſible ſpots. They not only pair, but continue in pairs all the year round; and the ſame pair procreates year after year.

PAI

This at leaſt is the caſe of eagles: the male and female hunt together, unleſs during incubation, at which time the female is fed by the male. A greater number than a ſingle pair are never ſeen in company.

Gregarious birds pair, in order probably to prevent diſcord in a ſociety confined to a narrow ſpace. This is the caſe particularly of pigeons and rooks. The male and female ſit on the eggs alternately, and divide the care of feeding their young.

Partridges, plovers, pheaſants, ſea-fowl, grouſe, and other kinds that place their neſts on the ground, have the inſtinct of pairing; but differ from ſuch as build on trees in the following particular, that after the female is impregnated, ſhe completes her taſk without needing any help from the male. Retiring from him, ſhe chooſes a ſafe ſpot for her neſt, where ſhe can find plenty of worms and graſs-ſeed at hand; and her young,

as ſoon as hatched, take foot, and ſeek food for themſelves. The only remaining duty incumbent on the dam is, to lead them to proper places for food, and to call them together when danger impends. Some males, provoked at the deſertion of their mates, break the eggs if they happen to fall in their way. Eider ducks pair like other birds that place their neſts on the ground; and the female finiſhes her neſt with down plucked from her own breaſt. If the neſt be deſtroyed for the down, which is remarkably warm and elaſtic, ſhe makes another neſt as before. If ſhe is robbed a ſecond time, ſhe makes a third neſt; but the male furniſhes the down. The eider duck may give a leſſon to many a married woman, who is more diſpoſed to pluck her huſband than herſelf. The black game never pair: in ſpring, the cock on an eminence crows, and claps his wings; and all the females within hearing inſtantly reſort to him.

Pairing birds, excepting thoſe of prey, flock together in February, in order to chooſe their mates. They ſoon diſperſe, and are not ſeen afterward but in pairs.

Pairing is unknown to quadrupeds that feed on graſs. To ſuch it would be uſeleſs; as the female gives ſuck to her young while ſhe herſelf is feeding. If M. Buffon deſerves credit, the roe-deer are an exception. They pair, though they feed on graſs, and have but one litter in a year.

Beaſts of prey, ſuch as lions, tigers, wolves, pair not. The female is left to ſhift for herſelf and for her young; which is a laborious taſk, and often ſo unſucceſsful as to ſhorten the life of many of them. Pairing is eſſential to birds of prey, becauſe incubation leaves the female no ſufficient time to hunt for food. Pairing is not neceſſary to beaſts of prey, becauſe their young can bear a long faſt. Add another reaſon, that they would multiply ſo faſt by pairing, as to prove troubleſome neighbours to the human race.

Among animals that pair not, males fight deſperately about a female. Such a battle among horned cattle is finely deſcribed by Lucretius. Nor is it unuſual for ſeven or eight lions to wage bloody war for a ſingle female.

The ſame reaſon that makes pairing neceſſary for gregarious birds, obtains with reſpect to gregarious quadrupeds; thoſe eſpecially who ſtore up food for winer, and during that ſeaſon live in common. Diſcord among ſuch would be attended with worſe conſequences than even among lions and bulls, who are not confined to one place. The beavers, with reſpect to pairing, reſemble birds that place their neſts on the ground. As ſoon as the young are produced, the males abandon their ſtock of food to their mates, and live at large; but return frequently to viſit them while they are ſuckling their young.

Hedgehogs pair as well as ſeveral of the monkey-kind. We are not well acquainted with the natural hiſtory of theſe animals; but it would appear that the young require the nurſing care of both parents.

Seals have a ſingular œconomy. Polygamy ſeems to be a law of nature among them, as a male aſſociates with ſeveral females. The ſea-turtle has no occaſion to pair, as the female concludes her taſk by laying her eggs in the ſand. The young are hatched by the ſun, and immediately crawl to the ſea.

PAISLEY, a large manufacturing town in Renfrewſhire. Its ſtreets have names deſcriptive of the various employments of the inhabitants; ſuch as Silk Street, Cotton Street, Lawn Street, &c. The principal manufactures are in ſilk and thread gauze; and it has extenſive cotton works. The magnificent abbey, for which Paiſley was once noted, is now partly in ruins; but there is a chapel entire, which is uſed as the family burial-place of the marquis of Abercorn, and is famous for a ſurpriſing echo. Paiſley is ſuppoſed to contain about one third of the number of the inhabitants of Glaſgow; but it ſtands on nearly as much ground, and is ſix miles W. of that city. W. lon. 4. 20. N. lat. 55. 52.

PAIX, a town of America, in the iſland of Hiſpaniola, and on the north coaſt. It was built by the French, to whom it is ſubject, and has a prettty good harbour. W. lon. 72. 55. N. lat. 19. 58.

PAITA, a ſea-port of America, in Peru, and in the audience of Quito. The town conſiſts of about 200 houſes but one ſtory high; and the walls are made of ſplit cane and mud, and the roofs only a covering of leaves. The only defence of Paita is a fort without either ditch or outwork; but it is ſurrounded by a brick wall of little or no ſtrength, on which are mounted eight pieces of cannon. It has frequently been plundered by the buccaneers: and Commodore Anſon got poſſeſſion of its fort in 1741, and took and burnt the town becauſe the governor refuſed to ranſom it. W. lon. 81. 19. S. lat. 6. 12.

PALACE, Palatium, a name generally given to the dwelling-houſes of kings, princes, and other great perſonages; and taking different epithets, according to the quality of the inhabitants, as *imperial* palace, *royal* palace, *pontifical* palace, *cardinal* palace, *ducal* palace, *epiſcopal* palace, &c.

It is cuſtomary in China to build palaces in honour of great anceſtors. Hu-pi-lay, of the Mogul empire, in the year 1263, built one for his anceſtors; and he is the firſt who borrowed this Chineſe cuſtom. Amongſt the works of the ancient Egyptians, we have an account, in the Ancient Univerſal Hiſtory, of a moſt magnificent palace in the Upper Egypt, not far from Aſwan, the ancient Syene; the ruins whereof are enough to ſtrike a ſpectator with aſtoniſhment. It is as large as a little city, having four avenues of columns, leading to as many porticoes. At each gate, between two pillars of porphyry, ſtand two gigantic figures of fine black marble, armed with maces. The avenues conſiſt of columns ſet three and three together, in a triangle, on one pedeſtal: on the chapiter of each triangle is placed a ſphynx and a tomb alternately. Every column is 70 feet high, all of one ſtone. There are in all the four avenues about 5000 or 6000 of theſe columns, a great many of which are fallen down.

The firſt hall of this palace is adorned with pieces of hiſtory, which ſeem as freſh as if the painting had not been long finiſhed. In ſome places they have repreſented the hunting of antelopes; in others, feaſts, and a great many young children playing with all kinds of animals. From thence you go into other apartments, incruſted with marble, the roof being ſupported with pillars of porphyry and black marble. Notwithſtanding the vaſt quantity of rubbiſh, our author made ſhift to get up to the top of this building, from whence he had a proſpect of the ruins of the greateſt city that ever had been, as he thought, in the world. He ſuppoſes it might be the ancient Thebes; but that city ſtood much lower.

Palace-*Court*. See Marshalsea.

PALÆMON, or Melicerta. See Melicerta.

Palæmon (Q. Rhemmius), a famous grammarian of Rome, in the reign of Tiberius. He was born of a ſlave at Vicenza. We are told he was firſt brought up in the buſineſs of a weaver: but attending his maſter's ſon to ſchool, he uſed this opportunity to procure knowledge; and acquired ſo much ſkill in the common learning, that he obtained his freedom, and became a teacher or preceptor at Rome. His claim to learning cannot be queſtioned, ſince he is recorded as a ſcholar even by Juvenal:

Quis gremio Enceladi doctique Palæmonis affert,
Quantum grammaticus meruit labor? Sat. 7.

He had alſo an excellent memory, a ready elocution, and could make verſes extempore. On account of theſe qualities, notwithſtanding his debauched courſe of life, which was ſuch that nobody was more unworthy to have the preceptorſhip of youth, he held the firſt rank among thoſe of his profeſſion. But his arrogance ſurpaſſed his merit: he had the confidence to aſſert, that learning was born when he was born, and would die when

he died; and that Virgil had inſerted his name in his Eclogues by a certain prophetic ſpirit: for that he, Palæmon, would infallibly become one day ſole judge and arbiter of all poetry. He was exceſſively prodigal for the gratification of his voluptuous humour; inſomuch that neither the immenſe ſums he gained by teaching, nor the great profit he made both by cultivating his lands and in the way of traffic, proved a ſufficient fund to ſupport his extravagancies. We have only ſome fragments of his works.

PALÆOLOGUS (Michael), a very able man, who was governor of Aſia under the emperor Theodorus Laſcaris; and who, by various ſtratagems and cruelties, procured the empire for himſelf and his poſterity. See Constantinople.

PALÆPAPHOS (Strabo, Virgil, Pliny), a town of Cyprus, where ſtood a temple of Venus; and an adjoining town called *Nea Paphos*; where St. Paul ſtruck Elymas blind, and converted the proconſul Sergius Paulus.

PALÆSTRA, in Grecian antiquity, a public building where the youth exerciſed themſelves in wreſtling, running, playing at quoits, &c. To prevent the combatants from hurting themſelves by falling, the bottom of the palæſtra was covered with duſt or gravel. Some will have the palæſtra to be only a part of the gymnaſium. Many authors imagine that the palæſtra was of two kinds; the one for the exerciſe of the body, the other for the cultivation of the mind: but the derivation of the word ſeems to confine it to bodily exerciſe.

We have this account of the palæſtræ in Barthelemi's Anacharſis: "They are nearly of the ſame form with the gymnaſia. We viſited the apartments appropriated to all the ſpecies of baths; thoſe where the wreſtlers leave their clothes, where they rub their bodies with oil to render their limbs ſupple, and where they roll themſelves in the ſand in order to give their antagoniſts a hold.

"Wreſtling, leaping, tennis, and all the exerciſes of the Lyceum, were here repeated before us with greater varieties, and with more ſtrength and ſkill on the part of the performers. Among the different groups before us, we diſtinguiſhed men of the moſt perfect beauty, and worthy of ſerving as models for artiſts; ſome with vigorous and boldly marked outlines, as Hercules is repreſented; and others of a more ſlim and elegant ſhape, as Achilles is deſcribed. The former, devoting themſelves to wreſtling and boxing, had no object but to increaſe their bodily ſtrength; the latter, educated to leſs violent exerciſes, ſuch as running, leaping, &c. confined themſelves to acquirements of agility.

"Their regimen is ſuited to the different exerciſes for which they are deſigned. Some of them abſtain from women and wine; others lead a very abſtemious life; but thoſe who make laborious exertions ſtand in need of a great quantity of ſubſtantial food, ſuch as roaſted beef and pork, to reſtore their ſtrength. If they require only two minæ a-day, with bread in proportion, they give a very favourable idea of their temperance. But ſeveral are mentioned who have made a terrible conſumption of proviſions. Theagenes of Thaſos, for inſtance, is ſaid to have eaten a whole ox in a day. The ſame exploit is attributed to Milo of Crotona, whoſe uſual quantity of food for a day was twenty minæ of meat, as many of bread, and three congii of wine. It is ſaid likewiſe, that Aſtydamas of Miletus, when at the table of Ariobarzanes the Perſian ſatrap, devoured alone the ſupper prepared for nine gueſts. Theſe ſtories, no doubt exaggerated, prove at leaſt the idea generally entertained of the voracity of this claſs of wreſtlers. When they are able to gratify it without danger, they acquire extraordinary ſtrength: their ſtature becomes ſometimes gigantic; and their adverſaries, ſtruck with terror, either decline entering the liſts, or ſink under the weight of their enormous bodies.

"They are ſo oppreſſed by exceſs of nutriment as to be obliged to paſs part of their lives in a profound ſleep, and ſoon become ſo extremely corpulent as to be no longer known to be the ſame perſons: this is ſucceeded by diſorders which render them as wretched as they have always been unſerviceable to their country; for it cannot be denied that wreſtling, boxing, and all thoſe combats diſputed with ſo much fury and obſtinacy in the public ſolemnities, are no longer any thing but oſtentatious exhibitions, ſince tactics have been brought to perfection. Egypt at no time adopted them, as they give only a temporary ſtrength. Lacedæmon has corrected their inconveniences by the wiſdom of her inſtitutions. In the other ſtates of Greece men have diſcovered, that, by ſubjecting their children to them, they incur the riſk of injuring their ſhape and preventing their growth; and that, in a more advanced age, profeſſed wreſtlers never make good ſoldiers, becauſe they are unable to ſupport hunger, thirſt, watching, the ſmalleſt wants, or the moſt trifling deviation from their uſual habits." See Pentathlum and Pancratium.

PALÆSTROPHYLAX was the director of the palæſtra, and the exerciſes performed there.

PALAMBOANG, or Palambang, a town of Aſia, in the Eaſt Indies, and in the iſland of Java, capital of a kingdom; ſeated at the eaſt end of the iſland, on the ſtraits of Bally, and ſeparated from the iſland of Bally by a narrow channel. E. lon. 115. 10. S. lat. 7. 10.

PALAMEDEA, in ornithology, a genus belonging to the order of grallæ. The character of this genus, according to Latham, is, the bill bends down at the point with a horn, or with a tuft of feathers erect near the baſe of it; the noſtrils are oval; the toes are divided almoſt to their origin, with a ſmall membrane between the bottoms of each. See pl. 27.

There are two ſpecies of it; the firſt of which is the palamedea cornuta, or horned ſcreamer. It is about the ſize of a turkey; in length about three feet four inches. The bill is two inches and a quarter long, and black; the upper mandible is a little gibbous at the baſe, the under ſhuts beneath it, as in the gallinaceous tribe: the noſtrils are oval and pervious, and placed near the middle of the bill. From the crown of the head ſprings a ſlender horn of more than three inches in length, and pointed at the end: the irides are the colour of gold: the plumage on the head, neck, and upper part of the body, is black, margined with grey on the firſt, and downy: ſome of the feathers round the neck are likewiſe edged with the ſame: the under parts of the wings are pale rufous, appearing on the ſhoulders and edges of them when cloſed: at the bend of the wing are two ſtrong, ſharp, horny, yellow ſpurs, one above another, the uppermoſt an inch and a half in length: the belly, thighs, and vent are white: the tail is eight inches and a half long, and black: the legs are ſtout and duſky: the fore claws are moderately bent; the hind one is nearly ſtraight, not unlike that of a lark, and is about an inch long.—The female, we are told, is very like the male.

It is remarked, that they are always met with in pairs; and if one dies, the other mourns to death for the loſs. They frequent places near the water; make a large neſt of mud, in the ſhape of an oven, upon the ground; and lay two eggs, the ſize of thoſe of a gooſe. The young are brought up in the neſt till able to ſhift for themſelves. They have but one neſt in a year, which is in January or February, except the firſt eggs are taken away, when they make a ſecond in April or May. The young birds are frequently eaten by the natives, though the colour of the fleſh is very dark; that of the old ones is tough and ill taſted. By ſome authors this ſpecies is ſaid to feed on crabs and birds, ſuch as pigeons, poultry, and even to attack ſheep and goats; but this is denied by others, who ſay that its principal food is reptiles. In the ſtomach of one which M. Bajon diſſected, there were only found herbs and ſeeds of

plants; however, he adds, that the bird has no gizzard. The cornuta is a rare ſpecies. It is found in certain diſtricts in Cayenne, Guiana, Surinam, and other parts of South America, chiefly in the marſhes and wet ſavannas, and for the moſt part near the ſea. Theſe ſhould ſeem to be the birds mentioned by Ulloa, which are called by the inhabitants of Quito *diſpertadores*, or "awakeners," from their giving notice to others of the approach of danger; as on hearing the leaſt noiſe, or ſeeing any one, though at a great diſtance, they riſe from the ground, and make a loud chattering like a magpie, continuing the noiſe, and hovering over the object which cauſed the alarm, whereby the reſt of the birds, taking the hint, are able in time to eſcape the impending danger. This ſcreaming noiſe, which ſome authors relate as being exceedingly loud and terrible, has occaſioned Mr. Pennant to give the genus the name annexed to it. In Dr. Hunter's muſeum there is a fine ſpecimen of this bird, brought from Cayenne.

The ſecond ſpecies of palamedea is the criſtata, or creſted ſcreamer. This bird is about the ſize of an heron: the bill is ſhort, bent like that of a bird of prey, and of a yellowiſh brown: the irides are gold-coloured: on the forehead, juſt above the bill, is a tuft of black feathers variegated with aſh-colour: the head, neck and body are grey, mixed with rufous and brown, moſt inclining to the laſt on the wings and tail: the wings are not furniſhed with ſpurs: the legs pretty long, of a dull yellow: claws brown; the hind toe placed high up, ſo as not to touch the ground in walking.

This bird inhabits Braſil. Linnæus makes it to belong to the ſcreamer genus, perhaps from its cry; for it is ſaid to be heard at a great diſtance, and is not unlike that of a hen turkey. None of our later writers ſeem to have ſeen it, all of them relying on Marcgrave both for deſcription and figure. It is ſaid to feed on the ſame food as the heron tribe: the fleſh is good, and the bird by ſome kept tame.

PALAMEDES, a Greek chief, ſon of Nauplius king of Eubœa, by Clemene. He was ſent by the Grecian princes who were going to the Trojan war, in order to bring Ulyſſes to the camp, who, to avoid the expedition, pretended inſanity; and the better to carry on the impoſition, he often harneſſed different animals to a plough, and ſowed ſalt inſtead of barley. Palamedes ſoon diſcovered the cheat. He knew that regret to part with Penelope, whom Ulyſſes had lately married, was his only reaſon for pretending infanity; and to demonſtrate this, Palamedes took Telemachus, of whom Penelope had lately been delivered, and put him before his father's plough. Ulyſſes turned the plough a different way, not to hurt his child. He was therefore obliged to attend the Greek princes to the war; but an immortal enmity took place between Ulyſſes and Palamedes. The king of Ithaca determined to take every opportunity to diſtreſs him; and when all his expectations were fruſtrated, he was mean enough to bribe one of his ſervants, and to make him dig a hole in his maſter's tent, and there conceal a large ſum of money. After this Ulyſſes forged a letter in Phrygian characters, as from Priam to Palamedes. In the letter the Trojan king ſeemed to beg Palamedes to deliver into his hands the Grecian army, according to the conditions which had been previouſly agreed upon when he received the money. This forged letter was carried, by means of Ulyſſes, before the princes of the Grecian army. Palamedes was ſummoned, and made the moſt ſolemn proteſtations of innocence, but in vain. The money that was diſcovered in his tent ſerved to corroborate the accuſation; and he was therefore found guilty by the whole army, and ſtoned to death. Homer is ſilent about the unfortunate fate of Palamedes; and Pauſanias mentions, that it had been reported by ſome that Ulyſſes and Diomedes had drowned him in the ſea as he was fiſhing on the coaſt. Philoſtratus, who mentions the tragical ſtory as above related, adds, that Achilles and Ajax buried his body with great pomp on the ſea-ſhore; and that they raiſed upon it a ſmall chapel, where ſacrifices were regularly offered by the inhabitants of Troas. Palamedes was a man of learning as well as a ſoldier; and according to ſome he completed the alphabet of Cadmus by the addition of the four letters θ, ξ, χ, ϕ, during the Trojan war. To him alſo is attributed the invention of dice and backgammon; and it is ſaid that he was the firſt who regularly ranged an army in a line of battle, and who placed ſentinels round the camp, and excited their vigilance and attention by giving them a watchword.

PALARIA, among the Romans, a kind of exerciſe performed at a ſtake by the ſoldiers. The ſtake being fixed in the ground, and ſix feet high above it, the young undiſciplined ſoldiers advanced againſt it, armed with a hurdle and cudgel, inſtead of a ſword and ſhield, and went through all the rules of attack and defence, as if actually engaged with an adverſary. Sometimes they ſtood at a diſtance, and attacked with miſſive weapons; at the ſame time uſing all the requiſite motions for defending themſelves, and warding off what might be thrown againſt them.

PALATE, in anatomy, the fleſh that compoſes the roof, or the upper and inner part, of the mouth. The palate has much the ſame ſtructure with the gums; but it has alſo a great number of glands, diſcovered ſo early as the time of Fallopius: theſe are principally ſituated in the hinder part near the uvula, where it is pendulous, in the manner of a curtain, which part is called the *velum*, or *clauſtrum*, of the palate. The glands ſituated particularly in this part ſecrete a mucous fluid, ſerving to lubricate the mouth and throat, and to facilitate deglutition: they have a great number of apertures there for the diſcharge of this humour into the mouth. The great uſes of this membrane are to defend the bones of the palate from corrupting; and for preventing, by its clauſtrum or velum, the things to be ſwallowed from getting up into the noſtrils.

PALATINATE, a province or ſigniory poſſeſſed by a palatine.

PALATINATE of the Rhine, a province of Germany, divided into two parts by the Rhine, called the *Upper* and *Lower Palatinate*. The former lies in the circle of Bavaria, and belongs to the elector thereof; but the latter, in the circle we are now treating, belongs to the elector Palatine. The latter part is bounded to the caſt by the county of Katzenellnbogen, the archbiſhopric of Mentz, the biſhopric of Worms, and part of the territory of the Teutonic order in Franconia; to the weſt by Alſace, the duchy of Deuxponts, the county of Sponheim, the duchy of Simmern, and certain diſtricts of the electorate of Mentz; to the ſouth by the duchy of Wurtemberg and the biſhopric of Spire; and to the north by a part of the archbiſhopric of Mentz and the county of Katzenellnbogen. It contains 41 towns, beſides ſeveral boroughs; and is about 100 miles in length, and 70 in breadth. The air is healthful, and the ſoil fruitful in corn, paſturage, wine, tobacco, and all ſorts of pulſe and fruits, particularly walnuts, cheſnuts, and almonds. This country alſo breeds abundance of cattle, and is well watered by the Neckar, the Nahe, and the Rhine. In the laſt of theſe, near Germerſheim and Selz, is found gold; the excluſive right of ſearching for which is farmed out by the elector. The ſtate of religion hath varied greatly here ſince the Reformation, Lutheraniſm and Calviniſm having been uppermoſt by turns, till the electorate devolved to the Popiſh branches of the family, when Popery, with all its ſuperſtition and mummery, was eſtabliſhed anew: ſo that the Proteſtant religion is now on a very precarious footing in the Palatinate, though moſt of the natives are ſtill of that perſuaſion: but the two ſects of Proteſtants, namely, the Lutherans and Calviniſts, have greatly contributed to their own ruin, by their mutual

jealouſy and animoſity, being no leſs rancorous againſt one another than againſt their common adverſaries the Papiſts. The Lutherans reckon themſelves 50,000 ſtrong, and are poſſeſſed of about 85 churches; but not one half of their preachers and ſchoolmaſters have a competent maintenance. The number of Calviniſt clergy here is eſtimated at 500, and that of the Roman Catholics at 400. Beſides ſchools and Jeſuits colleges in this country, there is one univerſity, namely, that of Heidelberg; but there is very little trade in it except in wine. Authors are divided about the origin of the name *Palatines*, or *Pfalzgraves*, as the Germans call them; but it ſeems moſt likely to be derived from the *palatia*, or palaces, which the old Frankiſh and German kings and Roman emperors were poſſeſſed of in different parts of the country, and over which they appointed ſupreme ſtewards or judges, who were called *Palatines* or *Pfalzgraves*. The countries where theſe Palatines kept their courts, were, from them, called *Palatinates*; which name came at laſt to be appropriated, by way of eminence, to this country, as being the moſt conſiderable of them. The ancient electoral line failing in 1685, the electorate devolved to Philip-William duke of Neuburg; and upon the death of his ſecond ſon Charles-Philip, to the prince of Sultzbach. This elector has the title of arch-treaſurer of the empire, as well as the elector of Brunſwic-Lunenburgh, and is the fifth in rank among the ſecular electors. He is alſo one of the vicars of the empire alternately with the elector of Bavaria, and enjoys many other prerogatives. In his own dominions, he diſpoſes of all vacant benefices; but allows the eccleſiaſtical council, compoſed of two clergymen and two laymen, to preſent two candidates, of which he chooſes one. He is alſo maſter of all the tithes in his dominions; but he either grants them to the clergy, or ſalaries in lieu of them, out of the revenues of the church. His title is Pfalzgrave of the Rhine; archtreaſurer and elector of the holy Roman empire; duke of Bavaria, Juliers, Cleve, and Berg; prince of Mors; marquis of Bergen-op-Zoom; count of Veldens, Sponheim, the Mark, and Ravenſberg; and lord of Ravenſtein. His quota to the army of the empire is 30 horſe and 138 foot, or 914 florins monthly. To the chamber of Wetzlar he contributes, each term, 404 rix dollars, 82 kruitzers. There is an order of knighthood in this country, viz. that of St. Hubert; the badge of which is a quadrangular croſs pendent to a red ribbon, with a ſtar on the breaſt. The whole of the elector's revenue, ariſing from the Palatinate, the duchies of Berg and Juliers, the ſeigniory of Ravenſtein, and the duchies of Neuburg and Sultzbach, hath been eſtimated at about 300,000 l. *per annum*. The military eſtabliſhment conſiſts of ſeveral regiments of horſe and foot, beſides the horſe and Swiſs life-guards: in time of peace he is ſaid to maintain about 6000 men. All the different courts and councils, uſual in other countries for the different departments of government, are alſo to be found here.

In general, the Lower Palatinate has ſuffered more by the preceding wars with France, than all the provinces of Germany put together during the ſpace of 30 years; for the French have plundered the country, and demoliſhed ſome of its firſt towns more than once. In the modern part of the Univerſal Hiſtory, we have an account of the riſe of the Palatinate of the Rhine, under the hiſtory of Germany.

PALATINATES *of* POLAND. Previous to the revolution in this unfortunate country, it was divided into palatinates; whether thoſe will be now changed cannot be at preſent aſcertained, though it ſeems likely. A Poliſh palatine is thus deſcribed in the Univerſal Hiſtory: "A palatine may be regarded as the governor of a province, who levies and leads the troops of his own juriſdiction to join the army of the republic. His civil power is likewiſe conſiderable, as he preſides at the aſſemblies of his palatinate, rates the prices of all commodities and merchandiſe in the province, regulates the weights and meaſures, and judges and defends the Jews within his juriſdiction. This part of his function is particularly ſpecified, that a ſet of men the moſt uſeful and induſtrious in Poland may not be oppreſſed; the king being likewiſe obliged, by his oath, to afford them the protection of the laws and his ſovereignty. Under him is appointed a ſubſtitute or vice-palatine, who takes an oath to his ſuperior, and muſt be poſſeſſed of a land-eſtate to a certain value."

PALATINE, or COUNT PALATINE, a title anciently given to all perſons who had any office or employment in the prince's palace: but afterwards conferred on thoſe delegated by princes to hold courts of juſtice in the provinces; and on ſuch among the lords as had a palace, that is, a court of juſtice, in their own houſes.

*Counties-*PALATINE *in England.*—Cheſter, Durham, and Lancaſter, are called *counties-palatine*. The two former are ſuch by preſcription, or immemorial cuſtom; or, at leaſt as old as the Norman conqueſt: the latter was created by king Edward III. in favour of Henry Plantagenet, firſt earl and then duke of Lancaſter; whoſe heireſs being married to John of Gaunt, the king's ſon, the franchiſe was greatly enlarged and confirmed in parliament, to honour John of Gaunt himſelf, whom, on the death of his father-in-law, the king had alſo created duke of Lancaſter. Counties-palatine are ſo called *a palatio*; becauſe the owners thereof, the earl of Cheſter, the biſhop of Durham, and the duke of Lancaſter, had in thoſe counties *jura regalia*, as fully as the king hath in his palace; *regalem poteſtatem in omnibus*, as Bracton expreſſes it. They might pardon treaſons, murders, and felonies; they appointed all judges and juſtices of the peace; all writs and indictments ran in their names, as in other counties in the king's; and all offences were ſaid to be done againſt their peace, and not, as in other places, *contra pacem domini regis*. And indeed by the ancient law, in all peculiar juriſdictions, offences were ſaid to be done againſt his peace in whoſe court they were tried; in a court-leet, *contra pacem domini*; in the court of a corporation, *contra pacem ballivorum*; in the ſheriff's court or tourn, *contra pacem vicecomitis*. Theſe palatine privileges (ſo ſimilar to the regal independent juriſdictions uſurped by the great barons on the continent during the weak and infant ſtate of the firſt feudal kingdoms in Europe) were in all probability originally granted to the counties of Cheſter and Durham, becauſe they bordered upon enemies' countries, Wales and Scotland; in order that the owners, being encouraged by ſo large an authority, might be the more watchful in its defence; and that the inhabitants, having juſtice adminiſtered at home, might not be obliged to go out of the county, and leave it open to the enemy's incurſions. And upon this account alſo there were formerly two other counties palatine, Pembrokeſhire and Hexhamſhire, the latter now united with Northumberland: but theſe were aboliſhed by parliament, the former in 27 Hen. VIII. the latter in 14 Eliz. And in 27 Hen. VIII. likewiſe, the powers before mentioned of owners of counties-palatine were abridged; the reaſon for their continuance in a manner ceaſing: though ſtill all writs are witneſſed in their names, and all forfeitures for treaſon by the common law accrue to them

Of theſe three, the county of Durham is now the only one remaining in the hands of a ſubject. For the earldom of Cheſter, as Cambden teſtifies, was united to the crown by Hen. III. and has ever ſince given title to the king's eldeſt ſon. And the county-palatine or duchy of Lancaſter was the property of Henry of Bolingbroke, the ſon of John of Gaunt, at the time when he wreſted the crown from Richard II. and aſſumed the title of Hen. IV. But he was too prudent to ſuffer this to be united to the crown; leſt, if he loſt one, he ſhould loſe the other alſo. For, as Plowden and Sir Edward Coke obſerve, "he knew he

had the duchy of Lancaſter by ſure and indefeaſible title, but that his title to the crown was not ſo aſſured: for that after the deceaſe of Richard II. the right of the crown was in the heir of Lionel duke of Clarence, ſecond ſon of Edward III. John of Gaunt, father to this Henry IV. being but the fourth ſon." And therefore he procured an act of parliament, in the firſt year of his reign, ordaining that the duchy of Lancaſter, and all other his hereditary eſtates, with all their royalties and franchiſes, ſhould remain to him and his heirs for ever; and ſhould remain, deſcend, be adminiſtered, and governed, in like manner as if he never had attained the regal dignity: and thus they deſcended to his ſon and grandſon, Henry V. and Henry VI. many new territories and privileges being annexed to the duchy by the former. Henry VI. being attainted in 1 Edward IV. this duchy was declared in parliament to have become forfeited to the crown, and at the ſame time an act was made to incorporate the duchy of Lancaſter, to continue the county-palatine (which might otherwiſe have determined by the attainder), and to make the ſame parcel of the duchy: and, farther, to veſt the whole in king Edward IV. and his heirs, kings of England, for ever; but under a ſeparate guiding and governance from the other inheritances of the crown. And in 1 Hen. VII. another act was made, to reſume ſuch part of the duchy lands as had been diſmembered from it in the reign of Edward IV. and to veſt the inheritance of the whole in the king and his heirs for ever, as amply and largely, and in like manner, form, and condition, ſeparate from the crown of England and poſſeſſion of the ſame, as the three Henries and Edward IV. or any of them, had and held the ſame.

The iſle of Ely is not a county-palatine, though ſometimes erroneouſly called ſo, but only a royal franchiſe: the biſhop having, by grant of king Henry I. *jura regalia* within the iſle of Ely; whereby he exerciſes a juriſdiction over all cauſes, as well criminal as civil.

Palatine *Games*, in Roman antiquity, games inſtituted in honour of Auguſtus by his wife Livia, after he had been enrolled among the gods. They were celebrated in the palace, from whence the name, and were confirmed by the ſucceeding emperors. Some authors ſay that theſe games were inſtituted in honour of Julius Cæſar, and others again confound them with the Ludi Auguſtales; but neither of theſe opinions ſeems to be well ſupported. See Augustales.

PALATINUS mons, or *Palatium*, the firſt mountain of Rome, occupied by Romulus, and where he fixed his reſidence and kept his court, as did Tullus Hoſtilius, Auguſtus, and all the ſucceeding emperors: and hence it is that the reſidence of princes is called *palatium*. The reaſon of the name is variouſly aſſigned: ſome ſay it is derived from the goddeſs Pales, or from the Palatini, who originally inhabited the place, or from *balare* or *palare*, the bleatings of ſheep, which were frequent there; or perhaps from the word *palantes*, wandering, becauſe Evander, when he came to ſettle in Italy, gathered all the inhabitants, and made them all one ſociety. To the eaſt it has the mount Cœlius, to the ſouth the Aventine, to the weſt the Capitoline, and to the north the Forum.—*Palatinus*, the ſurname of Apollo from this place; where Auguſtus built a temple to that god, adorned with porticoes, and a library valuable for the various collections of Greek and Latin manuſcripts which it contained.

PALATIUM (anc. geog.), a place in the territory of Reate, diſtant from it 25 ſtadia. Dionyſius Halicarnaſſeus reckons it one of the firſt towns of the Aborigines; and from it Varro accounts for the name of the *Mons Palatinus*; namely, that a colony from Palatium ſettled there.

Palatium (Pliny), *Pallantium* (Pauſanias), *Palanteum* (Livy); *Pallanteum* (Solinus). This laſt is the true writing: the great grandfather of Evander, from whom it took its name, being called *Pallas*, not *Palas*: A town of Arcadia, which concurred to form Megalopolis (Pauſanias). From it the *Palatium*, or *Mons Palatinus*, takes alſo its name, according to Virgil and Pliny.

Palatium *Diocleſiani*; the villa of Diocleſian, near Salonæ, where he died (Euſebius). Afterwards called *Spalatum*; which roſe to a conſiderable city from the ruins of Salonæ; ſituated in Dalmatia on the Adriatic. Now *Spalato* or *Spalatro*.

Palatium *Luculli* (Plutarch), or *Villa Luculli*; a place between Miſenum and Baiæ in Campania, of wonderful ſtructure. Now in ruins, and called *Piſcina Mirabile*.

PALATO-salpingæus, Palato-*Staphylinus*, } See Anatomy, *Table of the Muſcles*.

PALE, a little pointed ſtake or piece of wood uſed in making incloſures, ſeparations, &c. The *pale* was an inſtrument of puniſhment and execution among the ancient Romans, and ſtill continues ſo among the Turks. Hence empaling, the paſſing a ſharp pale up the fundament through the body.

Pale, in heraldry. See Heraldry.

PALEARIUS (Aonius), was a man of the greateſt probity, and one of the beſt writers of the 16th century. He gained the eſteem of the men of wit and learning of his time by a noble poem on the immortality of the ſoul. He was appointed profeſſor of polite literature at Sienna; where his tranquillity was diſturbed by conteſts with an envious colleague, and by the malicious aſperſions of his enemies; againſt which, however, his eloquence proved always a ſufficient defence. At laſt he left Sienna, and accepted the invitation of the magiſtrates of Lucca, who gave him ſeveral marks of their eſteem, and ſettled a conſiderable ſtipend upon him. Some years after, he removed to Milan; where he was ſeized by order of pope Pius V. and carried to Rome. He was convicted of having ſpoken in favour of the Lutherans, and againſt the Inquiſition; and therefore was condemned to be burnt. This ſentence was executed in 1566. He wrote ſeveral pieces in verſe and proſe; of which the one above-mentioned is the moſt eſteemed.

PALENCIA, a town of Spain, in the kingdom of Leon, with a rich archbiſhop's ſee. It had an univerſity, but it was removed to Salamanca. It is ſeated in a fertile ſoil on the river Carion on the frontiers of Caſtile, in W. lon. 3. 7. N. lat. 42. 10.

PALERMO, an ancient city of Sicily, in the Val-di-Mazara, ſituate near the extremity of a kind of natural amphitheatre formed by high and rocky mountains. The country between the city and the mountains is one of the richeſt plains in the world; the whole appearing a magnificent garden, filled with fruit-trees of every ſpecies, and watered by clear fountains and rivulets. The inhabitants of Palermo are eſtimated at 150,000. Two great ſtreets interſect each other in the centre of the city, where they form a handſome ſquare, called the Ottangolo, adorned with elegant uniform buildings. From the centre of this ſquare is ſeen the whole of theſe noble ſtreets, and the four elegant gates which terminate them, each at the diſtance of half a mile. The Porta Felice opens to the Marino, a delightful walk, that has on one ſide the wall of the city, and on the other the ſea; and in the centre is an elegant kind of temple, which in ſummer is made uſe of as an orcheſtra. The concert does not begin till midnight; at which time the walk is crowded with carriages and people on foot: the better to favour pleaſure and intrigue, there is an order that no perſon ſhall preſume to carry a light; and the company generally continue an hour or two together in utter darkneſs, except when the intruding moon comes to diſturb them. The churches of Palermo are upwards of 300, and many of them very rich and magnificent. The cathedral is a large Gothic ſtructure, ſupported within by 80 columns of oriental granite, and divided into a great number of chapels, ſome of which are extremely rich, particularly that of St. Roſolia, the patroneſs of Palermo, who is held in the greateſt veneration. The relics of the ſaint are preſerved in a large

box of ſilver, curiouſly wrought, and enriched with precious ſtones: many miracles, it is pretended, are performed by them; and they are conſidered as the greateſt treaſures of the city. The monuments of their Norman kings, ſeveral of whom are buried here, are of the fineſt porphyry, ſome of them near 700 years old. The city is crowded with ſtatues of ſovereigns and tutelar ſaints, placed in ſmall courts and ſquares, upon pedeſtals of coloſſal proportion and taſteleſs form. In the ſtreets the women hide their heads in black veils; a very ancient mode of dreſs in this iſland. This city has ſuffered greatly, at different periods, by earthquakes or inundations. The harbour is dangerouſly open to the ſwell and ſea from the N. E. and even at the anchoring place ſhips lie in peril whenever a weſterly wind blows, as it ruſhes with great impetuoſity through the valley of Colli between the mountains. About a mile from Palermo is a celebrated convent of capuchins, in which is a vault made uſe of as a receptacle for the dead. It conſiſts of four wide paſſages, each about forty feet in length, with arches along the ſides, in which the bodies are ſet upright, clothed in coarſe garments, with their heads, arms, and feet bare. They are prepared for this ſituation by broiling them ſix or ſeven months upon a gridiron, over a ſlow fire, till all the fat and moiſture are conſumed. In ſome of the higher niches they are laid out at full length, and at the top are children of ſix or ſeven years of age. On the floor are handſome trunks, containing the bodies of perſons of diſtinction, the keys of which are kept by the relations. Palermo is ſeated on the N. ſide of the iſland, at the bottom of a gulf of the ſame name, 110 miles W. of Meſſina, and 162 S. by W. of Naples. E. lon. 13. 23. N. lat. 38. 15.

PALES, in Pagan worſhip, the goddeſs of the ſhepherds; to whom they offered milk and honey, in order that ſhe might deliver them and their flocks from wild beaſts and infectious diſeaſes. This goddeſs is repreſented as an old woman. She was worſhipped with great ſolemnity at Rome; and her feſtivals, called *Palilia*, were celebrated on the 21ſt of April, the very day that Romulus began to lay the foundation of the city of Rome; the ceremony of which conſiſted in burning heaps of ſtraw, and in leaping over them. No ſacrifices were offered, but purifications were made with the ſmoke of horſes blood, and with the aſhes of a calf that had been taken from the belly of its mother after it had been ſacrificed, and with the aſhes of beans. The purification of the flocks was alſo made with the ſmoke of ſulphur, of the olive, the pine, the laurel, and the roſemary. Offerings of mild cheeſe, boiled wine, and cakes of millet, were afterwards made to the goddeſs. Some call this feſtival *Parilia, quaſi a pariendo*, becauſe the ſacrifices were offered to the divinity for the fecundity of the flocks.

PALESTINE, in its preſent ſtate, is a part of Aſiatic Turkey ſituated between 31° 30′ and 33° 20′ north latitude, and between 34° 50′ and 37° 15′ eaſt longitude. It is bounded by Mount Libanus, which divides it from Syria, on the north; by Mount Hermon, which ſeparates it from Arabia Deſerta, on the eaſt; by the mountains of Seir and the deſerts of Arabia Petræa, on the ſouth; and by the Mediterranean ſea on the weſt.

This once fertile and happy ſpot was firſt called the land of *Canaan*, or *Chanaan*, from Noah's grandſon. In Scripture, however, it is frequently diſtinguiſhed by other names; ſuch as the *Land of Promiſe*, the *Land of God*, the *Land of Iſrael*, &c. It received the name of *Paleſtine* from the *Paleſtines*, or *Philiſtines*, who poſſeſſed a great part of it; and it had the name of *Judæa*, or *Judæa Paleſtina*, from *Judah*, the moſt conſiderable of the twelve ſons of Jacob. The Chriſtians have denominated it the *Holy Land*; partly on account of the many ſingular bleſſings it received from the Divine Providence, and partly on account of its metropolis being made the centre of God's worſhip and his peculiar habitation; but much more for its being the place of our Saviour's birth, the ſcene of his preaching and manifold miracles; eſpecially the place in which he accompliſhed the great work of our redemption. As to the name of *Judæa*, it did not begin to receive that till after the return of the Jews from the Babyloniſh captivity, though it had been ſtyled long before the *Kingdom of Judah*, in oppoſition to that of *Iſrael*, which revolted from it under Jeroboam, in the reign of Rehoboam the ſon of Solomon. But after the return, the tribe of Judah, the only one that made any figure, ſettling at Jeruſalem, and in the countries adjacent, quickly gave its name to the whole territory. By profane authors it was called by many different names; ſuch as Syria, Paleſtina Syria, Cæleſyria, Iduma, Idumæa, and Phœnicia or Phœnice; but theſe are ſuppoſed only to have been given out of contempt to the Jewiſh nation, whom they looked upon as unworthy of any other name than what diſtinguiſhed the moſt obſcure parts of the neighbouring provinces.

That part of the country which was properly called the *Land of Promiſe*, was incloſed on the weſt by the Mediterranean; on the eaſt by the lake Aſphaltites, the Jordan, and the ſea of Tiberias or of Galilee, and the Samachonite lake; to the north it had the mountains of Libanus, or rather of Antilibanus, or the province of Phœnicia; and to the ſouth, that of Edom or Idumæa, from which it was likewiſe parted by another ridge of high mountains. The boundaries of the other part, which belonged to the two tribes and an half beyond the river Jordan, are not ſo eaſily defined, as well as thoſe of the conqueſts made by the more proſperous kings of the Jews. All that can be ſaid with any probability is, that the river Arnon was the firſt northern boundary on that ſide; and with reſpect to thoſe on this ſide the Jordan, there is a conſiderable diſagreement between the Hebrew and Samaritan verſions of the Pentateuch.

The extent of this country is likewiſe variouſly ſettled by geographers; ſome giving it no more than 170 or 180 miles from north to ſouth, and 140 in breadth where broadeſt, though not much above half that breadth where narroweſt. But from the lateſt and moſt accurate maps, it appears to extend near 200 miles in length, and about 80 in breadth about the middle, and about 10 or 15, more or leſs, where it widens or ſhrinks.

The climate is certainly very happy, its ſituation being neither too far ſouth nor too far north. The longeſt day is not above 14 hours 15 minutes: But the limits of Paleſtine appear ſo ſmall, conſidering that the country is likewiſe interſected by high ridges or mountains, woods, deſerts, &c. that many learned men have been induced to queſtion what we read of its fertility and populouſneſs in former times. It muſt be owned indeed, that when we compare its ancient and flouriſhing ſtate, when it was cultivated with the utmoſt diligence by perſons well ſkilled in every branch of agriculture, with what it hath been ſince the total extirpation of the Jews out of it, and more eſpecially ſince it fell into the hands of the Turks, the contraſt is amazingly great: but when we conſider the many evident cauſes which have contributed to effect this change, and even yet conſider the nature of the country itſelf, we find not the leaſt reaſon to doubt the truth of what the ſacred hiſtorians have related. Moſes deſcribes the richneſs of it in the ſtrongeſt terms, even before the Iſraelites got poſſeſſion of it. It even exceeded the land of Egypt, ſo much celebrated by ancient hiſtorians; eſpecially in the vaſt numbers of cattle which it produced; in the quantity and excellence of its wine, oil, and fruits. With reſpect to the oil and fruits, it is plain that the olives and oil of Canaan exceeded in goodneſs thoſe of Egypt, ſince the tribes ſent them thither from thence; and as for vines, Herodotus tells us, that the Egyptians had none at all, but ſupplied the want of them by a liquor brewed from barley. The preſents which Jacob ſent to his ſon Joſeph, of honey, ſpices, myrrh, almonds, and other fruits of Paleſtine, ſhow, that they muſt have been much better in the land of Judea than in Egypt. The wines

of Gaza, Aſcalon, and Sarepta, were famous among the moſt remote nations; though it is allowed, that the wine which was made at and in the neighbourhood of Bethlehem, in great quantities, was equal at leaſt, if not ſuperior, to any of the reſt: and that of Libanus, mentioned by the prophet Hoſea, was no leſs celebrated for its excellent flavour.

Several circumſtances contributed to this wonderful fecundity: ſuch as, the excellent temperature of the air, which was never ſubject to exceſſive heats or colds; the regularity of its ſeaſons, eſpecially the former and latter rain; and the natural fatneſs and fertility of its ſoil, which required neither dunging nor manuring, and could be ploughed with a ſingle yoke of oxen and a ſmall kind of plough; for the ſoil was, and is ſtill, ſo ſhallow, that to have gone deep into it would rather have endangered than improved the crop. With reſpect to the excellency of its corn, we are told that the bread of Jeruſalem was preferred above all other; and the tribe of Aſher produced the beſt of both, and in greater quantity than any other tribe; and ſuch plenty was there of it, that, beſides what ſufficed the inhabitants, who made it their chief ſuſtenance, Solomon, we read, could afford to ſend 20,000 cors, or meaſures, of it, and as many of oil, yearly, to Hiram king of Tyre; beſides what they exported into other countries. And we find, even ſo late as king Herod, ſurnamed Agrippa, the countries of Tyre and Sidon received moſt of their ſuſtenance from his tetrarchy.

As to their fruits, the grapes were delicious, finely flavoured, and very large. The palm-tree and its dates were in no leſs requeſt; and the plain of Jericho, among other places, was famed for the great plenty and excellence of that fruit; inſomuch, that the metropolis of that territory was emphatically ſtyled *the city of palm-trees*. But what both this plain, and other parts of Paleſtine, were moſt celebrated for, was the balſam ſhrub, whoſe balm was eſteemed ſo precious a drug among the Greeks, Romans, Egyptians, and other nations, and is ſtill to this day under the name of *balm of Gilead*. They had likewiſe the greateſt variety of other fruit-trees in the higheſt perfection; and which might be, in ſome ſenſe, ſtyled *perpetual*, becauſe they were not only covered with a conſtant verdure, but becauſe the new buds always appeared on the ſame boughs before the old fruit was ripe; and of thoſe buds, which were in too great quantities to be allowed to come to maturity, they gathered enough to make very delightful pickles and ſweetmeats, eſpecially of their citrons, oranges, and apples of paradiſe, which laſt commonly hung by hundreds in a cluſter, and as big as hens' eggs, and of an excellent taſte and flavour. Their vines yielded grapes twice, and ſometimes three times, a year, great quantities of which were dried up, and preſerved for uſe, as well as their figs, plums, and other fruits. They had plenty of honey; the very trees diſtilled it; and the rocks yielded it in great quantities: but whether that of the latter kind was there depoſited by the induſtrious bees, or produced ſome other way, is much diſputed by travellers and naturaliſts. They likewiſe cultivated ſugar-canes in great abundance; and the cotton, hemp and flax were moſtly of their own growth and manufacture, except ſome of a finer ſort, that were brought to them from Egypt, and worn by thoſe of the higher rank. Their vicinity to Libanus made the cedars, cypreſſes, and other ſtately fragrant trees, very common in moſt parts of the land, but more eſpecially in Jeruſalem. Cattle, both large and ſmall, they fed in vaſt quantities; and the hilly countries not only afforded them variety and plenty of paſture, but alſo of water, which deſcended thence into the valleys and lowlands, and fertilized them to the degree we have ſeen; beſides ſeveral other rivers and brooks, ſome of the moſt remarkable of which we ſhall ſpeak of in their proper places. But the moſt fertile paſture grounds were thoſe on each ſide of the river Jordan; beſides thoſe of Sharon, or Sarona, the plains of Lydda, Jamnia, and ſome others then juſtly famed for their fecundity. As for fiſh, the rivers above-mentioned, the lake of Tiberias, and the Mediterranean ſea, afforded, as they do to this day, great plenty and variety. Vaſt quantities were brought to Jeruſalem, on which the inhabitants moſtly ſubſiſted; and hence one of the gates of that metropolis was, according to St. Jerome, called the *fiſh-gate*. The lake Aſphaltites yielded ſalt in abundance, wherewith to ſeaſon and preſerve their fiſh, which Galen affirms to have been preferable to any other for wholeſomeneſs, digeſtion, and extenuation. In ſhort, the Scripture is ſo pregnant with proofs of the extraordinary richneſs and fecundity of this once happy land, and the vaſt number of people that lived in it, almoſt wholly upon its product, to ſay nothing of the vaſt exports of its corn, wine, oil, raiſins, and other fruits, &c. that a man muſt have taken a ſtrange warp to infidelity, that can call it in queſtion merely on account of the melancholy and quite oppoſite figure it now makes under its preſent tyrannical government.

But its fertility has been called in queſtion; and Voltaire and other infidel writers have raiſed difficulties and objections againſt the authority of Scripture, from the pretended ſterility of the land of Judea. In anſwer to which, the Abbé Guenée, about the year 1780, communicated to the academy of inſcriptions and belles lettres at Paris, *Two Memoirs concerning the Fertility of Paleſtine*, in order to ſhow that ſuch objections had no ſolid foundation. But even thoſe who have viewed it in this doleful condition tell us, there are ſtill ſuch viſible ſigns of its natural richneſs and fertility, as plainly ſhow, that the bare want of culture is the main if not the only cauſe of its preſent poverty and barrenneſs. We ſhall adduce, as a farther proof of this, what a learned traveller hath lately written of it from his own obſervations.

"The Holy Land (ſays Dr. Shaw), were it as well peopled and cultivated as in former times, would ſtill be more fruitful than the very beſt part of the coaſt of Syria and Phœnice; for the ſoil is generally much richer, and, all things conſidered, yields a preferable crop. Thus the cotton that is gathered in the plains of Ramah, Eſdraelon, and Zabulun, is in greater eſteem than what is cultivated near Sidon and Tripoli. Neither is it poſſible for pulſe, wheat, or any ſort of grain, to be more excellent than what is ſold at Jeruſalem. The barrenneſs, or ſcarcity rather, which ſome authors may, either ignorantly or maliciouſly, complain of, doth not proceed from the incapacity or natural unfruitfulneſs of the country, but from the want of inhabitants, and the great averſion there is to labour and induſtry in thoſe few who poſſeſs it. There are, beſides, ſuch perpetual diſcords and depredations among the petty princes who ſhare this fine country, that, allowing it was better peopled, yet there would be ſmall encouragement to ſow, when it was uncertain who ſhould gather in the harveſt. Otherwiſe, the land is a good land, and ſtill capable of affording its neighbours the like ſupplies of corn and oil which it is known to have done in the time of Solomon."

Volney, in his Travels in Egypt and Syria, likewiſe obſerves, that though the whole of Paleſtine is almoſt an entire level plain, without either river or rivulet in ſummer, and only watered by the winter torrents, the ſoil is yet good, and may even be termed fertile; for, when the winter rains do not fail, every thing ſprings up in abundance; and the earth, which is black and fat, retains moiſture ſufficient for the growth of grain and vegetables during the ſummer. More doura, ſeſamum, water-melons, and beans, are ſown here than in any other part of the country. They alſo raiſe cotton, barley, and wheat; but though the latter be moſt eſteemed, it is leſs cultivated, for fear of too much inviting the avarice of the Turkiſh governors and the rapacity of the Arabs.

Judea, in its largeſt ſenſe, was divided into maritime and in-

land, as well as into mountainous and champain; and again ſubdivided into Judea on this ſide, and Judea beyond Jordan. But the moſt conſiderable diviſion is that which was made among the twelve tribes, by lot, to prevent all murmuring and diſcontent among that ſtubborn people; of theſe, two and a half were ſeated beyond Jordan, and the reſt on this ſide. The next remarkable diviſion was made by king Solomon, who divided his kingdom into twelve provinces or diſtricts, each under a peculiar officer; and every one of theſe was to ſupply the king with proviſions for his houſehold in his turn; that is, each for one month in the year. But the moſt fatal diviſion of all was, that which obtained under his imprudent ſon Rehoboam; when ten of the twelve tribes revolted, under the conduct of Jeroboam, who became head of this new monarchy, ſtyled *the kingdom of Iſrael*, in oppoſition to that of *Judah*, the title which diſtinguiſhed the maimed kingdom of Rehoboam from that time downwards. Under the ſecond temple the diſtinction laſted a conſiderable time, and the ſame bloody hatred and hoſtilities continued between theſe two kingdoms; that of Iſrael taking the name of *Samaria*, from its capital. The inhabitants were a mixture of the old Iſraelites, and of new colonies ſent thither by the kings of Aſſyria after their conqueſt of it, till they were ſubdued by the Maccabees, and their metropolis deſtroyed. Under the Romans it began to be divided into tetrarchies and toparchies: the larger were thoſe of Judea, Samaria, and Galilee Upper and Lower; the leſſer, thoſe of Gerarritica, Sarona, and others of leſs note; all which lay on this ſide of the Jordan. The reſt, on the other ſide, were thoſe of Gilead, Peræa, Gaulonitis, Auranitis, Batanea, and Decapolis. Joſephus mentions another diviſion made in Gabinius's time, into five diſtricts, or, as he ſtyles them, συνεδρια or *councils*, agreeable to the Roman manner: theſe were Jeruſalem, Jericho, and Sephoris on this ſide Jordan; and Gadaris and Amathus on the other. In the reigns of the Chriſtian emperors, it was divided afreſh into Paleſtina Prima, Paleſtina Secunda, and Paleſtina Tertia or Salutaris; which laſt included the far greater part, if not the whole country, as is known to all who are acquainted with hiſtory. On that account we ſhall wave all other diviſions and changes that happened to it under the northern barbarians, Saracens, &c. and conclude this article with the preſent ſtate and diviſion of it under the Turks.—The whole country of Paleſtine is now reduced to a diſtrict or province, under the beglerbegate or baſſaſhip of Scham or Damaſcus, who hath the ſeven following ſangiacs or ſubgovernors under him, ſtyled, according to the different places of their reſidence, 1. The ſangiac of Damaſcus, who is under the baſha of that province; 2. of Jeruſalem, or, as the Turks call it, *Cudſembaric* or *Coudſcherif*; 3. Aglum; 4. Bahara; 5. Scifat; 6. Gaza; 7. Nabolos. Each of theſe has a number of ziamets, and each ziamet a number of timariots under them; for the better underſtanding of which terms, we ſhall refer our readers to Sir Paul Ricaut's Account of the Ottoman Empire. At preſent it will be ſufficient to ſay of theſe inferior ſubdiviſions, under the ſangiac of this diſtrict, or ſangiacate of Jeruſalem, that it hath nine of the former and ſixteen of the latter claſs. Neither muſt the reader imagine theſe ſangiacates or ſub-governments to be any thing conſiderable, or the reſidence of theſe officers to be places of any note or opulence. The former indeed live by oppreſſing the people under them, and extort contributions of every thing that comes within their reach, ſuch as the protection of travellers, merchants, and caravans; but being all under their reſpective baſhas, who are ſtill more griping than their underlings, they are commonly fleeced of ſome conſiderable part of their unjuſt gains. As for the places of their reſidence, except it be here and there one in a conſiderable city, as at Damaſcus and Jeruſalem, the reſt are either ſome old cities or even inconſiderable villages.

There are a variety of curioſities in Paleſtine, both natural and artificial; but they are ſo very numerous as almoſt to preclude deſcription: we therefore refer our readers to the Ancient Univerſal Hiſtory, Vol. II. where they are mentioned and particularly deſcribed. The principal mountains, rivers, and other places of note, have already been, or will be, noticed under their reſpective names.

PALESTRINA, a town of Italy, in the Campagna di Roma, with a biſhop's ſee. It is the capital of a principality of the ſame name, and the biſhop is one of the ſix cardinal biſhops. It was anciently famous for the temple of Fortune, being then called *Prænesſte*, and ſeated on the top of a mountain, the ruins of which may yet be ſeen. E. lon. 12. 55. N. lat. 41. 51.

PALESTRINA, is one of the largeſt and moſt populous of the iſlands called the Lagunes, near Venice, and where the moſt conſiderable of the noblemen have houſes of pleaſure. It is 15,000 paces in length and 400 in breadth; the principal harbour has alſo the ſame name.

PALFIN (JOHN), an eminent ſurgeon, anatomiſt, and reader in ſurgery at Ghent, the place of his birth; acquired great reputation by his learning and works. The principal of theſe are, 1. A Treatiſe on Oſteology, in 12mo, Paris, 1731. 2. Anatomy of the Human Body, in 2 vols. 8vo, Paris, 1734. He died at Ghent at a great age, in 1730.

PALFREY, is one of the better ſort of horſes uſed by noblemen or others for ſtate; and ſometimes of old taken for a horſe fit for a woman to ride. Camden ſays, that William Fauconberge held the manor of Cukeny, in the county of Nottingham, in ſergeantry, by the ſervice of ſhoeing the king's palfrey when the king ſhould come to Mansfield.

PALICAUD, or PALOATCHERRY, a fortreſs of conſiderable ſtrength in India, which commands the paſſage between the two coaſts of Malabar and Coromandel, by way of the Trichinopoly and Coimbettore countries: there is alſo a communication with it through the Nayre country. It is in the hands of the Engliſh; and is of great importance to them, becauſe, as Coimbettore is in the hands of Tippoo, by our holding this place on the weſt, and Dindigul on the eaſt of Coimbettore, the province is rendered of little uſe to Tippoo in time of war, unleſs he keeps a very large force there to protect it. See Memoir of a Map of the Peninſula of India by Major Rennel.

PALICATE, a ſea-port town of India, on this ſide of the Ganges. It is ſeated on the coaſt of Coromandel, in the kingdom of Carnate, 70 miles north of Fort St. George. Here the Dutch have a factory, and fort called the *Fort of Gueldorland*. E. lon. 80. 1. N. lat. 13. 34.

PALICI, or PALISCI (fab. hiſt.), two deities, ſons of Jupiter by Thalia, whom Æſchylus, according to Macrobius, calls *Ætna*, in a tragedy which is loſt. The nymph Ætna, when pregnant, begged Jupiter to remove her from the purſuit of Juno. Upon which he concealed her in the bowels of the earth; and when the time of her delivery arrived, the earth opened and brought into the world two children, to whom were given the name of *Palici*, απο του παλιν ικεσθαι, *becauſe they came again into the world from the bowels of the earth*. Theſe deities were worſhipped with many ceremonies by the Sicilians; and near their temple were two ſmall lakes, which were ſuppoſed to have ſprung out of the earth when they were born. Near theſe pools it was uſual to take the moſt ſolemn oaths when any body wiſhed to decide controverſies and quarrels. If any of the perſons who took the oaths were perjured, they were immediately puniſhed ſupernaturally; and

thoſe whoſe oath, by the deities of the place, was ſincere, departed unhurt. The Palici had alſo an oracle, which was conſulted upon ſome great emergencies, and which rendered the trueſt and moſt unequivocal anſwers. In a ſuperſtitious age, the altars of the Palici were ſtained with the blood of human ſacrifices; but this barbarous cuſtom did not laſt long, as the deities were ſatisfied with the uſual offerings.

PALINDROMUS, a verſe or ſentence which runs the ſame when read either backwards or forwards. Such is the verſe, "*Roma ti'i ſubito motibus ibit amor*," Some people of leiſure have refined upon the Palindromus, and compoſed verſes, each word of which is the ſame backwards as forwards; for inſtance, that of Camden:

Odo tenet mulum, madidam mappam tenet Anna.
Anna tenet mappam, madidam mulum tenet Odo.

PALINGENESIA, among divines, the ſame with regeneration. Among chemiſts, it denotes the producing of a body from its principles.

PALINGENIUS (Marcellus), well known by a poem divided into 12 books, and intitled *Zodiacus Vitæ*, which he was ſeveral years of compoſing, and dedicated to Hercules II. of Eſte, duke of Ferrara. Some ſay he was phyſician to the prince; others rank him among the learned Lutherans, to whom the ducheſs of Ferrara gave a reception in her court, and honoured with her protection. His *Zodiac* contains good things, and is a philoſophical ſatire againſt immorality and falſe prejudices. Though this poem has borne a multitude of impreſſions, the author's life is but little known. He died ſome time between the years 1537 and 1543.

PALINODY, a diſcourſe contrary to a preceding one: hence the phraſe of *palinodiam canere* was taken for a recantation.

PALINURI promontorium (Virgil, Velleius), with a cognominal port, was ſituated at the ſouth extremity of the Sinus Pæſtanus, on the coaſt of Lucania; ſo called from Palinurus, Æneas's ſteerſman, who there periſhed (Mela, Dionyſius Halicarnaſſeus).

PALINURUS (fab. hiſt.), Æneas's pilot, whoſe fate Virgil very particularly deſcribes. He fell into the ſea when aſleep; and was three days expoſed to the tempeſts and its agitation, and at laſt came ſafe aſhore, where the cruel inhabitants of the place murdered him to get his clothes. His body was left unburied on the ſea-ſhore; and ſince, according to the religion of the old Romans, no one could croſs the Stygian lake before 100 years were elapſed, if his remains had not been decently buried, we find Æneas, when he went down to hell, ſpeaking to Palinurus, and aſſuring him, that, though his bones were deprived of a funeral, yet the place where his body was expoſed ſhould ſoon be adorned with a monument, and bear his name; and accordingly a promontory was called *Palinurus*.

PALISADES, in fortification, ſtakes made of ſtrong ſplit wood, about nine feet long, ſix or ſeven inches ſquare, three feet deep in the ground, in rows about two and an half or three inches aſunder, placed in the covert way, at three feet from, and parallel to the parapet or ſide of the glacies, to ſecure it from ſurpriſe. They are alſo uſed to fortify the avenues of open forts, gorges, half moons, the bottoms of ditches, and in general all poſts liable to ſurpriſe. They are uſually fixed perpendicularly, though ſome make an angle inclining towards the ground next the enemy, that the ropes caſt over them to tear them up may ſlip off.

Turning palisades; an invention of Mr. Coehorn, in order to preſerve the paliſades of the covert way from the beſiegers ſhot. They are ſo ordered, that as many of them as ſtand in the length of a rod, or about ten feet, turn up and down like traps, ſo as not to be in ſight of the enemy till they juſt bring on their attack; and yet are always ready to do the proper ſervice of paliſades.

PALISSE, in heraldry, a bearing like a range of paliſades before a fortification, repreſented on a feſſe, riſing up a conſiderable height, and pointed a top, with the field appearing between them.

PALIURUS, in botany. See Rhamnus.

PALL, in heraldry, a figure like a Greek Υ, about the breadth of a pallet; it is by ſome heralds called a *croſs-pall*, on account of its being looked upon as an archiepiſcopal bearing.

PALLA, in Roman antiquity, a mantle which women wore over the gown called *ſtola*. It was borne on the left ſhoulder; whence paſſing to the other ſide, under the right arm, the two ends were bound under the left arm, leaving the breaſt and arm quite bare. It had a great many folds, and derived its name from παλλω, to *ſhake* or *tremble*.

PALLADIO (Andrea), a celebrated Italian architect of the 16th century, was a native of Vicenza in Lombardy, and the diſciple of Triſſin. He made exact drawings of the principal works of antiquity to be met with at Rome, adding commentaries to them, which went through ſeveral impreſſions: But this, though a very uſeful work, was greatly exceeded by the Treatiſe of Architecture in four books, which he publiſhed in 1570. Inigo Jones wrote ſome excellent remarks on it; which were included in an edition of Palladio, publiſhed by Leoni, in two vols folio, 1742.

PALLADIUM, in antiquity, a ſtatue of the goddeſs Pallas. It was about three cubits high, and repreſented the goddeſs ſitting and holding a pike in her right hand, and in her left a diſtaff and a ſpindle. It fell down from heaven near the tent of Ilus, as he was building the citadel of Ilium. Some, however, ſuppoſe, that it fell at Peſſinus in Phrygia; or, according to others, Dardanus got it as a preſent from his mother Electra. There are ſome who maintain, that the palladium was made with the bones of Pelops by Abaris; but Apollodorus ſays, that it was no more than a piece of clock-work which moved of itſelf. However various the opinions of ancient authors be about this celebrated ſtatue, it is univerſally allowed, that on its preſervation depended the ſafety of Troy. This fatality the Greeks, during the Trojan war, were well aware of; and therefore Ulyſſes and Diomedes were commiſſioned to ſteal it. This they effected; and if we can rely upon the authority of ſome, they were directed how to carry it away by Helenus a ſon of Priam, who in this betrayed his country; becauſe his brother Deiphobus, at the death of Paris, had married Helen, of whom he was enamoured. Minerva was enraged at the violence offered to her ſtatue; and, according to Virgil, the palladium itſelf ſeemed to have received life and motion; and by the flaſhes which ſtarted from its eyes, and ſudden ſprings from the earth, it ſeemed to ſhow the reſentment of the goddeſs. The true palladium, as is obſerved by ſome, was not carried away from Troy by the Greeks, but only a ſtatue of ſimilar ſize and ſhape, which was placed near it, to deceive whatever ſacrilegious perſons attempted to ſteal it. The palladium, therefore, as they maintain, Æneas conveyed ſafe from Troy to Italy, and it was afterwards preſerved by the Romans with the greateſt ſecrecy and veneration in the temple of Veſta; a circumſtance which none but the veſtal virgins knew. It was eſteemed the deſtiny of Rome; and there were ſeveral others made perfectly like it, to ſecure it from being ſtolen, as was that at Troy, which the oracle of Apollo declared ſhould never be taken ſo long as the palladium was found

within its walls. A palladium was alſo placed by Nicias in the citadel of Athens.

PALLADIUS, biſhop of Helenopolis in Bithynia, and then of Aſpona. He was a Galatian, and born at Cappadocia. He became an Anchorite in the mountain of Nebria in 388, and was conſecrated a biſhop in 401. He was an intimate friend of St. John Chryſoſtom, whom he never forſook during the time of his perſecution, nor even in his exile. He went to Rome ſome time after Chryſoſtom's death, and, at the requeſt of Lauſus governor of Cappadocia, compoſed the hiſtory of the Anchorites or Hermits, and intitled it *Lauſiaca*, after the name of that lord, to whom he dedicated it in 420, when it was written, being then in the 20th year of his epiſcopacy, and 53d of his age. Palladius was accuſed of being an Origeniſt. It is true he was an enemy to St. Jerome, of whom he does not ſpeak well, and was intimately connected with Ruffinus; but perhaps no good proof can be brought of his Origeniſm. He had been the diſciple of Evagrius of Pontus, and was even ſuſpected of entertaining the ſentiments of Pelagius. He died in the 5th century, but in what year is not certain. His hiſtory was publiſhed in Greek by Meurſius at Amſterdam in 1619, and in Latin in the *Bibliotheca Patrum*: but he ſeems not to have been the writer of the Life of St. John Chryſoſtom, in Greek and Latin by M. Bigot, printed in 1680.

PALLAS, a freed man of Claudius, celebrated for the power and the riches which he obtained. He adviſed the emperor his maſter to marry Agrippina, and to adopt her ſon Nero for his ſucceſſor. It was through him and Agrippina that the death of Claudius was haſtened, and that Nero was raiſed to the throne. Nero, however, forgot to whom he was indebted for it. He diſcarded Pallas, and ſome time after cauſed him to be put to death, that he might procure his great riches.

PALLAVICINI (Ferrante), an Italian wit of conſiderable note, was deſcended from a branch of a noble family ſeated in Placentia, where he was born about the cloſe of the 16th century. He ſoon gave great proofs of an extraordinary genius, and quickly acquired a maſterly knowledge in the elements of claſſical erudition. He was afterwards ſent to complete his education in the monaſtery of Auguſtin friars at Milan, where he took the habit, lived much eſteemed, improved himſelf in piety as well as learning, and raiſed great expectations of future fame; but being ſomewhat amorouſly inclined, he engaged in an intrigue with a young courtezan of Venice, whoſe charms proved irreſiſtible; and in order to enjoy them without reſtraint, he obtained leave from his general to make the tour of France. Accordingly he pretended to ſet out for that country; but it was only a blind to cover his real deſign. He never left Venice, but lived there privately, inchanted in the arms of his Venus: and having too ready a talent at invention, he impoſed upon his friends, by often ſending them in letters feigned accounts of his travels through France; alſo informing them of ſeveral things reſpecting that court, which he learned from the advices of many conſiderable perſons with whom he correſponded.

His money in the mean time flew with expanded wings, and he ſoon found his purſe much drained. In this exigence he naturally had recourſe to his wits for ſupplies. He wrote for the bookſellers; and compoſed ſeveral pieces, more for the ſake of lucre than out of fondneſs for authorſhip. Among other things, he wrote a collection of letters, moſtly ſatirical, which he called *The Courier robbed of his Mail.* The work appeared at firſt in ſuch a caſt, as could not give great offence except to the Spaniards, againſt whom he had ſome grudge. The piece was accordingly licenſed by the inquiſitors; but falling into the hands of the ſecretary of the republic of Venice, who at that time was licenſer of books, he would not give his imprimatur, though great intereſt was employed for that purpoſe; neither would he return the manuſcript. This enraged Pallavicini ſo much, that had not his friends reſtrained him, he would have purſued the affair to his ruin.

At length he found an opportunity of travelling into Germany with duke Amalfi as his chaplain.—This journey, as was to be expected, had no good effect either upon his wit or his morals. On the contrary, finding himſelf, from the manners of the Germans, more at liberty, he indulged his genius and paſſions with greater eaſe; and after a reſidence there of upwards of a year with the duke, he returned to Venice, with a face marked all over with blotches like the evil, and a ſpirit reſolved to ſacrifice to his reſentment at the riſk of his life. He was reſolved to have his full meaſure of revenge againſt the ſecretary of the republic for keeping his manuſcript; and with him his reſentment joined the family of the Barberini, pope Urban VIII. and his nephews, becauſe they alſo endeavoured, at the inſtigation of the Jeſuits, to get all his manuſcripts forbid the preſs. In this rancorous ſpirit he caſt his Courier into a new model, and enlarged it with many letters and diſcourſes. Thus new-modelled, he offered it to a bookſeller who undertook to get it printed; but our author was betrayed by a pretended friend, who acted the part of a ſpy, and informed the archbiſhop of Vitelli, then the Pope's Nuncio at Venice, juſt as the work was finiſhed at the preſs: at the ſame time, this treacherous friend bought the whole impreſſion; and upon the Nuncio's complaint, Pallavicini was impriſoned. In this miſerable condition he found a friend in one of his miſtreſſes, who, ſeeing him abandoned by moſt of his patrons, not only ſupported him, but conveyed letters to him, by which ſhe gave him ſuch information as enabled him to make a proper defence and to recover his liberty.

But a war having in the mean time broke out between the Barberini and the duke of Parma; Pallavicini, in order to revenge himſelf upon the ſuppoſed inſtruments of his impriſonment, wrote a piece intitled "The tinkling Inſtrument to call together the Barberini Bees;" and dedicated it, in terms of the profoundeſt contempt, to the Nuncio Vitelli. The Nuncio, finding that little notice was taken of his complaints on the occaſion, procured by bribery one Charles Morſu, a Frenchman of infamous character, who pretended to paſs for a gentleman, to enſnare Pallavicini: to which end, the traitor uſed his beſt endeavours to inſinuate himſelf into his friendſhip, and at length exhorted him to accompany him to France. He declared that his fortune would be made by the extraordinary encouragement which was given to men of letters by Cardinal Richelieu; and the better to favour the deceit, he produced feigned letters from the Cardinal, inviting our author to France, and expreſſing a deſire he had to eſtabliſh in Paris an academy for the Italian tongue, under the direction of Pallavicini. The ſnare took; and now, faſcinated by the proſpect of gain, Pallavicini ſuffered himſelf to be led like an ox to the ſlaughter, whitherſoever Morſu thought proper. He left Venice much againſt the advice of his friends, and went firſt to Bergamo, where he ſpent a few days with ſome of his relations, by way of giving ſome entertainment to Morſu. They then ſet off for Geneva, to the great ſatisfaction of our author, who propoſed to get ſome of his works printed there, which he had not been able to do in Italy. Morſu, however, inſtead of conducting him to Paris, took the road to Avignon; where, croſſing the bridge of Soraces, in the county of Venaiſſin, they were ſeized by a gang of *ſbirri*, or ſheriff's officers, on pretence of carrying contraband goods, and confined. Morſu was quickly diſcharged and very liberally rewarded; but Pallavicini, being carried to Avignon, was impriſoned; and notwithſtanding, on his examination concerning ſome papers found upon him, he made a very artful defence, it was in vain. The

ſentence was already brought from Rome, and he was to undergo a trial merely for form's ſake. For this purpoſe being put into a dark dungeon, he made another effort to eſcape. He managed matters ſo well with his keeper, as to procure wax candles to be allowed him, under pretence of amuſing himſelf with reading; and when he had got a number of theſe, he ſet fire one night to the priſon-door, in order to get off by that means; but the ſtratagem did not ſucceed, and he was of courſe confined much cloſer, and treated with great inhumanity. After a year's ſuffering, he was brought to trial, in which he made an excellent defence, and flattered himſelf with hopes of relief. He had even begun a whimſical piece on the ſubject of melancholy; but, contrary to his expectations, he was ſentenced to die, and loſt his head on a ſcaffold in the flower of his age.

He was of ſo heedleſs and profuſe a diſpoſition, that, had he poſſeſſed an immenſe eſtate, he would have ſpent it all. He was never engaged in a virtuous paſſion, being inflamed to a prodigious and unnatural degree with the love of the meaneſt and moſt infamous proſtitutes. On the other hand, no one could be more ſincere and faithful in his friendſhips; nor was ever a man a greater prey to treachery; inſomuch that when releaſed from priſon in Venice, he was told that a wretch had betrayed him, he could not be prevailed upon to believe it, ſaying, "How can this be, ſince he declared himſelf my friend, and I made him privy to all my concerns!" He uſed, while he wore a religious habit, to ſtudy or write two or three hours in bed every morning. The reſt of the day he ſpent either in the company of idle perſons, or elſe with the ladies: but after he had wholly left the monaſtic life, upon pretence of ſecuring himſelf from the ſnares of his enemies, he lived in a very irregular manner. He was poſſeſſed of a fine genius, and had a great facility in writing; and, till he was corrupted by the commerce of mean lewd women, he wrote pieces worthy of immortality. He did not ſpend much time or pains either in compoſition or in reviſion, for he frequently ſent to the preſs the very firſt exertions of his genius; yet nature had given him ſo noble a vein of eloquence, which he had greatly improved by peruſing the beſt authors, that his firſt thoughts were often equal to the moſt laboured compoſitions. He was modeſt, and ſpoke of himſelf with diffidence; but his works are ſtrongly tinctured with envy, malice, and gall. He made but a poor figure in converſation; and when with perſons of worth and diſtinction, would often retire to a corner of the room, and ſeem quite wrapt up in thought. He never exerted his wit and humour after his return from Germany, but when he was in the company of ſome mean women. Upon the whole, it is difficult to determine whether vice or virtue was the moſt predominant feature in his character. His death gave birth to a dialogue, intitled, *Anima erranti di Ferrante Pallavicini*, or, "the wandering Ghoſt of Pallavicini." Beſides his life at the head of his works in two volumes, there is another prefixed to the "Divortio celeſte," at Amſterdam in 1696.

PALLENE, a ſmall peninſula of Thrace or Macedonia, formerly called *Phlegra*. It is ſituated near the bay of Thermæ, and contains five cities, the principal of which is called *Pallene*. It was famous, according to ſome of the ancients, for an engagement between the gods and the giants.

PALLET, among painters, a little oval table, or piece of wood, or ivory, very thin and ſmooth; on and round which the painters place the ſeveral colours they have occaſion for, to be ready for the pencil. The middle ſerves to mix the colours on, and to make the tints required in the work. It has no handle, but, inſtead thereof, a hole at one end to put the thumb through to hold it.

PALLET, among potters, crucible-makers, &c. a wooden inſtrument, almoſt the only one they uſe, for forming, heating, and rounding their works. They have ſeveral kinds; the largeſt are oval, with a handle; others are round, or hollowed triangularly; others, in fine, are in manner of large knives, ſerving to cut off whatever is ſuperfluous on the moulds of their work.

PALLET, in gilding, an inſtrument made of a ſquirrel's tail, to take up the gold leaves from the pillow, and to apply and extend them on the matter to be gilt. See GILDING.

PALLET, in heraldry, is nothing but a ſmall pale conſiſting of one half of it in breadth, and therefore there are ſometimes ſeveral of them upon one ſhield.

PALLET is alſo a part belonging to the balance of a watch on movement. See the article WATCH.

PALLIATÆ, a name which the Romans give to ſuch plays as laid the plot in Greece, and required the performers to appear in Grecian habits. It is uſed in contradiſtinction to *togatæ*, in which the ſcene was laid at Rome, and in which the dreſſes were Roman. The word palliatæ is derived from *pallium*, which was a part of dreſs peculiar to the Greeks; whereas the toga belonged to the Romans only. See TOGATÆ, COMEDY, &c.

PALLIATION, or a PALLIATIVE *Cure*, in medicine, is when, in deſperate and incurable diſeaſes, after predicting the fatal event, the phyſician preſcribes ſome remedies for mitigating the pain or ſome other urgent ſymptoms, as in ulcerated cancers, or cancerous fiſtulas, and the like.

PALLIO *Cooperire*. It was an ancient cuſtom, where children were born out of lawful wedlock, and their parents were afterwards married, that thoſe children, together with the father and mother, ſhould ſtand *pallio cooperti*, under a cloth, while the marriage was ſolemnizing; which was a kind of adoption, and had the effect of a legitimation. Thus Robert Groſthead, the famous biſhop of Lincoln, in one of his letters, ſays: *In ſignum legitimationis, nati ante matrimonium conſueverunt poni ſub* pallio *ſuper parentes eorum extento, in matrimonii ſolemnizatione*. Selden, in his notes on Fleta, adds, that the children of John of Gaunt, duke of Lancaſter, by Catharine Swinford, though legitimated by act of parliament, yet were *covered with the pall* when their parents were married.

PALLIUM, a word often mentioned in our old hiſtorians. Durandus tells us, that it is a garment made of white wool, after the following manner, viz. The nuns of St. Agnes, every year on the feaſt day of their ſaint, offer two white lambs on the altar of their church, during the time they ſing *Agnus Dei*, in a ſolemn maſs; which lambs are afterwards taken by two of the canons of the Lateran church, and by them given to the pope's ſubdeacons, who ſend them to paſture till ſhearing time; and then they are ſhorn, and the pall is made of their wool mixed with other white wool. The pall being thus made, is carried to the Lateran church, and there placed on the high altar, by the deacons of that church, on the bodies of St. Peter and St. Paul; and after an uſual watching, it is carried away in the night, and delivered to the ſubdeacons, who lay it up ſafe. And becauſe it was taken from the body of St. Peter, it ſignifies the plenitude of eccleſiaſtical power: and therefore it was the prerogative of popes, who pretend to be the immediate ſucceſſors of that ſaint, to inveſt other prelates with it; which at firſt was done nowhere but at Rome, though afterwards at other places.

PALLIUM, in antiquity, an upper garment or mantle worn by the Greeks, as the toga was by the Romans. Each of theſe were ſo peculiar to the reſpective nations, that *Palliatus* is uſed to ſignify a Greek, and *Togatus* a Roman.

PALM, has among almoſt all nations been regarded as an emblem of victory, and aſſigned as the reward of it. The reaſon why this tree was adopted and made uſe of to repreſent victory, is ſaid to be, becauſe it is ſo elaſtic that, if preſſed by the greateſt weight, it will riſe ſuperior to the preſſure, and be

able to reſtore itſelf to its former ſtate, appearing almoſt invincible.

Palm *Sunday*, in the Chriſtian church, the Sunday next before Eaſter; being ſo called in memory of our Saviour's triumphal entry into Jeruſalem, when the multitude that attended him ſtrewed branches on his way. The ancients had other names for this day. For, 1. They called it *Dominica Competentium*, i. e. Sunday of the Competentes; becauſe on that day the catechumens came to aſk the biſhop leave to be admitted to baptiſm, which was conferred the Sunday following. They had alſo then given them the ſymbol or credo, to get off by heart, to be repeated to the biſhop in the ceremony of baptiſm. 2. They called it *Capitiluvium*, the Sunday of waſhing the head; becauſe thoſe who were to be baptiſed the following Sunday were prepared by waſhing their heads on this day. Some time afterwards they called it *Indulgence Sunday*, becauſe the emperors and patriarchs uſed to diſtribute gifts on that day.

Palm-*Tree*, in botany. See Phoenix.

PALMA, or Palma-*Nova*, a very ſtrong town of Italy, in the territory of Venice, and in Friuli. It is a very important place, for the defence of the Venetians againſt the Auſtrians and Turks; and was built in 1593 for that very purpoſe. They have cut a canal near this place, which is very advantageous. It is ſeated on the ſea-ſide, 10 miles ſouth-eaſt of Udino, and 55 north-eaſt of Venice. E. lon. 13. 15. N. lat. 46. 2.

Palma, an iſland in the Atlantic Ocean, and one of the Canaries, 36 miles north-weſt of Gomera, and about 75 in circumference. It abounds in wine and ſugar; and has a handſome town of the ſame name, which carries on a trade in wine to the Weſt Indies and other parts. Their beſt vines grow in a ſoil called the *Brenia*, where they make 12,000 butts of wine every year, which is well known by the name of *Palm-wine*. There is plenty of cattle, and all ſorts of fruits. In 1625 a volcano broke out in this iſland, with a moſt violent earthquake; the flame was ſeen for ſix weeks together, and a great quantity of aſhes were thrown as far as Teneriff. It was conquered by the Spaniards in 1460.

PALMÆ, *Palms*. Under this name Linnæus has arranged ſeveral genera, which, although capable of a place in ſeparate claſſes of his ſyſtem, he chooſes rather, on account of their ſingular ſtructure, to place apart, in an appendix to the work. See Areca, Chamærops, Phoenix, Cocos, &c. and Corypha. The ſame plants conſtitute one of the ſeven families or tribes into which all vegetables are diſtributed by Linnæus in his *Philoſophia Botanica*. They are defined to be plants with ſimple ſtems, which at their ſummit bear leaves reſembling thoſe of the ferns, being a compoſition of a leaf and a branch; and whoſe flowers and fruit are produced on that particular receptacle or ſeat called a *ſpadix*, protruded from a common calyx in form of a ſheath or ſcabbard, termed by Linnæus *ſpatha*. Palmæ is likewiſe the name of the firſt order in Linnæus's Fragments of a Natural Method. See Botany.

PALMARIS muscle, in anatomy. See Anatomy, *Table of the Muſcles*.

PALMATED, ſomething reſembling the ſhape of the hand: thus we ſay, palmated leaves, roots, ſtones, &c.

PALMERSTON's Island, ſituated in the South Seas, which Captain Cook viſited in his ſecond and laſt voyages. It conſiſts of a group of ſmall iſlets, nine or ten in number, connected by a reef of coral rocks, and lying in a circular direction. It admits of no anchorage, nor are there any inhabitants on it, though it abounds with cocoa-nuts, ſcurvy-graſs, and the wharra-tree. This iſland is not more than a mile in circumference, and is not elevated above three feet above the level of the ſea. It conſiſts entirely of a coral ſand, with a ſmall mixture of blackiſh mould, which appeared to be produced from rotten vegetables. "At one part of the reef (ſay our navigators), which bounds the lake within, almoſt even with the ſurface, there was a large bed of coral, which afforded a moſt enchanting proſpect. Its baſe, which was fixed to the ſhore, extended ſo far that it could not be ſeen, ſo that it appeared to be ſuſpended in the water. Even this delightful ſcene was greatly improved by the multitude of fiſhes that gently glided along, ſeemingly with the moſt perfect ſecurity. Their colours were the moſt beautiful that can be imagined, blue, yellow, black, red, &c. far excelling any thing that can be produced by art. The richneſs of this ſubmarine grotto was greatly increaſed by their various forms; and the whole could not poſſibly be ſurveyed without a pleaſing tranſport, accompanied at the ſame time with regret, that a work ſo aſtoniſhingly elegant ſhould be concealed in a place ſo ſeldom explored by the human eye." E. lon. 196. 35. S. lat. 18. 8.

PALMIPEDES, among ornithologiſts, the ſame with web-footed birds. See Ornithology.

PALMISTRY, a kind of divination, or rather a deceitful art practiſed by gipſies, who pretend to foretel events by looking upon the lines and marks of the hand.

PALMUS, a long meaſure uſed both by the Greeks and Romans. The Grecian palmus was of two ſorts; the greater, which contained nine finger-breadths, and the leſs, which contained four. The Roman palmus was alſo of two ſorts; the greater, which contained twelve finger-breadths, or eight inches and an half Engliſh; and the leſs, which contained four finger-breadths, or near three inches Engliſh.—The great palmus was taken from the length of the hand or ſpan; the leſs from the breadth of it. The Greek palmus was called *doron*. See Measure.

PALMYRA, or Tadmor, a noble city of ancient Syria, now in ruins, the origin of whoſe name is uncertain. Neither is it well known by whom this city was built; for though, from the identity of the names, it is thought by many to have been the *Tadmor in the wilderneſs* built by Solomon, this point, however, is much controverted by many learned men. For the world have been long and juſtly aſtoniſhed to find in the Deſert of Syria, at a diſtance from the ſea, with a very precarious and ſcanty ſupply of water only, and without a particular connection with any great monarchy, ruins of a city more extenſive and ſplendid than Rome itſelf, the depoſit of all the arts which Greece in its moſt flouriſhing periods could afford. The problem is an intricate one; yet when we diveſt it of many of its difficulties, we ſhall bring this ſtupendous prodigy to no very uncommon magnitude. The coaſt of Syria was in very early ages rich and populous; and either from the conveniency of procuring water, or from the vicinity of India and Egypt, the population, inſtead of increaſing on the mountains, extended to Judea, and from thence through its plains only to the internal parts. The ruins of this numerous people, and of their habitations, remain; but as their edifices were not uncommonly ſplendid, or, as the cauſes of their deſtruction were powerful, they have not attracted much attention. Yet the ruins of more than 30 towns are diſcoverable to the ſouth-eaſt of the Dead Sea, and from thence towards Tadmor or Palmyra: we know the cauſe of the deſtruction of theſe towns, and we know that it did not reach Palmyra. This ſplendid city was not, therefore, inſulated in a maſs of ſand: it was probably a link of a continued chain of population, or perhaps its termination. The ſituations of towns in the Sandy Deſert muſt neceſſarily be determined by local advantages. Tadmor is ſituated where two hills converge, and beyond the point where they approach. Theſe hills afforded water, that neceſſary aid to animal life; and the aqueducts through which it was brought from them were diſcovered and deſcribed by Mr. Wood. Though the other towns now in ruins afford ſome remains of luxury and opulence, yet in theſe reſpects they are much inferior to Palmyra;

and this deſerves to be explained. Palmyra was undoubtedly very ancient. "The two ſprings of freſh water it poſſeſſes (ſays Volney) were, above all, a powerful inducement in a deſert every where elſe ſo parched and barren. Theſe, doubtleſs, were the two principal motives which drew the attention of Solomon, and induced that commercial prince to carry his arms ſo remote from the limits of Judea." "He built ſtrong walls there (ſays the hiſtorian Joſephus), to ſecure himſelf in the poſſeſſion, and named it *Tadmor*, which ſignifies the Place of Palm-trees." Hence it has been inferred that Solomon was its firſt founder; but we ſhould, from this paſſage, be rather led to conclude that it was already a place of known importance. The palm-trees he found there are not the trees of uninhabited countries. Prior to the days of Moſes, the journeys of Abraham and Jacob from Meſopotamia into Syria ſufficiently prove a communication between theſe countries, which muſt ſoon have made Palmyra flouriſh. The cinnamon and pearls mentioned in the time of the Hebrew legiſlator demonſtrate a trade with India and the Perſian Gulph, which muſt have been carried on by the Euphrates and Palmyra. At this diſtance of time, when the greater part of monuments of theſe early ages have periſhed, we are liable to form very falſe opinions concerning the ſtate of theſe countries in thoſe remote times, and are the more eaſily deceived, as we admit as hiſtorical facts antecedent events of an entirely different character. If we obſerve, however, that men in all ages are united by the ſame intereſts and the ſame deſires, we cannot help concluding, that a commercial intercourſe muſt early have taken place between one nation and another, and that this intercourſe muſt have been nearly the ſame with that of more modern times. Without, therefore, going higher than the reign of Solomon, the invaſion of Tadmor by that prince is ſufficient alone to throw a great light on the hiſtory of this city. The king of Jeruſalem would never have carried his attention to ſo diſtant and detached a ſpot, without ſome powerful motive of intereſt; and this intereſt could be no other than that of an extenſive commerce, of which this place was already the emporium. This commerce extended itſelf to India, and the Perſian Gulph was the principal point of union.

From the nature of the commodities, from the requiſite aſſiſtance of the Tyrians, and other forcible arguments, M. Volney ſhows that the Perſian Gulph was the centre of the moſt ancient commerce of the eaſtern world; and that it was with a view of obtaining a ſhorter route, by means of the Euphrates, that Solomon turned his attention to Tadmor, diſtant but three days journey from it. Our author goes on, "We may even reaſonably conjecture, when we reflect on the revolutions of the following ages, that this commerce became a principal cauſe of thoſe various wars in lower Aſia, for which the barrren chronicles of thoſe early times aſſign no motives. If, after the reign of Solomon, the Aſſyrians of Nineveh turned their ambitious views towards Chaldea, and the lower part of the Euphrates, it was with the intention to approach that great ſource of opulence the Perſian Gulph. If Babylon, from being the vaſſal of Nineveh, in a ſhort time became her rival, and the ſeat of a new empire, it was becauſe her ſituation rendered her the emporium of this lucrative trade: in ſhort, if the kings of this great city waged perpetual wars with Jeruſalem and Tyre, their object was not only to deſpoil theſe cities of their riches, but to prevent their invading their trade by the way of the Red Sea. An hiſtorian who has informed us that Nabuchodonoſor, before he laid ſiege to Jeruſalem, took poſſeſſion of Tadmor, clearly indicates that the latter city acted in concert with the two neighbouring capitals. Their gradual decline became, under the Perſian empire and the ſucceſſors of Alexander, the efficient cauſe of the ſudden greatneſs of Palmyra in the time of the Parthians and Romans; ſhe then enjoyed a long peace for many centuries, which allowed her inhabitants to erect thoſe monuments of opulence whoſe ruins we ſtill admire." If the former obſervations ſhowed the connection of this remote ſpot with a more populous country, theſe remarks explain the cauſe of the renovation and of the magnificence of this city. Our author's remarks are at leaſt probable, and are, in our opinion, very convincing. Cairo, in another, probably a ſubordinate route, never attained the ſplendour of Palmyra; but the genius of the Egyptians, perhaps the laws of Egypt, prevented it.

There is, however, no authentic hiſtory of Palmyra till after the captivity of the Roman emperor Valerian by the Perſians. It is firſt mentioned by the Roman hiſtorians, as a place which Mark Antony attempted to plunder, upon pretence that it had not obſerved a juſt neutrality between the Romans and Parthians. Pliny takes notice of it as being ſituated in a rich ſoil, among pleaſant ſtreams, and totally ſeparated from the reſt of the world by a vaſt ſandy deſert, which had preſerved its independence between Parthia and Rome. There is ſtill a conſiderable ſpot of good ſoil next the town and on the hills; and even in the wilderneſs there were palms and fig-trees, ſome of which remained till the latter end of the 17th century, though not one is now to be found.

Little is known concerning the fortunes of Palmyra ſince the time of Mahomet, except that it was conſidered as a place of ſtrength; and that in the 12th century there were 2000 Jews in it. With reſpect to the ruins, they appeared to be of two different and diſtinct periods: the oldeſt are ſo far decayed as not to admit of menſuration, and look as if they had been reduced to that ſtate by the hand of time; the others appear to have been broken into fragments by violence. Of the inſcriptions none are earlier than the birth of Chriſt, and none are later than the deſtruction of the city by Aurelian, except one, which mentions Dioclefian.

Mr. Wood is of opinion, that the face of the country which ſurrounds Palmyra was always the ſame; but though Palmyra was always ſaid to be ſituated in a wilderneſs, it does not follow that the wilderneſs was always of the ſame extent: it is perhaps more probable, that when Palmyra was firſt ſettled, the rich ſoil mentioned by Pliny extended much farther; for, whatever were the reaſons for making a ſettlement there, Palmyra can ſcarcely be ſuppoſed to have invited a greater number of people than it could ſeed. The palms and fig-trees that were formerly found on the hills, and in the borders of the deſert that are now totally barren, confirm this opinion. Mr. Wood obſerves, that while he was there a whirlwind happened, which took up ſuch quantities of ſand as quite darkened the ſky; this ſand, therefore, might by degrees encroach upon the fertile environs of Palmyra, and reduce the number of inhabitants as it reduced their ſuſtenance, till the few wretched families only were left who found it difficult to furniſh food for Mr. Wood and his company, though they did not continue longer than a fortnight among them. It will alſo appear from hiſtory, that what is ſuppoſed to have happened here has happened at other places where ſuch an event was much leſs probable. On the ſea-coaſt in the neighbourhood of St. Pol de Leon, in Lower Bretagne, there is a conſiderable tract of land which before the year 1666 was inhabited, but which was rendered uninhabitable by a ſand, which encroaching every year covered it to the depth of above 20 feet. In the year 1718 it had advanced more than ſix leagues, and within one league of St. Pol; ſo that it was then thought probable that the town would of neceſſity be abandoned. This ſand is raiſed by the eaſt or north-eaſt wind, which drives it in clouds with great ſwiftneſs, and in a prodigious quantity. It was alſo atteſted by the captain of a ſhip, and all on board, that in the year 1719 there fell in the Atlantic Ocean, at 15 degrees of north latitude, and at the diſtance of more than eight leagues from any land, a ſhower of ſand,

ſome of which they produced, and depoſited in the academy at Paris.

The company with whom Mr. Wood, the publiſher of the Ruins of Palmyra, travelled, arrived at length at the end of the plain, where a ridge of barren hills, by which it was divided on the right and left, ſeemed to meet; between them there was a vale, through which an aqueduct formerly conveyed water to Palmyra. On each ſide of this vale they remarked ſeveral ſepulchres of the ancient Palmyrenes, which they had ſcarce paſſed, when the hills opening on a ſudden, they diſcovered ſuch piles of ruin as they had never ſeen. They were all of white marble; and beyond them, towards the Euphrates, was a wide level, ſtretching farther than the eye could reach, totally deſolate, without variety and without bounds. After having gazed ſome time upon this proſpect, which rather exceeded than fell ſhort of their expectations, they were conducted to one of the huts of the Arabs, of which there are about thirty in the court of the great temple. The inhabitants of both ſexes were well ſhaped; and the women, though very ſwarthy, had good features. They were veiled, but did not ſo ſcrupulouſly conceal their faces as the eaſtern women generally do. They paint the ends of their fingers red, their lips blue, and their eye-brows and eye-laſhes black. They had large rings of gold or braſs in their ears and noſtrils, and appeared to be healthy and robuſt. The walls of the city are flanked by ſquare towers, into which ſome ancient funeral monuments have been converted; but the walls are in moſt places level with the ground, and ſometimes not to be traced. It is, however, probable, by their general direction, that they included the great temple, and are three miles in circumference. The Arabs ſhowed a tract which was near ten miles in circumference, the ſoil of which was raiſed a little above the level of the deſert: this, they ſaid, was the extent of the old city; and that by digging in any part of it ruins were diſcovered.

Theſe ruins conſiſt of temples, palaces, and porticos of Grecian architecture, and lie ſcattered over an extent of ſeveral miles. They were accidentally diſcovered by ſome Engliſh travellers from Aleppo ſomewhat more than a century ago. By far the moſt remarkable of them is the Temple of the Sun, of which the ruins are ſpread over a ſquare of 220 yards. It was encompaſſed with a ſtately wall, built of large ſquare ſtones, and adorned with pilaſters within and without, to the number of 62 on a ſide. Within the court are the remains of two rows of very noble marble pillars 37 feet high, with their capitals of moſt exquiſite workmanſhip. Of theſe only 58 remain entire; but there muſt have been many more, for they appear to have gone round the whole court, and to have ſupported a double piazza. The walks on that ſide of the piazza which is oppoſite to the front of the caſtle ſeem to have been the moſt ſpacious and beautiful. At each end of this line are two niches for ſtatues, with their pedeſtals, borders, ſupporters, and canopies, carved with the utmoſt propriety and elegance. The ſpace within this incloſure, which is now filled with the dirty huts of the inhabitants, ſeems to have been an open court, in the middle of which ſtood the temple, encompaſſed with another row of pillars of a different order, and much taller, being 50 feet high; but of theſe only 16 remain. The whole ſpace contained within theſe pillars is 59 yards in length, and near 28 in breadth. The temple is no more than 33 yards in length, and 13 or 14 in breadth. It points north and ſouth; and exactly into the middle of the building, on the weſt ſide, is a moſt magnificent entry, on the remains of which are ſome vines and cluſters of grapes, carved in the moſt bold and maſterly imitation of nature that can be conceived. Juſt over the door are diſcerned a pair of wings, which extends its whole breadth: the body to which they belonged is totally deſtroyed; and it cannot now certainly be known whether it was that of an eagle or a cherub, ſeveral repreſentations of both being viſible on other fragments of the building. It is obſerved of the windows of this building, which were not large, that they were narrower at the top than below. The north end of the building is adorned with the moſt curious fret-work and bas-relief; and in the middle there is a dome or cupola about ten feet diameter, which appears to have been either hewn out of the rock, or moulded of ſome compoſition which by time is grown equally hard. North of this place is an obeliſk, conſiſting of ſeven large ſtones, beſides its capital and the wreathed work about it. It is about 50 feet high, and juſt above the pedeſtal is 12 feet in circumference. There was probably a ſtatue upon it, which the Turks, in their zeal againſt idolatry, deſtroyed. At about the diſtance of a quarter of a mile from this pillar, to the eaſt and weſt, are two others, beſides the fragment of a third; ſo that perhaps they were originally a continued row.

About 100 paces from the middle obeliſk, ſtraight forward, is a magnificent entry to a piazza, which is 40 feet broad, and more than half a mile in length, incloſed with two rows of marble pillars 26 feet high, and eight or nine feet in compaſs. Of theſe there ſtill remain 129; and, by a moderate computation, there could not originally have been leſs than 560. The upper end of the piazza was ſhut in by a row of pillars, ſtanding ſomewhat cloſer than thoſe on each ſide. A little to the left are the ruins of a ſtately building, which appears to have been a banqueting-houſe. It is built of better marble, and is finiſhed with yet greater elegance than the piazza. The pillars which ſupported it were of one entire ſtone, which is ſo ſtrong, that one of them which is fallen down has received no injury. It meaſures 22 feet in length, and in compaſs 8 feet 9 inches. In the weſt ſide of the piazza are ſeveral apertures for gates into the court of the palace. Each of theſe was adorned with four porphyry pillars, not ſtanding in a line with thoſe of the wall, but placed by couples in the front of the gate facing the palace, two on each ſide. Two of theſe only remain entire, and but one ſtanding in its place. They are 30 feet long and 9 in circumference. On the eaſt ſide of the piazza ſtand a great number of marble pillars, ſome perfect, but the greater part mutilated. In one place 11 are ranged together in a ſquare: the ſpace which they incloſe is paved with broad flat ſtones, but there are no remains of a roof. At a little diſtance are the remains of a ſmall temple, which is alſo without a roof, and the walls are much defaced. Before the entry, which looks to the ſouth, is a piazza ſupported by ſix pillars, two on each ſide of the door, and one at each end. The pedeſtals of thoſe in front have been filled with inſcriptions both in the Greek and Palmyrene languages, which are become totally illegible. Among theſe ruins are many ſepulchres: they are ranged on each ſide of a hollow way, toward the north part of the city, and extend more than a mile. They are all ſquare towers, four or five ſtories high. But though they are alike in form, yet they differ greatly in magnitude and ſplendour. The outſide is of common ſtone, but the floors and partitions of each ſtory are marble. There is a walk acroſs the whole building, juſt in the middle; and the ſpace on each hand is ſubdivided into ſix partitions by thick walls. The ſpace between the partitions is wide enough to receive the largeſt corpſe; and in theſe niches there are ſix or ſeven piled upon one another.

Many inſcriptions have been found at Palmyra, which have occupied much of the attention of the learned; and if any thing certain could be derived from them, there is no doubt but they would tend very conſiderably to the elucidation of ancient hiſtory. See Barthelemy's Reflections on the Palmyrene Alphabet, publiſhed at Paris in 1754; and *An Explication* of the Inſcriptions at Palmyra hitherto publiſhed, by John Swinton

of Chriſt church, Oxford. See alſo Phil. Tranſ. No. 217 and 218; the firſt volume of the Ancient Univerſal Hiſtory; and, above all, conſult the *Ruins of Palmyra, or Tadmor in the Deſert*, publiſhed by Mr. R. Wood, who, with M. Bouverie and Mr. Dawkins, travelled thither in 1751. The reſult of their obſervations was publiſhed in 1753, in the form of an atlas. The ruins of this once mighty and celebrated city are repreſented in 57 copper-plates, 16 by 12 inches, printed on imperial paper, and admirably executed. In a work like ours it is impoſſible to give theſe views at length; we ſhall content ourſelves then, after referring to this ſplendid work, with a view of the ruins of the Temple of the Sun, and of ſome other miſcellaneous ruins. See Plate 23.

Palmyra was viſited by Mr. Bruce before his journey into Abyſſinia; but, on account of the many publications concerning theſe celebrated ruins, he has declined ſaying much concerning them. He informs us, that, before he came in ſight of the ruins, he aſcended a hill of white gritty ſtone, in a very narrow winding road, ſuch as is called a paſs; but on getting up to the top, his eyes were ſtruck with the moſt ſtupendous ſight which, he believes, ever mortal ſaw. The whole plain below, which is very extenſive, was ſo covered with magnificent buildings, that they ſeemed to touch one another. All of them are finely proportioned, agreeably ſhaped, and compoſed of white ſtones, which at that diſtance appeared like marble. In taking a draught of theſe ruins Mr. Bruce divided the whole into ſix angular views, for which the ſituation of the place is very convenient. The columns are all uncovered to the very baſes, the ground on which they are built being hard and ſolid. The views he took were upon large paper; ſome of the columns being repreſented a foot long, and ſome of the figures in the fore-ground of the Temple of the Sun (a magnificent building which ſtood at one end of the town) being near four inches. Before he left Palmyra he obſerved its latitude with a reflecting quadrant of Hadley; but as the inſtrument was out of order, he could not determine it exactly. In his opinion, however, 33° 58′ is not far diſtant from truth. From ſuch obſervations as he could make on the longitude, he concluded it to be 37° 9′ E. from Greenwich. Mr. Wood makes the latitude 34° N.

From Palmyra Mr. Bruce proceeded to Baalbec, diſtant about 130 miles, where he found ruins ſtill more magnificent. The interior part of the great temple at this place, according to our author, ſurpaſſes any thing he had ſeen at Palmyra, or any where elſe. "All theſe views of Palmyra and Baalbec (ſays he) are now in the king's collection. They are the moſt magnificent offering, in their line, that ever was made by one ſubject to his ſovereign."—In the neighbourhood of Palmyra are ſome ſalt-marſhes; and to the adjacent country a trade is carried on in kelp from Tripoli in Syria. There are two Arab tribes, almoſt equally powerful; one of them, called Annecy, remarkable for the fineſt horſes in the world. They poſſeſs the country to the ſouth weſt, at the back of Libernus, about Bozrah, and ſouthward towards the borders of Arabia Petræa and Mount Horeb. The other tribe, named Mowalli, inhabit the plains eaſt from Damaſcus, to the Euphrates, and north to near Aleppo. They are fewer in number than the Anneey, but better ſoldiers; and their breed of horſes not greatly inferior.

Reſpecting the latitude and longitude there are ſtill various opinions: that which appears to be neareſt the truth is E. lon. 38. 50. N. lat. 33. 20. It ſtands about 50 leagues ſouth-eaſt of Aleppo, as much from Damaſcus, and 20 leagues weſt of the Euphrates.

PALPITATION *of the Heart*, an irregularity in the heart's motion, indicated by a fluttering ſenſation in the cheſt. It may be the effect of oſſification of the principal veſſels; but it ariſes moſt commonly from an irritability of the nervous ſyſtem, and is to be relieved by ſuch medicines as ſtrengthen and invigorate the conſtitution.

PALSGRAVE (John), a learned writer, who flouriſhed in the reigns of Henry VII. and Henry VIII. He received his grammatical learning at London, his native place. He ſtudied logic and philoſophy at Cambridge, at which univerſity he reſided till he became bachelor of arts; after which he went to Paris, where he ſpent ſeveral years in the ſtudy of philoſophy and other parts of learning, took the degree of maſter of arts, and acquired ſuch excellence in the French tongue, that in 1514, when a treaty of marriage was negotiated between Louis XII. king of France and the princeſs Mary, ſiſter of Henry VIII. of England, Mr. Palſgrave was appointed to be her tutor in that language. But Louis XII. dying ſoon after his marriage, Palſgrave attended his fair pupil back to England, where he taught the French language to many of the young nobility, obtained good preferment in the church, and was appointed by the king one of his chaplains in ordinary. In 1531 he ſettled at Oxford for ſome time, and the next year was incorporated maſter of arts there, as he had before been in Paris, and a few days after was admitted to the degree of bachelor of divinity. At this time he was much eſteemed for his learning; and, what is very remarkable, though an Engliſhman, he was the firſt who ever reduced the French tongue to grammatical rules, or that had attempted to fix it to any kind of ſtandard. This he undertook, and executed with great ingenuity and conſiderable ſucceſs, in a large work which he publiſhed in that language at London, entitled *L'Eclairciſſement de la Langue Francoiſe*, in three books in thick folio, 1530, to which he has prefixed a large Engliſh introduction; ſo that the French nation ſeems to ſtand originally indebted to England for that univerſality which their language at preſent poſſeſſes, and on which they ſo much pride themſelves. He tranſlated into Engliſh a Latin comedy called *Acolaſtus*, written by one Will. Fullonius, an author then living at Hagen in Holland.

At what time Mr. Palſgrave was born, or how long he lived, is not eaſy to ſay; yet, from the concurrence of ſeveral facts, he appears to have been much leſs than 60 years of age at the time of his publiſhing the above-mentioned tranſlation, which was in the year 1540.

PALSY. See Medicine.

PALUDAMENTUM, in Roman antiquity, a habit that differed but little from the chlamys, except that this laſt belonged chiefly to the lower claſs of people. It was worn by the officers and principal men among the Romans in time of war, who are therefore called *Paludati*; which diſtinguiſhed them from the common ſoldiers, who, becauſe they wore the ſagum, were called the *Sagati*. The paludamentum came down only to the navel, was open on the ſides, had ſhort ſleeves reſembling angels wings, and was generally white or red. It is ſometimes uſed to ſignify the common ſoldier's coat.

PALUS Meotis, the ancient name of a gulph between Europe and Aſia, to the north of the Black Sea, now called the *ſea of Zabach*, or *Aſoph*.

PALY, or Pale, in heraldry, is when the ſhield is divided into four or more equal parts, by perpendicular lines falling from the top to the bottom.

Paly *Bende*, is when the eſcutcheon is divided by perpendicular lines, which is *paly*; and alſo by diagonals, which is called *bendy*.

PAMBOUK, the Turkiſh name of the ruined city of Hierapolis. See Hierapolis.

PAMPELUNA, the capital of the kingdom of Navarre in Spain, with a very ſtrong citadel and rich biſhopric. It is handſome and populous, and carries on a great trade, ſeated in a very fertile plain, in E. lon. 1. 25. N. lat. 42. 42.

Pampeluna, a town of New Granada in South America, famous for its gold mines and numerous flocks of sheep. W. lon. 68. 30. N. lat. 6. 30.

PAMPHILUS, a celebrated painter of Macedonia, in the age of Philip. He was founder of the school for painting at Sicyon; and he made a law which was observed not only in Sicyon but all over Greece, that none but the children of noble and dignified persons should be permitted to learn painting. Apelles was one of his pupils.

PAMPHYLIA, the ancient name of a country of Natolia, in Asia, now called *Carimania* and *Cay-lay*, between Lycia and Cilicia, on the south coast, to the north of the Mediterranean sea.

PAN, the god of shepherds, hunters, and all country exercises. Such he is described by the Greek and Roman poets; but he bore a higher character among the earliest Greeks, as well as among the Egyptians; from whom his worship was borrowed by that people. In Egypt he was known by the name of *Mendes*, which, according to Jablonski, signifies fecundity. Hence his symbol was a living he-goat, the most salacious of all animals: "Hircum Mendesium colunt Ægyptii, eo quod virtuti prolificæ ac genitivæ consecratus est.—Nam animal hoc coitûs valde cupidum est." His principal temple was a magnificent building in a city of lower Egypt, called after his name. It is well known (see Polytheism) that from dedicating certain animals to certain gods, the Egyptians proceeded to consider the animals themselves as actuated by the divinities to whom they were sacred. Hence the origin of brute worship. In the temple of Mendes was kept a *he-goat*, to whom sacrifices of a very monstrous kind were offered. Herodotus, speaking of the præfecture of *Mendes*, says, Εγενετο δ' εν τω νομω τουτω επ' εμευ τουτο το τερας γυναικι τραγος εμισγετο αναφανδον. Τουτο ες επιδειξιν ανθρωπων απικετο. Our readers, learned and unlearned, will forgive us for not translating this passage, which contains, however, nothing that is not confirmed by the testimony of other writers; particularly of Plutarch, and Pindar as he is quoted by Strabo. The most wonderful circumstance of this monstrous sacrifice is, that it was made publicly in the presence of a great concourse of men! But to what divinity was it made? To a mere goat, or to some superior principle animating the goat? Doubtless to the latter; for it is said that the fair worshippers were of the first rank, and of unspotted fame; and that if they had borne a different character, the deity would not have accepted of their devotions.

The deity whom the Egyptians adored by the name of *Mendes*, was no other than the Soul of the Universe; for he was their most ancient god: and we are told by Plutarch, "That they took the first God and the Universe for one and the same thing." Hence his name Παν among the Greeks: not that either the Greeks or their masters in theology worshipped, as the first god, mere brute matter, but that spirit which they conceived to be coeternal with matter, and to animate all things, making them *one*. Thus Orpheus, who imported the Egyptian doctrine into Greece, declares that all things are one: and after him Parmenides, and other philosophers, taught, ἐν ειναι το παν, that "one is the universe;" and that "the universe is immoveable." That the ancient Grecian *Pan*, or the Egyptian *Mendes*, was not the corporeal world, as senseless and inanimate, but the whole system of things, animated and eternal, appears further from the following testimony of Macrobius. "Hunc deum Arcades colunt, appellantes τον της ὑλης κυριον, non sylvarum dominum, sed universæ substantiæ materialis dominatorem:—The Arcadians worship this god, calling him the lord of Hyle; *i. e.* not the lord of the woods, but the lord of all material substance." In the same manner, Pharnutus describes the Pan of the other Greeks, not as the mere corporeal world, but as the intellectual principle actuating it and presiding over it: and he adds, that "Pan was feigned to be lascivious, because of the multitude of *spermatic reasons* in the world, and the continual mixtures and generation of things."

The Egyptians, as we learn from Jablonski, had nearly the same notion with the Greeks of the spirit which they worshipped as the Soul of the Universe; only they gave to it both sexes. As the maker, governor, and bountiful father of universal nature, they considered it as a *male*, whose symbol was the *he-goat* of Mendes; and as a *female* it was adored by the name of *Isis*, to whom the *she-goat* was consecrated, though not held in such veneration as the male. From this view of the Egyptian creed, the sacrifice which we have mentioned appears no longer unaccountable. It was made to a god, believed to be the universal source of fecundity, and to whom, from the well-known character of the animal whom he was supposed to actuate, they had reason to believe it would be most acceptable.

The Greeks never worshipped their Pan by the emblem of a living goat; but they painted him with the lower parts of a goat, for a reason which shall be afterwards mentioned. How he came to degenerate among that people, from one of the *Dii majorum gentium*, or rather from the first principle of all things, to the rank of a dæmon or demi-god, we cannot pretend to say: but that such was his fate, is certain; for under this last character mention is made both of his birth and his death.

Whose son he was, is not agreed among them. Homer makes him the son of Mercury, and says he was called *Pan* from παν, *omne*, because he charmed all the gods with his flute; others say that he was the son of Demogorgon, and first invented the organ, of seven unequal reeds, joined together in a particular manner: Having on a time fought with Cupid, that god in spite made him fall in love with the coy nymph Syrinx, who, flying from him to the banks of Fadon, a river of Arcadia, at the instant prayers of the Nymphs was turned into a reed, as her name in Greek signifies; which the god grasping instead of her, made a pipe of it, and for his music was adored by the Arcadians. The most common opinion was, that he was the son of Mercury and Penelope. But *Nat. Comes*, out of *Duris Samius*, makes his birth scandalous, by saying he was called Παν, because begot by all Penelope's suitors. He was painted half-man half-goat, having large goats horns, a chaplet of pine on his red face, a pleasant laughter, with the feet and tail of a goat; a motley skin covering his body, with a crooked stick in one hand and his pipe in the other. See him nicely described by *Sil. Ital.* 13. 326. *& seq.* a sight enough to frighten women and children, yea, armed men too; for, when Brennus the Gaul was about to pillage the temple of Apollo at Delphos, he by night struck such a terror into his army, that he quitted his sacrilegious design: hence *Panici terrores*. Yet, as homely as he was, he pleased the goddess Luna, turning himself easily into a white ram, Virgil, *Georg.* iii. 392. *& deinceps*; and the nymph Dryope also, almost putting off his divinity, and turning shepherd for her sake. Neither was he displeasing to other nymphs, who are generally made dancing round about him to hear the charms of his pipe. The usual offerings made him were milk and honey, in shepherds' wooden bowls; also they sacrificed to him a dog, the wolf's enemy; whence his usual epithet is λυκαιος; and whence also his priests were called *Luperci*.

His festival was celebrated on February 15th by the Romans, brought into Italy by Evander the Arcadian, and revived afterwards by Romulus, in memory of his preserver. He was also called by the Romans *Inuus*, ab ineundo. *Vid.* Liv. i. 5. Macrob. Sat. i. 22. and Serv. in Virg. Æn. vi. 775. The ancients, by giving so many adjuncts and attributes to this idol, as we have observed above, seem to have designed him for the symbol of the universe; his upper parts being human, because the upper part of the world is fair, beautiful, smiling, like his

face; his horns ſymbolize the rays of the ſun and of the moon; his red face, the ſplendor of the ſky; the ſpotted ſkin wherewith he is clothed, the ſtars which beſpangle the firmament; the roughneſs of his lower parts, beaſts and vegetables; his goat's feet, the ſolidity of the earth; his pipe, compact of ſeven reeds, the ſeven planets, which they ſay make the harmony of the ſpheres: his crook, bending round at the top, the years circling in one another. *Serv. Interpr.*

PANACEA, among phyſicians, denotes an univerſal medicine, or a remedy for all diſeaſes; a thing impoſſible to be obtained.

PANADA, a diet conſiſting of bread boiled in water to the conſiſtence of pulp, and ſweetened with a little ſugar.

PANAMA, the capital city of the province of Darien in South America, where the treaſures of gold and ſilver, and the other rich merchandiſes of Peru, are lodged in magazines till they are ſent to Europe. W. lon. 82. 15. N. lat. 8. 57. When Guzman firſt touched at this place in 1514, it conſiſted entirely of fiſhermen's huts. Orius d'Avila ſettled a colony here in a few years after, and in 1521 it was conſtituted a city by the emperor Charles V. with the proper privileges. In 1670 it was ſacked and burnt by John Morgan, an Engliſh adventurer, who had the preceding year taken Porto Bello. This misfortune induced the inhabitants to remove the city to its preſent ſituation, diſtant about a league from the place where it ſtood before. For the greater ſecurity, the new city was incloſed by a free-ſtone wall, and the houſes were built of ſtone and brick. Since that time ſeveral baſtions have been added, and now there is always a complete garriſon maintained, and the walls are mounted with large cannon. But all theſe precautions could not ſave this city from another misfortune; it was entirely conſumed by fire in the year 1737. After this accident it was again rebuilt, in the manner as it now ſtands, with neat elegant houſes, but not magnificent. The inhabitants are rather independent in their fortunes than rich; there are few of them opulent, and ſcarce any in a ſtate of poverty. As to the harbour, it is convenient, and well ſecured againſt ſtorms by a number of ſurrounding iſlands, and is capable of containing the largeſt fleets. Here the royal audience is ſeated, at which the governor of Panama reſides; for which reaſon this city is commonly deemed the capital of the province.

This place, a little while after it was founded, became the capital of the kingdom of Terra Firma. Some hopes were at firſt entertained from the three provinces of Panama, Darien, and Veragua, which compoſed it; but this proſperity vaniſhed inſtantaneouſly. The ſavages of Darien recovered their independence; and the mines of the two other provinces were found to be neither ſufficiently abundant, nor of an alloy good enough to make it worth while to work them. Five or ſix ſmall boroughs, in which are ſeen ſome Europeans quite naked, and a very ſmall number of Indians who have come to reſide there, form the whole of this ſtate, which the Spaniards are not aſhamed of honouring with the great name of kingdom. It is in general barren and unwholeſome, and contributes nothing to trade but pearls.

The pearl-fiſhery is carried on in the iſlands of the gulph. The greateſt part of the inhabitants employ ſuch of their negroes in it as are good ſwimmers. Theſe ſlaves plunge and replunge in the ſea in ſearch of pearls, till this exerciſe has exhauſted their ſtrength or their ſpirits.

Every negro is obliged to deliver a certain number of oyſters. Thoſe in which there are no pearls, or in which the pearl is not entirely formed, are not reckoned. What he is able to find beyond the ſtipulated obligation, is conſidered as his indiſputable property: he may ſell it to whom he pleaſes; but commonly he cedes it to his maſter at a moderate price.

Sea monſters, which abound more about the iſlands where pearls are found than on the neighbouring coaſts, render this fiſhing dangerous. Some of theſe devour the divers in an inſtant. The manta fiſh, which derives its name from its figure, ſurrounds them, rolls them under its body, and ſuffocates them. In order to defend themſelves againſt ſuch enemies, every diver is armed with a poniard: the moment he perceives any of thoſe voracious fiſh, he attacks them with precaution, wounds them, and drives them away. Notwithſtanding this, there are always ſome fiſhermen deſtroyed, and a great number crippled.

The pearls of Panama are commonly of a very fine water. Some of them are even remarkable for their ſize and figure: theſe were formerly ſold in Europe. Since art has imitated them, and the paſſion for diamonds has entirely ſuperſeded or prodigiouſly diminiſhed the uſe of them, they have found a new mart more advantageous than the firſt. They are carried to Peru, where they are in great eſtimation.

This branch of trade has, however, infinitely leſs contributed to give reputation to Panama, than the advantage which it hath long enjoyed of being the mart of all the productions of the country of the Incas that are deſtined for the old world. Theſe riches, which are brought hither by a ſmall fleet, were carried, ſome on mules, others by the river Chagre, to Porto Bello, that is ſituated on the northern coaſt of the iſthmus which ſeparates the two ſeas. See DARIEN.

PANARI, one of the Lipari iſlands, lying in the Tuſcan Sea. It is only five miles in circumference, and the ſoil is barren. E. lon. 15. 0. N. lat. 39. 0.

PANARO, a river of Italy, which riſes in the Apennines, croſſes the valley of Frignano, and running on the confines of the Modeneſe and Bologneſe, waters Fenal, and falls into the Po at Bondeno, ten miles above Ferrara.

PANATHENÆA, *πανάθηναια*, in Grecian antiquity, an ancient Athenian feſtival, in honour of Minerva the protectreſs of Athens, and called *Athenæa*. Harpocration and Suidas refer the inſtitution of this feſtival to Erichthonius IV. king of Athens, who lived before Theſeus. Theodoret alone ſays the feaſt was eſtabliſhed by Orpheus. Be this as it will, till Theſeus it was never a particular feaſt of the city of Athens, and was called ſimply *Athenæa*; but that prince uniting all the people of Attica into one republic, they afterwards all aſſiſted at the feaſt; whence the name *Panathenæa*, i. e. the feaſt of all Attica. In effect all Attica was preſent; and each people ſent a bullock for the ſacrifices, and for the entertainment of the vaſt multitude of people aſſembled.

There were two feſtivals under this denomination, the greater and the leſſer. The greater panathenæa were exhibited every five years; the leſs every three, or, according to ſome writers, annually. Though the celebration of neither, at firſt, employed more than one day; yet in after times they were protracted for the ſpace of many days, and ſolemnized with greater preparations and magnificence than at their firſt inſtitution.

The ceremonies were the ſame in the great and the little panathenæa; excepting for a banner, wherein the actions of the goddeſs were repreſented in embroidery, performed by maids, with the names of thoſe who had diſtinguiſhed themſelves in the ſervice of the republic; which was only borne at the greater.

Prizes were eſtabliſhed there for three different kinds of combat: the firſt conſiſted of foot and horſe races; the ſecond, of athletic exerciſes; and the third, of poetical and muſical conteſts. Theſe laſt are ſaid to have been inſtituted by Pericles. Singers of the firſt claſs, accompanied by performers on the flute and cithara, exerciſed their talents here upon ſubjects preſcribed by the directors of theſe exhibitions.

PANAX, GINSENG: a genus of the dicœcia order, belonging to the polygamia claſs of plants. There are five ſpecies of this plant. 1. Quinqueſolium. 2. Trifolium. 3. Fruticoſum. 4. Arborea. 5. Spinoſa. See Pl. 25.

The firſt and ſecond are natives of North America. The quinquefolium is generally believed to be the ſame with the Tartarian ginſeng; the figures and deſcriptions of that plant which have been ſent to Europe by the miſſionaries agreeing perfectly with the American plant. This hath a jointed, fleſhy, and taper root, as large as a man's finger, frequently divided into two ſmaller fibres downwards. The ſtalk riſes near a foot and an half high, and is naked at the top, where it generally divides into three ſmaller foot ſtalks, each ſuſtaining a leaf compoſed of five ſpear-ſhaped lobes, ſawed on their edges: they are of a pale green, and a little hairy. The flowers grow on a ſlender foot-ſtalk, juſt at the diviſion of the foot-ſtalks which ſuſtain the leaves, and are formed into a ſmall umbel at the top: they are of an herbaceous yellow colour, compoſed of ſmall yellow petals, which are recurved. Dr. Woodville, in his *Medical Botany*, ſays they are white; that they are produced in a roundiſh terminal umbel, and are hermaphrodite or male on ſeparate plants. The former (ſee the Plate) ſtand in cloſe ſimple umbels: the involucrum conſiſts of ſeveral ſmall, tapering, pointed, permanent leaves; the proper calyx is tubular, and divided at the rim into five ſmall teeth: the corolla conſiſts of five petals, which are ſmall, oval, equal, and reflexed: the filaments are five, ſhort, and furniſhed with ſimple antheræ: the germen is roundiſh, placed below the corolla, and ſupports two ſhort erect ſtyles, crowned by ſimple ſtigmata: the fruit is an umbilicated two-celled berry, each containing a ſingle irregularly heart-ſhaped ſeed. The flowers appear in the beginning of June; and are ſucceeded by compreſſed, heart-ſhaped berries, which are firſt green, but afterwards turn red; incloſing two hard, compreſſed, heart-ſhaped ſeeds, which ripen in the beginning of Auguſt. The ſecond ſort grows naturally in the ſame countries: but Mr. Miller never ſaw more than one plant, which was ſent to him from Maryland, and did not live beyond the firſt year; being planted in a dry ſoil, in a very dry ſeaſon. The ſtalk was ſingle, and did not riſe more than five inches in height, dividing into three foot ſtalks, each ſuſtaining a trifoliate leaf, whoſe lobes were longer, narrower, and deeper indented on their edges, than the former. The flower-ſtalk roſe from the diviſions of the foot-ſtalk of the leaves; but, according to Mr. Miller, before the flowers opened the plant decayed.

Ginſeng was formerly ſuppoſed to grow only in Chineſe Tartary, affecting mountainous ſituations, ſhaded by cloſe woods: but it has now been long known that this plant is alſo a native of North America, whence M. Sarraſin tranſmitted ſpecimens of it to Paris in the year 1704; and the ginſeng ſince diſcovered in Canada, Pennſylvania, and Virginia, by Lafiteau, Kalm, Bartram, and others, has been found to correſpond exactly with the Tartarian ſpecies; and its roots are now regularly purchaſed by the Chineſe, who conſider them to be the ſame as thoſe of eaſtern growth, which are known to undergo a certain preparation, whereby they aſſume an appearance ſomewhat different. For it is ſaid that in China the roots are waſhed and ſoaked in a decoction of rice or millet-ſeed, and afterwards expoſed to the ſteam of the liquor, by which they acquire a greater firmneſs and clearneſs than in their natural ſtate. The plant was firſt introduced into England in 1720 by that induſtrious naturaliſt Peter Collinſon. They thrive in thoſe places where it hath a light ſoil and ſhady ſituation, and will produce flowers and ſeeds; but the latter, though in appearance ripe and perfect, will not produce any new plants, as Mr. Miller ſays he has repeatedly made the experiment, and waited for them three years without diſturbing the ground. There are many good ſpecimens in the Royal Botanic Garden at Kew.

The dried root of ginſeng, as imported here, is ſcarcely the thickneſs of the little finger, about three or four inches long, frequently forked, tranſverſely wrinkled, of a horny texture, and both internally and externally of a yelloviſh white colour. On the top are commonly one or more little knots, which are the remains of the ſtalks of the preceding years, and from the number of which the age of the root is judged of. "To the taſte it diſcovers a mucilaginous ſweetneſs, approaching to that of liquorice, accompanied with ſome degree of bitteriſhneſs, and a ſlight aromatic warmth, with little or no ſmell. It is far ſweeter, and of a more grateful ſmell, than the roots of fennel, to which it has by ſome been ſuppoſed ſimilar; and differs likewiſe remarkably from thoſe roots in the nature and pharmaceutic properties of its active principles, the ſweet matter of the ginſeng being preſerved entire in the watery as well as the ſpirituous extract, whereas that of fennel roots is deſtroyed or diſſipated in the inſpiſſation of the watery tincture. The ſlight aromatic impregnation of the ginſeng is likewiſe in good meaſure retained in the watery extract, and perfectly in the ſpirituous."

The Chineſe aſcribe extraordinary virtues to the root of ginſeng; and have long conſidered it as a ſovereign remedy in almoſt all diſeaſes to which they are liable, having no confidence in any medicine unleſs in combination with it. It is obſerved by Jartoux, that the moſt eminent phyſicians in China have written volumes on the medicinal powers of this plant. We know, however, of no proofs of the efficacy of ginſeng in Europe; and from its ſenſible qualities we judge it to poſſeſs very little power as a medicine. Dr. Cullen ſays, "We are told that the Chineſe conſider ginſeng as a powerful aphrodiſiac; but I have long neglected the authority of popular opinions, and this is one inſtance that has confirmed my judgment. I have known a gentleman, a little advanced in life, who chewed a quantity of this root every day for ſeveral years, but who acknowledged he never found his faculties in this way improved by it." Lewis tells us that a dram of the ginſeng root may be ſliced and boiled in a quarter of a pint of water to about two ounces; then a little ſugar being added, it may be drank as ſoon as it is cool enough. The doſe muſt be repeated morning and evening; but the ſecond doſe may be prepared from the ſame portion of root which was uſed at firſt, for it will always admit of being twice boiled.

PANAY, an iſland of Aſia, and one of the Philippines, lying between thoſe of Paraguay and Negro. It is 250 miles in circumference, and is the moſt populous and fertile of them all. It is watered by a great number of rivers and brooks, and produces a great quantity of rice. Its ſhape is triangular. The names of its principal capes are Potol, Naſo, and Bulacabi. The coaſt from Bulacabi to Potol lies eaſt and weſt; from Potol to Naſo, north and ſouth; from Bulacabi to Iloilo, another cape, leſs than the great ones, is alſo north and ſouth; from Iloilo to cape Naſo, eaſt and weſt. The middle of the iſland is in the latitude of ten degrees. On the north ſide, almoſt in the middle between the two capes of Potol and Bulacabi, the famous river Panay falls into the ſea; and the mouth of the harbour is covered by a ſmall iſland called *Lutaya*, in which port the Spaniards had a ſafe retreat before they diſcovered and conquered Manilla and Cavité. The iſland contains about 16,360 tributary Indians, partly belonging to the king and partly to particular encomienderos or lords; but they all pay in rice, the iſland producing 100,000 buſhels, Spaniſh meaſure, and but little other grain. The inhabitants are ſtout, luſty, and induſtrious farmers, and expert huntſmen, the country being full of wild boars and deer. The women make cloth of ſeveral colours. There are in the iſland 14 pariſhes, belonging to the fathers of the order of St. Auguſtin, three benefices of ſecular prieſts, and formerly one college of the ſociety of Jeſus, where they adminiſter the ſacraments to the garriſon of Iloilo. Beſides the tributary Indians, there are here thoſe

blacks the Spaniards call *Negrilloes*, who were the firſt inhabitants of the iſland. On the mountains there are wild boars, deer, and good timber. It has alſo in it the port of St. Anne, three leagues from Iloilo.

PANCARPUS, in Roman antiquity, a kind of ſhow which the Roman emperors frequently exhibited to the people. The word is formed from the Greek *παν all*, and *καρπος fruit*. Whence the name was alſo given by the Athenians to a ſacrifice wherein all kinds of fruits were offered. In this ſpectacle, the Circus, being all ſet over with large trees, repreſented a foreſt, into which the beaſts being let from the dens under-ground, the people, at a ſign given by the emperor, purſued, ſhot, and killed all they could lay hold of, which they afterwards carried away, to regale upon at home. The beaſts uſually given on theſe occaſions were boars, deers, oxen and ſheep. Caſaubon, Cujas, Pithou, &c. make the pancarpus and ſylva the ſame thing; Salmaſius will have them different. The ſylva, according to him, was ſuch a diverſion as that above deſcribed; but the pancarpus a combat, wherein robuſt people, hired for that purpoſe, fought with wild beaſts; which opinion he confirms from Caſſian, Juſtinian, Claudian, Firmicus, Manilius, and Caſſiodorus.

PANCIROLLUS (Guy), a famous lawyer of Rhegium, was a perſon of an excellent genius, which he cultivated with the greateſt care in the principal univerſities of Italy; and was afterwards ordinary profeſſor of law at Padua. Philibert Emanuel, duke of Savoy, invited him to his univerſity in 1571, where he compoſed his ingenious treatiſe *De rebus inventis et deperditis*. But the air of Turin not agreeing with him, he there loſt an eye; and, for fear of loſing the other, returned to Padua, where he died in 1591.

PANCRAS, a town of England, in the county of Middleſex, on the north-weſt ſide of London, in the highway to Kentiſh-town. Its church is one of the prebends of St. Paul's, of which cathedral ſome call it the mother, it being thought to be as old as that church even in the reign of Queen Elizabeth, when it is repreſented as weather-beaten and ſtanding alone, without any company, though it had formerly many buildings about it. In its church-yard lie many Roman Catholics. At a public-houſe on the ſouth ſide of the church is a medicinal ſpring.

PANCRATIUM (compounded of *παν all*, and *κρατεω I overcome*), among the ancients, a kind of intermixed exerciſe, conſiſting of the luƈta or wreſtling, and the boxing or pugilate: but it differs in this, that as the athletæ are not to ſeize the body, their hands are not armed with gauntlets, and give leſs dangerous blows. The *pancratium* was the third gymnaſtic exerciſe, and was not introduced till long after the others. The people who were engaged in theſe exerciſes were called *pancratiaſtæ*; which name was alſo given to ſuch as did not confine themſelves to one exerciſe, but ſucceeded in ſeveral different ones. Barthelemi, in his Travels of Anacharſis, gives us a ſhort account of one of thoſe at which he ſuppoſes him to have been preſent, in theſe words: "The action was ſoon terminated: a Sicyonian named *Soſtratus*, a champion celebrated for the number of prizes he had won, and the ſtrength and ſkill which had procured them, had arrived the preceding day. The greater part of the combatants yielded up all pretenſions to the crown as ſoon as he appeared, and the others on the firſt trial; for in thoſe preliminary eſſays, in which the athletæ try their ſtrength by taking each others hands, he ſqueezed and twiſted the fingers of his adverſaries with ſuch violence as inſtantly to decide the victory in his favour."

PANCREAS, in anatomy. See Anatomy.

PANDA, in mythology, a goddeſs who was invoked and honoured as the protectreſs of travellers and navigators. The goddeſs of peace was alſo called *Pandar*, becauſe ſhe opened the gates of cities which were ſhut in time of war. According to Varro. Panda is a ſurname of Ceres, derived *a pane dando*, becauſe ſhe gave bread to mankind.

PANDATARIA (Suetonius, Pliny, Strabo); Pandateria (Mela, Tacitus): an iſland in the Tuſcan ſea; a place of baniſhment for the more illuſtrious exiles. Hither Julia, the daughter of Auguſtus, was baniſhed for her incontinence. To this iſland Tiberius baniſhed Agrippina, his daughter-in-law (Suetonius). It was the place of confinement of Octavia, the daughter of Clodius, married to Nero; a ſight that affected every eye (Tacitus). Now *Santa Maria*, ſituated between Pontia and Iſchia (Holſtenius).

PANDECTS, pandectæ, in juriſprudence, the digeſt or collection, made by Juſtinian's order, of 534 deciſions or judgments of the ancient lawyers, on ſo many queſtions occurring in the civil law; to which that emperor gave the force and authority of law, by the epiſtle prefixed to them. The word is Greek, Πανδεκται, compounded of *παν* "all," and *δεχομαι capio*, "I take;" *i. e.* a compilation, or a book containing all things. Though others, as Bartoli, will have it formed from *παν*, and *δεχομαι*; as if theſe books contained the whole doctrine of the law. The pandects conſiſt of 50 books, and make the firſt part of the body of the civil law. They were denoted by two *ππ*; but the copyiſts taking thoſe *ππ* for *ff*, the cuſtom aroſe of quoting them by *ff*.

In the year 1137, the pandects of Juſtinian, which had been brought by an Amalfitan merchant from the Eaſt, fell into the hands of the Piſans. Angelus Politianus believes this copy to be that which had been compiled by order of the emperor. However that be, it is certain that all other copies are taken from it, as being the moſt ancient. The Piſans having obtained their requeſt from the emperor, carried the volumes to Piſa, and for near three centuries they were known by the name of the *Pandectæ Piſanæ*. But, about the year 1416, Piſa being taken by the Florentines, they were tranſported from thence to Florence, where they are now preſerved in the library of the Medici, and known by the name of the *Pandectæ Florentinæ*. Some authors allege, that Lotharius ordained by an edict that the Pandects ſhould be publicly read and explained at Bologna, and pleaded in the tribunals; but Corringius and Lindenbrogius fully refute their opinion. Papias extends the denomination of *Pandects* to the Old and New Teſtament.

There are alſo Pandecta *Medicinæ*, "Pandects of Medicine;" a kind of dictionary of things relating to medicine, compiled by Mat. Sylvaticus of Mantua, who lived about the year 1297. Leunclavius has publiſhed *Pandects of Turkey*; and biſhop Beveridge, *Pandecta canonum*.

PANDICULATION, a ſtretching; or that violent and tenſive motion of the ſolids which uſually accompanies the act of yawning.

PANDORA, in fabulous hiſtory, a woman formed by Prometheus, to whom each of the gods gave ſome perfection. Venus beſtowed upon her beauty; Pallas, wiſdom; Juno, riches; Apollo, muſic; and Mercury, eloquence: but Jupiter being diſpleaſed at Prometheus for having ſtolen fire from heaven to animate the maſs he had formed, gave Pandora a box, which ſhe was ordered not to open; and then ſent her to the earth with this box, in which were incloſed age, diſeaſes, peſtilence, war, famine, envy, diſcord, and all the evils and vices that could afflict mankind. This fatal box was opened by Epimetheus, Prometheus's brother, when inſtantly all the diſeaſes and miſchiefs with which it was filled ſpread over the earth, and Hope alone remained at the bottom. Heſiod ſays ſhe was the firſt woman.

PANDOURS, are Hungarian infantry: they wear a looſe garment fixed tight to their bodies by a girdle, with great ſleeves, and large breeches hanging down to their ancles. They

uſe fire-arms, and are excellent markſmen: they have alſo a kind of ſabre near four feet long, which they uſe with great dexterity.

PANDOSIA (Livy, Juſtin, Strabo), an inland town of the Brutti, and a place of ſtrength on the river Acheron, where Alexander of Epirus, deceived by the oracle of Dodona, met his fate and periſhed. Now *Mendicino* (Holſtenius). Another of Epirus (Strabo); ſituated on the river Acheron (Livy); which Alexander of Epirus was adviſed to avoid as fatal, but which he met with in Italy. This laſt is ſaid to have been the reſidence of the Chaotrian kings (Strabo).

PANDURA, or PANDORON, a muſical inſtrument, uſed among the ancients, reſembling the lute. The word is ſaid to be formed from the Greek παν δωρον, *i. e.* "all gifts, all ſorts of gifts." Iſidore derives the name from its inventor *Pandorus*; others from *Pan*, to whom they attribute its invention, as well as that of the flute. It has the ſame number of ſtrings with the lute; but they are of braſs, and of conſequence give a more agreeable ſound than thoſe of the lute. Its frets are of copper, like thoſe of the ciſtre; its back is flat, like that of the guitar; and the rims of its table, as well as its ribs, are cut in ſemicircles. Du Cange obſerves, that Varro, Iſidore, and others of the ancients, mention it as having only three ſtrings; whence it is ſometimes alſo ſpoken of under the denomination τριχορδον, *trichordum*.

PANEAS (Pliny, Joſephus); the apparent ſpring from which the Jordan riſes, on the extremity of the weſt ſide of the Trachonitis (Pliny).

PANEAS (Coins, Pliny, Joſephus), the name of a diſtrict adjoining to the ſpring *Paneas*, with a cognominal town, either enlarged and adorned, or originally built, by Philip ſon of Herod, and called *Cæſarea* by Joſephus; and in St. Matthew, *Cæſarea of Philip*; with a temple erected to Auguſtus his benefactor, who conferred the Trachonitis upon him (Coin). It was afterwards called *Neronias*, in honour of Nero (Joſephus).

PANEGYRIC, an oration in praiſe of ſome extraordinary thing, perſon, or virtue. The name is Greek, πανηγυρις; formed of παν "all," and αγειρω "I aſſemble;" becauſe anciently held in public and ſolemn aſſemblies of the Greeks, either at their games, their feaſts, fairs, or religious meetings. To make their panegyrics the more ſolemn, the Greeks uſed to begin with the praiſes of the deity in whoſe honour the games, &c. were celebrated; then they deſcended to the praiſe of the people or country where they were celebrated; then to the princes or magiſtrates who preſided at them; and at length to the champions, eſpecially the conquerors, who had gained the prizes in them.

PANEGYRICUM, in church hiſtory, an eccleſiaſtical book, uſed by the Greek church, containing the panegyrical orations of various authors on the ſolemnities of Jeſus Chriſt and the ſaints. It is found in MS. in moſt churches, but is not the ſame in all; each church having its particular ſaints; and the compilers of this kind of books uſually ſuited their collections to the taſte of their own devotion. They are diſpoſed according to the order of months, and frequently conſiſt of twelve volumes, anſwering to the twelve months of the year. Among the principal authors of this work are Athanaſius, Cyrill, Baſil, Chryſoſtom, &c.

PANEL *(Panella, Panellum)*, according to Sir Edward Coke, denotes "a little part;" but the learned Spelman ſays, that it ſignifies *ſchedula vel pagina*, "a ſchedule or roll;" as a panel of parchment, or a counterpane of an indenture: but it is uſed more particularly for a ſchedule or roll, containing the names of ſuch jurors as the ſheriff returns to paſs upon any trial. And the *impanelling* a jury is the entering their names in a panel or little ſchedule of parchment.

PANGOLIN, a ſpecies of the manis peculiar to Hindoſtan. See pl. 27. It is certainly a remarkable variety, if not a different ſpecies, of the pangolin of Buffon. According to a paper in the firſt volume of the Aſiatic Reſearches, "it has hardly any neck; and though ſome filaments are diſcernible between the ſcales, they can ſcarce be called briſtles. But the principal difference is in the tail; that of Buffon's animal being long, and tapering almoſt to a point; while that of ours is much ſhorter, ends obtuſely, and reſembles in form and flexibility the tail of a lobſter. In other reſpects it ſeems to have all the characters of Buffon's pangolin; a name derived from that by which the animal is diſtinguiſhed in Java, and conſequently preferable to Manis, or Pholidotus, or any other appellation deduced from an European language. We are told that the Malabar name of this animal is *alungu*. The natives of Bahar call it *bajar-cit*, or, as they explain the word, *ſtone-vermine*; and in the ſtomach of the animal before us was found about a teacupful of ſmall ſtones, which had probably been ſwallowed for the purpoſe of facilitating digeſtion; but the name alludes, we believe, to the hardneſs of the ſcales: for *vajracita* means in Sanſcrit the *diamond* or *thunderbolt reptile*; and *vajra* is a common figure in the Indian poetry for any thing exceſſively hard. The vajracita is believed by the Pandits to be the animal which gnaws their ſacred ſtone called *ſalgramaſila*: but the pangolin has apparently no teeth; and the ſalgrams, many of which look as if they had been worm-eaten, are perhaps only decayed in part by expoſure to the air.

"This animal had a long tongue ſhaped like that of a cameleon; and if it was nearly adult, as we may conclude from the young one found in it, the dimenſions of it were much leſs than thoſe which Buffon aſſigns generally to his pangolin; for he deſcribes its length as ſix, ſeven, or eight feet, including the tail, which is almoſt, he ſays, as long as the body when it has attained its full growth: whereas ours is but 34 inches long from the extremity of the tail to the point of the ſnout, and the length of the tail is 14 inches; but, excluſively of the head, which is five inches long, the tail and body are indeed nearly of the ſame length; and the ſmall difference between them may ſhow, if Buffon be correct in this point, that the animal was young. The circumference of its body in the thickeſt part is 20 inches, and that of the tail only 12. There are on each foot five claws, of which the outer and inner are ſmall when compared with the other three. There are no diſtinct toes; but each nail is moveable by a joint at its root. This creature is extremely inoffenſive. It has no teeth, and its feet are unable to graſp. Hence it would appear, that nature, having furniſhed it with a coat of mail for its protection, has, with ſome regard to juſtice, denied it the powers of acting with hoſtility againſt its fellow creatures. The nails are well adapted for digging in the ground; and the animal is ſo dexterous in eluding its enemies by concealing itſelf in holes and among rocks, that it is extremely difficult to procure one.

"The upper jaw is covered with a croſs cartilaginous ridge, which, though apparently not at all ſuited to any purpoſes of maſtication, may, by increaſing the ſurface of the palate, extend the ſenſe of taſte. The œſophagus will admit a man's forefinger with eaſe. The tongue at the bottom of the mouth is nearly about the ſize of the little finger, from whence it tapers to a point. The animal at pleaſure protrudes this member a great way from the mouth. The tongue ariſes from the enſiform cartilage and the contiguous muſcles of the belly, and paſſes in form of a round diſtinct muſcle from over the ſtomach, through the thorax, immediately under the ſternum; and interior to the windpipe in the throat. When diſſected, the tongue could be eaſily elongated ſo as to reach more than the length of the animal excluſive of its tail. There is a cluſter of ſalivary glands ſeated around the tongue, as it enters the mouth. Theſe will neceſſarily be compreſſed by the action of

the tongue; ſo as occaſionally to ſupply a plentiful flow of their ſecretion.

"The ſtomach is cartilaginous, and analogous to that of the gallinaceous tribe of birds. When diſſected, it is generally found full of ſmall ſtones and gravel, which in India are almoſt univerſally calcareous. The inner ſurface of the ſtomach is rough to the feel, and formed into folds, the interſtices of which are filled with a frothy ſecretion. The guts are filled with a ſandy pulp, in which, however, are interſperſed a few diſtinct ſmall ſtones. No veſtiges of any animal or vegetable food have been traced in the whole primæ viæ. The gall-bladder is commonly diſtended with a fluid reſembling in colour and conſiſtence the dregs of beer. It is a viviparous animal.

"From the contents of its ſtomach and primæ viæ, the pangolin has been ſuppoſed by Mr. Burt, a very eminent ſurgeon in Bengal, to derive its nouriſhment from mineral ſubſtances. Though we have perhaps no clear idea of the manner in which vegetables extract their nouriſhment from earth, yet the fact being ſo, it may not be unreaſonable to ſuppoſe, that ſome animal may derive nutriment by a proceſs ſomewhat ſimilar." See MANIS.

PANGONIA, in natural hiſtory, the name of a genus of cryſtals, conſiſting of ſuch as are compoſed of many angles. The word is derived from πολυς *numerous*, and γονυ *an angle* or *bending*. The bodies of this genus are ſingle-pointed or imperfect cryſtals, compoſed of dodecangular or twelve-planed columns, terminated by twelve-planed pyramids, and the whole body therefore made up of twenty-four planes. Of this genus there are only three known ſpecies.

PANIC, denotes an ill-grounded terror or fright. Polyænus ſays, it originates from *Pan*, one of the captains of Bacchus, who with a few men put a numerous enemy to rout, by a noiſe which his ſoldiers raiſed in a rocky valley, favoured with a great number of echoes. This ſtratagem making their number appear far greater than it was, the enemy quitted a very commodious encampment, and fled. Hence all ill-grounded fears have been called *panics*, or *panic-fears*; and it was this that gave occaſion to the fable of the nymph Echo's being beloved by the god Pan. Others derive the origin of it hence; that in the wars of the Titans againſt the gods, Pan was the firſt who ſtruck terror into the hearts of the giants. Theon on Aratus ſays, he did it by means of a ſea-ſhell, which ſerved him for a trumpet, whereof he was the inventor.

PANICLE, in botany, denotes a ſoft woolly beard, on which the ſeeds of ſome plants hang pendulous; as in millet, reeds, and hay.

PANICUM, in botany; a genus of the digynia order, belonging to the triandria claſs of plants. The calyx is trivalved; the third valvule being very ſmall. The *ſpecies* are, 1. Polyſtachion; 2. Verticillatum; 3. Glaucum; 4. Viride; 5. Italicum; 6. Crus corvi; 7. Crus galli; 8. Coronum; 9. Briſoides; 10. Dimidiatum; 11. Hirtellum; 12. Conglomeratum; 13. Sanguinale; 14. Dactylon; 15. Filiforme; 16. Lineare; 17. Diſtachion; 18. Elatum; 19. Compoſitum; 20. Halvoium; 21. Dichotomum; 22. Ramoſum; 23. Coloratum; 24. Repens; 25. Miliaceum; 26. Capillare; 27. Groſſarium; 28. Latifolium; 29. Clandeſtinum; 30. Arborefcens; 31. Curvatum; 32. Virgatum; 33. Patens; 34. Brevifolium; 35. Divaricatum.

In this place it is proper to take notice of the Guinea-graſs. By ſome authors it is claſſed as a panicum; but by expert botaniſts, who have lately examined the plant, it is the *holcus polygamum*. It is a native of Africa, and brought from thence to the Weſt Indies. About 70 years ago Mr. John Ellis got ſome birds from the coaſt of Guinea, and with them ſome ſeeds for their ſupport: The birds dying ſoon after, the ſeeds were thrown out of doors as uſeleſs. From theſe ſeeds a new luxuriant graſs ſprung up, which attracted the notice of Mr. Ellis and his family. He had a horſe, and afterwards a cow, brought where it was; both of them ate of it greedily. It was then tranſplanted into a garden, and gradually cultivated: at this day it is common all over Jamaica; and next to the ſugar-cane and plantain-tree, the greateſt bleſſing to that iſland. It agrees with every ſoil and ſituation; and in many of the rocky and barren parts of Jamaica, which formerly could not ſupport a goat, may now be ſeen large herds of cattle, ſheep, and horſes, in excellent order, and fitted for all the purpoſes of rural œconomy or the market. Since Guinea-graſs became ſo common, ſalted beef and pork are but little uſed by the white people in Jamaica. Freſh beef, mutton, pork, and poultry, are in abundance; and on the whole cheaper than ſalted meats from Ireland or America: By theſe means, too, people live better, and enjoy as good health as others in Europe.

Guinea-graſs is beſt propagated by the roots, and planted about three feet aſunder. In ſix months it grows very tall, ſo as often to be ſix feet high. At this time horſes and cattle are turned in to eat what they pleaſe of it; and while they plough up the ſurface of the ground with their feet, they ſhake the ripe ſeed. The rank graſs is afterwards cut down, burned off, and the old ſtocks rooted up and thrown away. The ſeeds vegetate and throw up a plentiful crop; which with common attention will laſt many years. For this purpoſe a Guinea-graſs paſture requires to be kept clean, and ſupplied in particular places as may be neceſſary from time to time. The fields ought to be divided into parks by fences, and the cattle ſhifted from one incloſure to another occaſionally.

PANINI (PAOLO), a painter of perſpective and architecture. He was born at Placentia in 1691, with a moſt happy genius to painting, which he cultivated by ſtudying at Rome, where he deſigned every veſtige of ancient magnificence, the ruins of ſuperb Roman edifices, cenotaphs, columns, baths, arches, and obeliſks, as alſo ſome of the moſt entire buildings, the ornaments of modern Rome. He ſtudied the works of Ghiſolfi with peculiar pleaſure; he formed his taſte, ſtyle, and manner, by the compoſitions of that eſteemed artiſt; and his ſtrongeſt ambition was to imitate him; ſo that he ſoon became eminent in that ſtyle beyond all his cotemporaries. His compoſition is rich; the truth of his perſpective is critically exact; and his paintings are univerſally eſteemed for the grandeur of the architecture, for the clearneſs of his colouring, for the beautiful figures which he generally introduced, and alſo for the elegant taſte with which he diſpoſed them. He always deſigned them correctly, and ſet them off with ſuitable attitudes and expreſſion.

However, this deſcription of his merit muſt be ſuppoſed to allude to his early and prime performances; for in his latter time his pictures were diſtinguiſhable by a free and broad touch, but they are feeble in their colouring and effect. At all times, indeed, he was too apt to deſign his figures rather too large for the architecture, which diminiſhed the grandeur of the moſt magnificent parts of his compoſition, and was quite contrary to the practice of Ghiſolfi; whoſe works muſt perpetually afford a pleaſing deception to the eye, by the perſpective proportions obſerved between the figures, buildings, and diſtances,

At Rivoli, a pleaſure-houſe belonging to the king of Sardinia, there are ſeveral of Panini's paintings, which are views of that fine retreat and its environs. They are beautifully coloured, well handled, and with a touch full of ſpirit; though in ſome parts the yellow ſeems a little too predominant, and the lights are not always diſtributed in ſuch a manner as to produce the moſt ſtriking effect.

PANIONIA, in antiquity, a feſtival celebrated in honour of Neptune by a concourſe of people from all the cities of Ionia. It is remarkable in this feſtival, that if the bull of-

fered in ſacrifice happened to bellow, it was accounted an omen of divine favour; becauſe that ſound was thought to be acceptable to Neptune.

PANNARIA, one of the Lipari iſlands. See LIPARA and LIPARI. The ancients called it *Thermiſſa*, from the hot waters which they found in it. It may be about eight or nine miles in circumference. It bears wheat, and grapes from which the inhabitants make wine. Pannaria, like the other adjacent iſlands, appears to be a volcano; its original having been deſtroyed by continued eruptions. It is now no longer of a conical figure. It contains about 100 inhabitants, reckoning every ſoul, men, women, and children. It is, like Stromboli, governed by a curate, who depends on the prieſt of the pariſh of St. Joſeph in Lipari; and when any couple in the iſland determine to marry, they muſt croſs the ſea to Lipari to receive the nuptial benediction in the pariſh of St. Joſeph, or pay a ſum for a licence to impower the curate of Pannaria to perform the ceremony. All the other adjoining iſlands are ſubject to the ſame regulation.

The inhabitants of Pannaria live by fiſhing, and by taking ſmall quantities of game on this and the little contiguous iſlands. They bring up and tame thoſe birds known by the name of *gulls*, which are ſeen in tempeſtuous weather flying near the ſurface of the ſea. They are here called *corraccis*. The body of the bird and the tips of its wings are white; but the head, the tail, and the reſt of the wings are grey: they are of the ſize of Indian hens: their wings are prodigiouſly large: they have their neſts on the ſteep inacceſſible cliffs of the ſeveral iſlands. When the iſlanders bring theſe birds up tame, they feed them with fiſh, which, though of ſuch ſize that you would think it impoſſible for their ſtomachs to receive them, they eagerly ſtretch their necks and ſwallow rapaciouſly. Theſe birds are thus brought up to be as tame as pullets or pigeons: and ſuch an attachment do they often acquire to the places in which they are reared, that ſome of them have been known to return to theſe iſlands after being conveyed to Melazzo and Meſſina.

On the ſummit of a hill in this iſland, which projects over the ſea, the inhabitants pretend to ſhow a caſtle and an inſcription. But their caſtle is only an elevated peak of the rock, which nature ſeems to have prepared as a retreat for birds. It conſiſts of puzzolana; and has been actually formed by the action of winds and rains, for a long courſe of time, into a fantaſtic figure, which may appear, when careleſsly viewed from a diſtance by an undiſtinguiſhing eye, the remains of ſome ancient ſtructure. The good people of the iſland, not being able to judge of it otherwiſe than from appearance, are perſuaded, that it can be nothing but a caſtle, which muſt have been reared for the defence of the iſland againſt the Turks and the corſairs of Barbary. Theſe they conſider as the moſt dreadful ſcourge with which mankind can poſſibly be afflicted, and fear them much more than the eruptions of the volcano. When they feel their iſland ſhaken, they embark with all their wealth, which a ſingle ſloop eaſily contains; and on board they are ſafe from both the ſhaking of the earth and the erruptions of the lava, but not from an hoſtile fleet.

In this iſland there appear various remains of ancient buildings, but very ruinous and very ſcanty. In ploughing the fields, many remains of ſepulchres, in different modes of conſtruction, are found; ſome of rough ſtones, tiles, or bricks; others conſiſting each of a ſingle ſtone. Vaſes of various ſorts and ſizes are alſo ſaid to have been found in the ſame fields, utenſils of different kinds, money, chains, and medals of lead. But none of theſe relicks of antiquity have been preſerved: the good people who found them were ignorant of their value, and therefore neglected them as trifles. In places along the ſhore of the iſland, where the ſea appears to have encroached, there are ſome hewn ſtones to be ſeen: they ſeem to be remains of walls, which muſt have been very ſtrong and of elegant architecture. In other places farther diſtant from the ſhore there likewiſe appear fragments of walls ſunk in the ground, and apparently overwhelmed with mud, which the winds and rains have brought down from the mountain above. Theſe remains ſhow, that Pannaria, either under the Greeks, or in that period when all the elements were taxed for the gratification of Roman luxury, muſt have been adorned with ſuperb buildings, as well as the adjacent iſlands of Lipari, Stromboli, and Baſiluzzo.

PANNELS *of a* SADDLE, are two cuſhions or bolſters, filled with cow's, deer, or horſe's hair, and placed under the ſaddle, on each ſide, to prevent the bows and bands from galling the horſe.

PANNICULUS CARNOSUS, in comparative anatomy, a robuſt fleſhy tunic, ſituated in beaſts between the ſkin and the fat; by means of which they can move their ſkin in whole or in part. It is altogether wanting in mankind.

PANNONIA (Pliny, Strabo, Dio), an extenſive country of Europe, having the Danube on the north, Dalmatia on the ſouth, Noricum on the weſt, and Mœſia on the eaſt. It is divided into *Superior* and *Inferior* (Ptolemy, Dio). The common boundary between both were the river Arabo and mount Cetius, having the Superior to the weſt, and the Inferior on the eaſt ſide. This diviſion is thought to be no older than the times of the Antonines. *Pannonicus* the epithet (Martial).

PANOMPHÆUS, in antiquity, a deſignation given to Jupiter, becauſe he was ſaid to be the original author of all ſorts of divination, having the books of fate, and out of them revealing either more or leſs, as he pleaſed, to inferior dæmons.

PANORMUS (Polybius, Pauſanias), a town of Achaia, in Peloponneſus, near the promontory Rhium.—Another (Ptolemy, Pliny), a town on the north ſide of Crete.—A third (Ptolemy), in Macedonia, on the Ægea ſea, near mount Athos.—A fourth, of Samos (Livy).—A fifth, of Sicily; an ancient city, built by the Phœnicians (Thucydides); a principal town of the Carthaginians (Polybius); ſituated between Lilybæus and Pelorus (Mela): a Roman colony. Now *Palermo*, capita of the iſland, on the north ſide. E. lon. 13. N. lat. 38. 30.—A ſixth Panormus of the Thracian Cherſoneſus, placed by Pliny on the weſt ſide of the peninſula, and mentioned by no other writer.

PANORMUS (Ptolemy), a port of Attica; its name denoting it to be capacious.—Another, of Epirus (Strabo, Ptolemy); a large harbour in the heart of the Montes Ceraunii, below the citadel Chimæra.—A third, of Ionia (Strabo); near Epheſus, with the temple of the Epheſian Diana.

PANORPA, the SCORPION-FLY, in zoology, a genus of inſects belonging to the order of neuroptera. See pl. 25. The roſtrum is horny and cylindrical; there are two pappi, and three ſtemonata; the feelers are longer than the thorax. The body of this inſect is of a black brown colour, yellow on the ſides, with a few ſpots of the ſame on the top. Its tail, formed by the three laſt ſegments of the abdomen, is of a maroon colour; of thoſe three ſegments the laſt is larger, almoſt round, and terminates in two hooks, which conſtitutes a tail like that of the ſcorpion. The wings, as long as the body, are diaphanous, reticulated, with fibres and ſtripes of ſpots of a brown colour. Sometimes we meet with different varieties of this inſect, conſiſting in the colour of the wings. Some, inſtead of ſeveral ſtripes of ſpots upon their wings, have only a ſingle black ſtripe, tranſverſe and irregular, ſituated on the middle of the wing, the extremity whereof is alſo black: others have their wings entirely white, excepting the extremity, which is black. The kind of forceps that is ſeen at the hinder part of this inſect is uſed by the males to lay hold of their females in their amorous embraces: the threatening tail of the male does no miſchief. This inſect is found in meadows, by the ſide of ditches. There are four ſpecies, diſtinguiſhed by the colour and ſhape of their wings.

PANTALARIA, an iſland in the Mediterranean ſea, between Sicily and the main land of Africa, about 17 miles in

circumference. It is near the coaſt of Tunis, and abounds in cotton, fruits, and wine; but the inhabitants are obliged to bring all their corn to Sicily, as it belongs to the king of the two Sicilies. E. lon. 12. 25. N. lat. 36. 55.

PANTÆNUS, a ſtoic philoſopher, born in Sicily (though ſome have erroneouſly ſuppoſed him to be a Hebrew) about the beginning of the reign of Commodus. He preſided over the celebrated ſchool of Alexandria, where, from the time of St. Mark, the founder of that church, they had always a divine that was eminent for his learning and piety, to explain the Holy Scriptures, and to inſtruct them in human learning. This employment he was obliged to leave; for, when the Indians required of Demetrius biſhop of Alexandria to ſend them one to inſtruct them in Chriſtianity, he ſent Pantænus, who undertook the miſſion with joy, and behaved himſelf very properly in it. We are told, that the Indians had been tinctured with Chriſtianity by St. Bartholomew the apoſtle; and that Pantænus met with the Hebrew original of St. Matthew's goſpel, which the apoſtle had left there. St. Jerome ſays that Pantænus brought it with him; and that it was, in his time, preſerved in the library of Alexandria. But we ſuſpect St. Jerome to be miſtaken in this reſpect. When Pantænus returned to Alexandria, he reaſſumed the government of the ſchool of that city, which, it is probable, he had, during his abſence, committed to the care of St. Clement, a preſbyter of Alexandria. He explained the ſcriptures publicly, under the reign of Severus and Antoninus Caracalla; and was, in St. Jerome's opinion, more ſerviceable to the church by his diſcourſes than by his writings. He publiſhed ſome commentaries upon the Bible, which are loſt. "That the prophets often expreſs themſelves in indifferent terms, and that they make uſe of the preſent time inſtead of the paſt and future," is a rule of Pantænus, which has been followed by all ſucceeding interpreters. Theodorus has related this rule; but he ſpeaks of it as if Pantænus had rather ſaid than written it. We may have ſome notion of Pantænus's manner of explaining the ſcriptures by the like performances of St. Clement of Alexandria, Origen, and others who were brought up in that ſchool.

PANTALOON, a ſort of garment conſiſting of breeches and ſtockings all of one piece; ſaid to have been firſt introduced by the Venetians.

PANTALOON, on the theatre, is a buffoon or maſked perſon, who performs high and groteſque dances, and ſhows violent and extravagant poſtures and airs. The word is likewiſe uſed for the habit or dreſs theſe buffoons uſually wear; which is made preciſely to the form of their body, and all of a piece from head to foot. And hence thoſe who wear a habit of this kind, for conveniency, under their other clothes, are called *pantaloons* of Venice.

PANTARBE, in natural hiſtory, a name given to an imaginary ſtone, the effects of which upon gold were ſimilar to thoſe of the loadſtone upon iron. The ancients, as well as ſome modern writers, ſeem to have had an opinion that there was ſuch a ſtone: and the *amphitane* of Pliny is deſcribed as poſſeſſing this remarkable quality; but neither they nor we have ever found reaſon, from any experiment well aſcertained, to believe that there ever was ſuch a ſtone.

PANTHEA, in antiquity, were ſingle ſtatues, compoſed of the figures, or ſymbols, of ſeveral different divinities together. Father Joubert, who calls them *panthea*, and who has remarked them ſometimes on medals, ſays their heads are moſt commonly adorned with the ſymbols or attributes belonging to ſeveral gods. An inſtance of this appears in a medal of Antoninus Pius; which repreſents Serapis by the buſhel it bears; the Sun by the crown of rays; Jupiter Ammon by the ram's horns; Pluto by the large beard; and Æſculapius by the ſerpent twiſted in his hand. M. Baudelot, in a diſſertation on the Lares, obſerves, that the *panthea* had their origin from the ſuperſtition of thoſe, who, taking ſeveral gods for the protectors of their houſes, united them all in the ſame ſtatue, by adorning it with the ſeveral ſymbols proper to each of theſe deities.

PANTHEISM, a philoſophical ſpecies of idolatry leading to atheiſm, in which the univerſe was conſidered as the ſupreme God. Who was the inventor of this abſurd ſyſtem, is, perhaps, not known; but it was of early origin, and differently modified by different philoſophers. Some held the univerſe to be one immenſe animal, of which the incorporeal ſoul was properly their God, and the heavens and earth the body of that God; whilſt others held but one ſubſtance, partly active and partly paſſive; and therefore looked upon the viſible univerſe as the only *Numen*. The earlieſt Grecian Pantheiſt of whom we read was Orpheus, who called the world *the body of God*, and its ſeveral parts *his members*, making the whole univerſe one *divine animal*. According to Cudworth, Orpheus and his followers believed in the immaterial ſoul of the world; thereiu agreeing with Ariſtotle, who certainly held that God and matter are coeternal; and that there is ſome ſuch union between them as ſubſiſts between the ſouls and bodies of men. See METAPHYSICS. In the ancient Orphic theology, we are taught, that "this univerſe, and all things belonging to it, were made *within* God; that all things are contained together in the *womb* of God; that God is the *head* and *middle* of all things; that he is the *baſis* of the *earth* and *heaven*; that he is the *depth of the ſea*, the *air* we breathe, the force of the untameable *fire*; that he is the *ſun*, *moon*, and *ſtars*; that there is one divine *body*; for, Παντα γαρ εν μεγαλῳ τα δε σωματι κειται, "*all theſe things lie in the great body of God.*"—But further, to prove that the moſt ancient Greek philoſophers reſolved all things into God, and made God *all*, we ſhall cite a moſt remarkable paſſage from Plutarch's Defect of Oracles. "Whereas there are two cauſes of all generations, the divine and the human, the moſt ancient theologers and poets attended only to the more excellent of theſe two; reſolving all things into God, and pronouncing this of them univerſally: Ζευς αρχη, Ζευς μεσα, Διος δ' εκ παντα πελονται, "*that God is both the beginning and middle, and that all things are out of God*;" inſomuch, that they had no regard at all to the other natural and neceſſary cauſes of things: but on the contrary, their juniors, who were called *naturaliſts*, deviating from this moſt excellent and divine principle, placed in all *bodies* their paſſions, colliſions, mutations, and commixtures."

That by the moſt ancient theologers here mentioned, Plutarch meant Orpheus and his immediate followers, is plain from the Orphic verſe by which he proves their antiquity. By their juniors, whom he calls *naturaliſts*, he could mean no other than the firſt Grecian philoſophers, *Anaximander*, *Anaximenes*, and *Hippo*, who were followed by the atheiſtical atomiſts, *Leucippus*, *Democritus*, *Protagoras*, and *Epicurus*. But with reſpect to the univerſe being God, and all things divine and human being modifications of mere matter, the Stoics undoubtedly agreed with Anaximander and his followers; for the ſchool of Zeno held but one ſubſtance. See METAPHYSICS. This impious doctrine, that all things are God, and that there is but one ſubſtance, was revived in modern times by Spinoza an apoſtate Jew. See farther the articles SPINOZA and PAN.

PANTHEON, a beautiful edifice at Rome, anciently a temple, dedicated to all the gods; but now converted into a church, and dedicated to the Virgin and all the martyrs. This edifice is generally thought to have been built by Agrippa ſon-in-law to Auguſtus, becauſe it has the following inſcription on the frieze of the portico: "M. AGRIPPA L. F. COS. TERTIUM FECIT." Several antiquarians and artiſts, however, have ſuppoſed that the Pantheon exiſted in the times of the commonwealth; and that it was only embelliſhed by Agrippa, who added the portico. Be this as it will, however, the Pantheon, when perfected by Agrippa, was an exceedingly magnificent building; the form

of whoſe body is round or cylindrical, and its roof or dome is ſpherical: it is 144 feet diameter within; and the height of it, from the pavement to the grand aperture on its top, through which it receives the light, is juſt as much. It is of the Corinthian order. The inner circumference is divided into ſeven grand niches, wrought in the thickneſs of the wall; ſix of which are flat at the top; but the ſeventh, oppoſite to the entrance, is arched. Before each niche are two columns of antique yellow marble fluted, and of one entire block, making in all 14, the fineſt in Rome. The whole wall of the temple, as high as the grand cornice inclusive, is cafed with divers ſorts of precious marble in compartments. The frieze is entirely of porphyry. Above the grand cornice ariſes an attic, in which were wrought, at equal diſtances, 14 oblong ſquare niches: between each niche were four marble pilaſters, and between the pilaſters marble tables of various kinds. This attic had a complete entablature; but the cornice projected leſs than that of the grand order below. Immediately from the cornice ſprings the ſpherical roof, divided by bands, which croſs each other like the meridians and parallels of an artificial terreſtrial globe. The ſpaces between the bands decreaſe in ſize as they approach the top of the roof; to which, however, they do not reach, there being a conſiderable plain ſpace between them and the great opening. That ſo bold a roof might be as light as poſſible, the architect formed the ſubſtance of the ſpaces between the bands of nothing but lime and pumice-ſtones. The walls below were decorated with lead and braſs, and works of carved ſilver over them; and the roof was covered on the outſide with plates of gilded bronze. There was an aſcent from the ſpringing of the roof to the very ſummit by a flight of ſeven ſtairs. And if certain authors may be credited, theſe ſtairs were ornamented with pedeſtrian ſtatues ranged as an amphitheatre. This notion was founded on a paſſage of Pliny, who ſays, "That Diogenes the ſculptor decorated the Panthcon of Agrippa with elegant ſtatues yet that it was difficult to judge of their merit, upon account of their elevated ſituation." The portico is compoſed of 16 columns of granite, four feet in diameter, eight of which ſtand in front, with an equal intercolumniation all along, contrary to the rule of Vitruvius, who is for having the ſpace anſwering to the door of a temple, wider than the reſt. Of theſe columns is a pediment, whoſe tympanum, or flat, was ornamented with bas-reliefs in braſs; the croſs beams which formed the ceiling of the portico were covered with the ſame metal, and ſo were the doors. The aſcent up to the portico was by eight or nine ſteps. Such was the Pantheon, the richneſs of which induced Pliny to rank it among the wonders of the world.

The eruption of Veſuvius, in the reign of Tiberius, damaged the Pantheon very conſiderably: it was repaired by Domitian; which occaſioned ſome writers to mention that prince as the founder of the building. The emperor Adrian alſo did ſomething to it. But it appears, that the Pantheon is more indebted to Septimius Severus than to any one ſince its erection. The moſt, perhaps, that any of his predeceſſors had done, was the adding ſome ornament to it: Septimius beſtowed eſſential reparations upon it. The following inſcription appears upon the architrave:

IMP. CAES. SEPTIMIVS. SEVERVS.
PIVS. PERTINAX.
ARABICVS. PARTHICVS. PONTIF.
MAX. TRIB. POT.
XI. COS. III. P. P. ET. IMP. CAES.
MARCVS.
AVRELIVS. ANTONINVS. PIVS.
FELIX. AVG. TRIB.
POT. V. COS. PROCOS. PANTHEVM.
VETUSTATE.
OBRVPTVM. CVM. OMNI. CVLTV.
RESTITVERVNT.

It is really a matter of aſtoniſhment, that a ſtructure, which, granting it to have been built by Agrippa, was not more than 200 years old, ſhould have fallen into decay through age. This ſingle conſideration ſeems ſufficient to confirm the opinion of thoſe who believe it to have ſtood in the time of the commonwealth.

The temple ſubſiſted in all its grandeur till the incurſion of Alaric in the time of Honorius. Zoſimus relates, that the Romans having engaged to furniſh this barbarian prince with 3000 pounds weight of gold and 5000 pounds weight of ſilver, upon condition that he ſhould depart from their walls; and it proving impoſſible to raiſe thoſe ſums either out of the public treaſury or private purſes, they were obliged to ſtrip the temples of their ſtatues and ornaments of gold and ſilver. It is probable that the Pantheon ſupplied a good part, as that of Jupiter Capitolinus was the only one in Rome that could vie with it for riches.

Alaric carried off nothing from the Romans beſides their precious metals. Thirty-nine years after this, Genſeric king of the Vandals took away part of their marbles; and whether from a greedineſs of plunder, or from a reliſh of the productions of art, loaded one of his ſhips with ſtatues. It cannot be queſtioned, but that on this occaſion the Pantheon was forced to part with more of its ornaments, and that the ineſtimable works of Diogenes became the prey of this barbarian.

Before theſe unwelcome viſits of the Goths and Vandals, the Chriſtian emperors had iſſued edicts for demoliſhing the Pagan temples. But the Romans, whatever were there motives, ſpared the Pantheon, which is known to have ſuffered no damage from the zeal of the pontiffs, or the indignation of the ſaints, before the firſt ſiege of Rome by Alaric. It remained ſo rich till about the year 655, as to excite the avarice of Conſtantine II. who came from Conſtantinople to pillage the Pantheon, and executed his purpoſe ſo far as to ſtrip it both of its inſide and outſide brazen coverings, which he tranſported to Syracuſe, where they ſoon after fell into the hands of the Saracens.

About fifty years before this, pope Boniface IV. had obtained the Pantheon of the emperor Phocas, to make a church of it. The artiſts of theſe days were totally ignorant of the excellence of the Greek and Roman architecture, and ſpoiled every thing they laid their hands upon. To this period certain alterations are to be referred, of which we ſhall ſpeak by and by.

After the devaſtations of the barbarians, Rome was contracted within a narrow compaſs: the ſeven hills were abandoned; and the Campus Martius, being an even plain, and near the Tyber, became the ground-plat of the whole city. The Pantheon happening to ſtand at the entrance of the Campus Martius, was preſently ſurrounded with houſes, which ſpoiled the fine proſpect of it; and it was yet more deplorably diſgraced by ſome of them which ſtood cloſe to its walls. Pedlars ſheds were built even within its portico, and the intercolumniations were bricked up, to the irreparable damage of the matchleſs pillars, of which ſome loſt part of their capitals, ſome of their baſes, and others were chiſſeled out ſix or ſeven inches deep, and as many feet high, to let in poſts. Which excavations are to this day half filled up with brick and mortar; a ſad monument of the licentiouſneſs of the vulgar, and of the ſtupid avarice of thoſe who ſold them the privilege to ruin the nobleſt piece of art in the world!

This diſorder continued till the pontificate of Eugene IV. whoſe zeal the decency of a conſecrated place prevailed upon him to have all the houſes cleared away that incumbered the Pantheon, and ſo the miſerable barracks in the portico were knocked down.

From the time Conſtantius carried off the braſs plating of the external roof, that part was expoſed to the injuries of the weather, or at beſt was but ſlightly tiled in, till Benedict II.

covered it with lead, which Nicholas V. renewed in a better ſtyle.

It does not appear that from this time to Urban VIII. any pope did any thing remarkable to the Pantheon.

Raphael Urbin, who had no equal as a painter, and who as an architect had no ſuperior, left a conſiderable ſum by his will for the reparation of the Pantheon, where his tomb is placed. Perino de la Vagua, Jacomo Udino, Hannibal Carracci, Flamingo Vacca, and the celebrated Archangelo Corelli, did the ſame. All the ornaments within, that have any claim to be called good, are of the later times; the paintings merit eſteem; and the ſtatues, though not maſterpieces, do honour to ſculpture, which alone is a proof that they are poſterior to the 15th century.

But with all the reſpect due to a pontiff who was otherwiſe a protector and even a practiſer of the arts, it were much to be wiſhed that Urban VIII. had not known that the Pantheon exiſted. The inſcriptions cut at the ſide of the door inform us, that he repaired it; yet, at the ſame time that he built up with one hand, he pulled down with the other. He cauſed two belfries of a wretched taſte to be erected on the ancient front work, and he diveſted the portico of all the remains of its ancient grandeur, *viz.* the brazen coverture of the croſs beams, which amounted to ſuch a prodigious quantity, that not only the vaſt baldaquin or canopy of the confeſſional in St. Peter's was caſt out of it, but likewiſe a great number of cannon for the caſtle of St. Angelo. This pope, who was of the family of Barberini, preſented alſo as much of this metal to his nephew, as was ſufficient for the decoration of his new palace; on which occaſion this remarkable paſquinade was ſtuck up: "*Quod non fecerunt Barbari fecere Barberini.*" If ever jingle added force to wit, it was certainly in this inſtance.

It is ſurpriſing, that whilſt all theſe operations were carrying on in the portico, he never once thought of repairing the damages which time had wrought in it! Of the 16 pillars which ſupported this magnificent pile, there were no more than 13 left; the three next the temple of Minerva had diſappeared; with theſe the entablature and an angle of the front had tumbled down. There were not wanting in Rome fragments enough of antique columns that might have been put together, and ſet up, to have prevented the downfall of a pile which deſerved to ſtand as long as the world endured.

Alexander VII. did what Urban VIII. had neglected to do. At the ſame time that Bernini was conſtructing the colonnade of St. Peter, this pontiff ordered ſearch to be made for pillars to match thoſe of the portico of the Pantheon; and ſome were found not far from the French church of St. Lewis of the very ſame model. They were granite of the iſle of Ilva, and thoſe of the portico were Egyptian granite; the colour, however, was the ſame, ſo that the effect was equal. The pope's zeal did not ſtop here; he cauſed all the old houſes before the portico to be pulled down, and the ſoil and rubbiſh to be cleared away, which covered the ſteps and even the baſes of ſome of the pillars. He began covering the roof with marble, and raiſed a lantern over the aperture, to keep out rain; but death took him off before his project was completed. Clement IX. his ſucceſſor, incloſed the portico within iron rails. Several later popes have added to its decorations, which were all in the taſte of the times they were done in; and the body of the edifice and its architecture gained nothing from them. The main object of their holineſſes' liberality was the embelliſhment of the grand altar. One gave purple curtains, another beſtowed ſilver tabernacles; others again vaſes, and ſuperb dreſſes, ſuited to the ſolemn ceremonies of religion. All theſe might be called rich; but they had in no ſenſe a tendency to retrieve the ancient majeſty or original ſplendor of the temple. The true guſto of the ornaments was a little imitated at the revival of the arts. Good ſtatues took place of the ſkeletons and ſquat figures that ridiculouſly diſgraced the altars for the ſpace of eight centuries. The paintings of Perugino, Cozza, and Greſſi, covered the dull moſaics with which the Greeks of Conſtantinople had loaded the walls of moſt of the churches in Rome. The porphyry and the green and yellow antique found among the old ruins were employed to much advantage.

There was beſides at Rome another Pantheon, dedicated to Minerva as the goddeſs of medicine. It was in the form of a decagon, and the diſtance from one angle to another meaſured about 22 feet and an half. Between the angles there were nine round chapels, each of which was deſigned for a deity; and over the gate there was a ſtatue of Minerva. The Pantheon of Athens was in many reſpects little inferior to the Roman one built by Agrippa. The Greek Chriſtians alſo converted it into a church, dedicated it to the Virgin, under the name of *Panegia*; and the Turks changed it into a moſque. The Pantheon of Niſmes was a temple in that city, wherein were 12 niches or ſtatues, ſuppoſed to have been deſtined for the 12 great gods. In the Eſcurial is a moſt magnificent chapel, called *Pantheon*, 35 feet in diameter, and 38 feet high from the pavement, which is compoſed of marble and jaſper inlayed. The whole inſide of the chapel is of black marble, except the luthern, and ſome ornaments of jaſper and red marble. In this chapel are depoſited the bodies of the kings and queens; there are only places for 26, and eight of them are already filled.

PANTHER, in zoology. See FELIS.

PANTOMIME, Παντομιμος, among the ancients, a perſon who could imitate all kinds of actions and characters by ſigns and geſtures without ſpeaking. The pantomimes made a part in the theatrical entertainments of the ancients; their chief employment was to expreſs, in geſtures and action, whatever the chorus ſung, changing their countenance and behaviour as the ſubject of the ſong varied. They were very ancient in Greece, being derived from the heroic times, according to ſome; but however this may be, they were certainly known in Plato's time. In Rome, it was ſo late as the time of Auguſtus before they made their appearance. As to their dreſs, it was various, being always ſuited as near as poſſible to that of the perſon they were to imitate. The crocota was much uſed among the Roman pantomimes, in which and other female dreſſes they perſonated women.

We have this account of them in Gibbon's hiſtory. "The pantomimes, who maintained their reputation from the age of Auguſtus to the ſixth century, expreſſed, without the uſe of words, the various fables of the gods and heroes of antiquity; and the perfection of their art, which ſometimes diſarmed the gravity of the philoſopher, always excited the applauſe and wonder of the people. The vaſt and magnificent theatres of Rome were filled by 3000 female dancers, and by 3000 ſingers, with the maſters of the reſpective choruſes. Such was the popular favour which they enjoyed, that in a time of ſcarcity, when all ſtrangers were baniſhed from the city, the merit of contributing to the public pleaſures exempted them from a law which was ſtrictly executed againſt the profeſſors of the liberal arts."

Pantomimes are ſtill very common in England: they differ indeed in ſome reſpects from thoſe of antiquity; but they retain the name, and like theſe they conſiſt in the repreſentations of things merely by geſtures.

PANUCO, a town and province of North America in New Spain, lying to the north of Mexico, with a biſhop's ſee. There are veins of gold, and ſalt works, which are the principal revenue of the inhabitants.—It is ſeated near the mouth of a river of the ſame name, at a ſmall diſtance from the Gulph of Mexico. W. lon. 100. 5. N. lat. 24. 0.

PANZACCHIA (MARIA HELENA). This paintreſs was born at Bologna in 1668, of a noble family, and appeared to have an

extraordinary genius for painting. She learned deſign under the direction of Emilio Taruffi, and in a ſhort ſpace of time made an aſtoniſhing proficiency; ſo that in the compaſs of a few years ſhe acquired great readineſs in compoſition, correctneſs of outline, and a lovely tint of colouring. She alſo excelled in painting landſcapes; and by the beauty of her ſituations and diſtances allured and entertained the eye of every judicious beholder. The figures which ſhe inſerted had abundance of grace; ſhe deſigned them with becoming attitudes, and gave them a lively and natural expreſſion. Her merit was inconteſtably acknowledged, and her works were exceedingly prized and coveted.

PAO-TING FOU, in China, where the viceroy reſides, is the moſt conſiderable city in the province next to Pekin. It has 20 others under its juriſdiction, three of the ſecond and 17 of the third claſs. The country around it is pleaſant, and inferior in fertility to no part of China. It is neceſſary to paſs this city in going from Pekin to the province of Chan-ſi.

PAPA, a ſmall but ſtrong town of Lower Hungary, in the county of Veſprin. It was taken from the Turks in 1683, after raiſing the ſiege of Vienna, and is ſubject to the houſe of Auſtria. It is ſeated on a mountain, near the river Marchaez, in E. lon. 18. 10. N. lat. 47. 20.

PAP-CASTLE, in England, in Bridekirk pariſh, Cumberland, ſtood two miles from Cockermouth, on the other ſide of the Derwent, whoſe Roman antiquity is proved by ſeveral monuments; and a large green ſtone veſſel found here, with little images upon it, is ſuppoſed to have been formerly a Daniſh font for dipping of infants; and has been ſince uſed at Bridekirk in the neighbourhood for their ſprinkling. The name of *Pap-caſtle* ſeems to be contracted from Pipard its owner: it is ſaid to have been demoliſhed, and the materials employed to build Cockermouth caſtle. In Gough's edition of Camden's Britannia, the ruins diſcovered at Pap-caſtle are deſcribed in a letter from Mr. Routh to Mr. Gale.

Dr. Stukeley ſays, the Roman caſtrum lies on the top of the hill above the village, and he traced its whole circumference, a bit of the Roman wall by the river ſide going to Wigton, and there the ditch is plainly viſible, though half filled up with the rubbiſh of the wall. A ſubterraneous vault floored with large ſlabs of free-ſtone, was found in the paſture of the ſouth-eaſt angle. The name of *Boroughs* includes both cloſes where it ſtood; and they find ſtones and ſlates with iron pins in them, coins, &c. on the whole ſpot below it, towards the water-ſide. It was a beautiful and well choſen plan, on the ſouth-weſt ſide of a hill, a noble river running under, and pretty good country about it. Coins of Claudius, Adrian, and a ſilver Geta, PONT *rev.* PRINCEPS IVVENTVTIS. He ſuppoſes its ancient name *Derventio*, derived from the Derwent.

PAPAVER, the POPPY: A genus of the monogynia order, belonging to the polyandria claſs of plants; and in the natural method ranking under the 27th order, *Rhœadæ*. The corolla is tetrapetalous; the calyx diphyllous; the capſule bilocular, opening at the pores below a perſiſting ſtigma. The *Species* are: 1. The *ſomniferum*, or ſomniferous common garden-poppy, riſes with an upright ſmooth ſtalk, dividing or branching a yard or more high; garniſhed with large, deeply jagged, amplexicaule, ſmooth leaves; and terminated by large, ſpreading, dark-purple, and other coloured flowers, in the varieties, having ſmooth cups and capſules. There are a great many varieties, ſome of them extremely beautiful. The white officinal poppy is one of the varieties of this ſort. It grows often to the height of five or ſix feet, having large flowers, both ſingles and doubles, ſucceeded by capſules or heads as large as oranges, each containing about 8000 ſeeds. See plate 25.

We are told, that in the province of Bahar in the Eaſt Indies, the poppy-ſeeds are ſown in the months of October and November, at about eight inches diſtance, and well watered till the plants are about half a foot high, when a compoſt of dung, nitrous earth, and aſhes, is ſpread over the areas; and a little before the flowers appear, they are again watered profuſely till the capſules are half grown, at which time the opium is collected; for when fully ripe they yield but little juice: two longitudinal inciſions from below upwards, without penetrating the cavity, are made at ſunſet for three or four ſucceſſive evenings; in the morning the juice is ſcraped off with an iron ſcoop, and worked in an iron pot in the ſun's heat till it is of a conſiſtence to be formed into thick cakes of about four pounds weight; theſe are covered over with the leaves of poppy, tobacco, or ſome other vegetable, to prevent their ſticking together, and in this ſituation they are dried.

The ſomniferous quality of the white poppy is well known. This quality reſides in the milky juice of the capſule containing the ſeeds, nor is it evaporated by drying the juice; hence the dried capſules are preſerved in the ſhops for making the ſyrup. The inſpiſſated juice itſelf is a kind of opium. See the article OPIUM. The ſeeds alſo make a very agreeable emulſion, but have no ſoporific virtue.

It grows in England, generally in neglected gardens, or uncultivated rich grounds, and flowers in July and Auguſt. This ſpecies is ſaid to have been named *white poppy* from the whiteneſs of its ſeeds; a variety of it, however, is well known to produce black ſeeds: the double-flowered white poppy is alſo another variety: but for medicinal purpoſes, any of theſe may be employed indiſcriminately, as we are not able to diſcover the leaſt difference in their ſenſible qualities or effects. The ſeeds, according to ſome authors, poſſeſs a narcotic power; but there is no foundation for this opinion: they conſiſt of a ſimple farinaceous matter, united with a bland oil, and in many countries are eaten as food. As a medicine, they have been uſually given in the form of emulſion, in catarrhs, ſtranguries, &c. The heads or capſules of the poppy, which are directed for uſe in the pharmacopœias, like the ſtalks and leaves, have an unpleaſant ſmell, ſomewhat like that of opium, and an acrid bitteriſh taſte. Both the ſmell and taſte reſide in a milky juice, which more eſpecially abounds in the cortical part of the capſules, and in its concrete ſtate conſtitutes the officinal opium. Theſe capſules are powerfully narcotic or anodyne; boiled in water, they impart to the menſtruum their narcotic juice, together with the other juices which they have in common with vegetable matters in general. The liquor, ſtrongly preſſed out, ſuffered to ſettle, clarified with whites of eggs, and evaporated to a due conſiſtence, yields an extract which is about one-fifth or one ſixth of the weight of the heads. This poſſeſſes the virtues of opium, but requires to be given in double its doſe to anſwer the ſame intention, which it is ſaid to perform without occaſioning a naufea and giddineſs, the uſual effects of opium. This extract was firſt recommended by Mr. Arnot; and a ſimilar one is now received in the Edinburgh Pharmacopœia. It is found very convenient to prepare the ſyrup from this extract, by diſſolving one dram in two pounds and a half of ſimple ſyrup. The *ſyrupus papaveris albi*, as directed by both colleges, is a uſeful anodyne, and often ſucceeds in procuring ſleep where opium fails; it is more eſpecially adapted to children. White poppy heads are alſo uſed externally in fomentations, either alone, or more frequently added to the decoction *pro fomento*.

2. The *rhœas*, or wild globular-headed poppy, riſes with an upright, hairy, multiflorous ſtalk, branching a foot and a half high; garniſhed with long, pinnatifid, deeply cut, hairy leaves; the ſtalk terminated by many red and other coloured flowers in the varieties, ſucceeded by globular ſmooth capſules.

This plant is common in corn-fields, and flowers in June and July. It may be diſtinguiſhed from *P. dubium*, to which it

bears a general reſemblance, by its urn-ſhaped capſules, and by the hairs upon the peduncles ſtanding in a horizontal direction. The capſules of this ſpecies, like thoſe of ſomniferum, contain a milky juice of a narcotic quality, but the quantity is very inconſiderable, and has not been applied to any medical purpoſe; but an extract prepared from them has been ſucceſsfully employed as a ſedative. The flowers have ſomewhat of the ſmell of opium, and a mucilaginous taſte, accompanied with a ſlight degree of bitterneſs. A ſyrup of theſe flowers is directed in the London Pharmacopœia, which has been thought uſeful as an anodyne and pectoral, and is therefore preſcribed in coughs and catarrhal affections; but it ſeems valued rather for the beauty of its colour than for its virtues as a medicine.

3. The *Cambricum*, or Welſh poppy, has a perennial root, pinnated cut leaves, ſmooth, upright, multiflorous ſtalks, a foot and an half high, garniſhed with ſmall pinnated leaves, and terminated by many large yellow flowers, ſucceeded by ſmooth capſules. The flowers appear in June.

4. The *orientalis*, or oriental poppy, hath a large, thick, perennial root; long, pinnated, ſawed leaves; upright, rough, uniflorous ſtalks, terminated by one deep red flower, ſucceeded by oval, ſmooth capſules. The flowers appear in May.

All the kinds are hardy, and will proſper any where. The two firſt ſpecies being annual, are to be propagated only by ſeeds; but the two laſt by parting the roots as well as the ſeeds.

PAPAW, or PAPA-TREE. See CARICA.

PAPER-MAKING.

THE word PAPER is evidently derived from the Greek παπυρος *papyrus*, the name of that celebrated Egyptian plant which was ſo much uſed by the ancients in all kinds of writing. It would be unneceſſary particularly to deſcribe the different expedients which men in every age and country have employed for giving ſtability to their ideas, and for handing them down to their children. When the art of writing was once diſcovered, ſtones, bricks, leaves of trees, the exterior and interior bark, plates of lead, wood, wax, and ivory, were employed. In the progreſs of ſociety, men have invented the Egyptian paper, paper of cotton, paper manufactured from the bark of trees, and in our times from old rags.

The inhabitants of Ceylon, before the Dutch made themſelves maſters of the iſland, wrote on the leaves of the talipot. The manuſcript of the bramins, ſent to Oxford from Fort St. George, is written on the leaves of a palm of Malabar. Herman ſpeaks of another palm in the mountains of that country which produces leaves of ſeveral feet in breadth. Ray, in his Hiſtory of Plants, vol. ii. book xxxii. mentions ſome trees both in India and America, the leaves of which are proper for writing. From the interior ſubſtance of theſe leaves they draw a whitiſh membrane, large and ſomewhat like the pellicle of an egg; but the paper made by art, even of the coarſeſt materials, is much more convenient in uſe than any of theſe leaves.

The Siameſe, for example, make two kinds of paper, the one black and the other white, from the bark of a tree which they call *Pliokkloi*. Theſe are fabricated in the coarſeſt manner; but they can be uſed on both ſides with a bodkin of fuller's earth.

The nations beyond the Ganges make their paper of the bark of many trees. The other Aſiatic nations within the Ganges, excepting thoſe toward the ſouth, make it of old rags of cotton cloth; but from their ignorance of the proper method, and the neceſſary machinery, their paper is coarſe. This, however, is by no means the caſe with that made in China and Japan, which deſerves attention from the beauty, the regularity, the ſtrength, and fineneſs of its texture. In Europe they have diſcovered, or rather carried to perfection, the ingenious art of making paper with old rags, originally either from flax or hemp; and ſince this diſcovery the paper produced from our manufactures is ſufficient for every purpoſe. And though theſe materials have been hitherto abundant, ſeveral philoſophers have attempted to ſubſtitute other vegetable ſubſtances in their place. In the 6th volume of the Tranſactions of the Society for the Encouragement of Arts, we have an account of paper made by Mr. Greeves near Warrington from the bark of willow-twigs; and it has been obſerved by a ſociety of able critics, that hop-buds would probably anſwer this purpoſe better. The rags in common uſe for paper-making are a texture of ſupple and ſtrong fibres ſeparated by a lee from the bark of the plants. It would be in vain to employ the whole body of the plant, as this ſubſtance forms a very improper ſtuff for the operations of the paper mill. From theſe principles we are directed in the choice of vegetable ſubſtances fit for the preſent purpoſe. The greater or leſs degree of purity in the materials is not abſolutely neceſſary; for flax itſelf, without any preparation, could be made into paper; but it would be extremely coarſe, and the bark of nettles or mallows would not bear the expence of labour. Although cotton be uſed in the fabrication of paper in the Levant, and perhaps in China, we are not to conclude that the down of plants in Europe, without the ſtrength or ſuppleneſs of cotton, will anſwer the ſame purpoſe.

HISTORY.

THE chief kinds of paper which merit attention in this work are, 1. The Egyptian paper; 2. The paper made from cotton; 3. Paper from the interior bark of trees, or liber; 4. Chineſe paper; 5. Japaneſe paper; 6. Paper made from aſbeſt; and 7. Paper made from linen rags.

Egyptian paper is the famous paper uſed by the ancients, which was made of a kind of reed called *papyrus*, growing in Egypt on the banks of the Nile. According to Iſidorus, this paper was firſt uſed at Memphis, and Lucan ſeems to be of the ſame opinion,

Nondum flamineas Memphis connexere biblos
Noverat. PHARSAL. lib. iii. ver. 222.

Whatever truth may be in this, it is certain, that of all the kinds of paper uſed by the ancients, the papyrus was the moſt convenient, both from its flexibility and from the eaſe of fabrication. It was a preſent from nature, and required neither care nor culture.

It is not certain at what particular period the ancients began to make paper of papyrus; but there are ſeveral authorities which prove the uſe of it in Egypt long before the time of Alexander the Great.

Pliny, lib. xiii. cap. 11. gives a full deſcription of the method of making this paper in Egypt. They divide, ſays he, with a kind of needle the ſtem of the papyrus into thin plates or ſlender pellicles, each of them as large as the plant will admit. Theſe are the elements of which the ſheets of paper are compoſed. The pellicles in the centre are the beſt; and they diminiſh in value as they depart from it. As they were ſeparated

from the reed, they were extended on a table, and laid acroſs each other at right angles. In this ſtate they were moiſtened by the water of the Nile, and while wet were put under a preſs, and afterwards expoſed to the rays of the ſun. "It was ſuppoſed that the water of the Nile had a gummy quality neceſſary to glue theſe ſtripes together. This, ſays Mr. Bruce, we may be aſſured is without foundation, no ſuch quality being found in the water of the Nile; on the contrary, I found it of all others the moſt improper, till it had ſettled and was abſolutely diveſted of all the earth gathered in its turbid ſtate. I made ſeveral pieces of this paper both in Abyſſinia and Egypt; and it appears to me, that the ſugar or ſweetneſs with which the whole juice of this plant is impregnated, is the matter that cauſes the adheſion of theſe ſtripes together; and that the uſe of the water is no more than to diſſolve this, and put it perfectly and equally in fuſion." When there was not enough of ſugar in the plant, or when the water did not ſufficiently diſſolve it, the pellicles were united by a paſte made of the fineſt wheat flour, mixed with hot water and a little vinegar, and when dried they were flattened and ſmoothed by the beating of a mallet.

The ſize of this paper varied much; it ſeldom exceeded two feet, but it was oftentimes ſmaller. It had different names, according to its ſize and quality: the firſt was called *Imperial*, which was of the fineſt and largeſt kind, and was uſed for writing letters by the great men amongſt the Romans. The ſecond ſort was called by the Romans the *Livian* paper, from Livia the wife of Auguſtus; each leaf of this kind was 12 inches. The third ſort was called the *Sacerdotal* paper, and was 11 inches in ſize.

The paper uſed in the amphitheatres was of the dimenſions of nine inches. But what was eſteemed of greateſt value in it, was its ſtrength, whiteneſs, and poliſh. The ink, however, ſunk leſs in paper highly poliſhed; and therefore the characters were more liable to be effaced. When it was not carefully ſoaked in the firſt preparation, the paper brought a leſs price; becauſe letters were with difficulty formed upon it, and it ſent forth a diſagreeable ſmell. To remedy this defect, the paper went through a new courſe of ſizing and hammering; and the ſize uſed on that occaſion was made of light bread ſteeped in boiling water, and paſſed through a filtering cloth. By this means the paper became in the higheſt degree united, and ſmoother than the fineſt linen. It was this paper which gave ſo long a duration to the works of the Gracchi, Tiberius, and Caius, in their own hand-writing. "I have ſeen them (ſays Pliny) in the library of Pomponius Secundus, a poet and citizen of the firſt rank, near 200 years after they were written." We may add, that manuſcripts of this paper ſtill remain, which have undoubtedly been written 1000 or 1200 years ago. It appears from Pliny, that the Egyptians paſted together the pellicles of the papyrus by means of the water of the Nile; but that the poliſhing with ivory, and the operations of the hammer and the preſs, were added by the invention and induſtry of the Roman artiſts. The Egyptians ſeem to have known the uſe of ſize; but it is evident from the ſame author, that the Romans uſed a ſtronger ſize in the making of paper. Notwithſtanding the care which was taken to give ſtrength and conſiſtency to the paper of Egypt, the leaves, although collected into a book, were too weak to ſupport themſelves; and for this reaſon it was a common practice, after every five leaves, to inſert a leaf of parchment. There ſtill remains in the abbey de St Germain de-prés a fragment of the epiſtles of St. Auguſtine written in this manner. The manuſcript is at leaſt 1100 years old, and in a high ſtate of preſervation.

This paper was an important branch of commerce to the Egyptians, which continued to increaſe towards the end of the Roman republic, and became ſtill more extenſive in the reign of Auguſtus. The demand from foreign nations was often ſo great as to occaſion a ſcarcity at Rome; and we read in the reign of Tiberius of a tumult among the people in conſequence of this ſcarcity. In a letter of the Emperor Adrian, the preparing of the papyrus is mentioned as one of the principal occupations at Alexandria. "In this rich and opulent city (ſays he) nobody is ſeen idle: ſome are employed in the manufactory of cloth, ſome in that of writing-paper," &c. During the time of the Antonines, this commerce continued equally to flouriſh. Apuleius ſays, that he wrote on the paper of Egypt with a reed of the Nile prepared at Memphis.

The demand for this paper was ſo great towards the end of the third century, that when the tyrant Firmus conquered Egypt, he boaſted that he had ſeized as much paper and ſize as would ſupport his whole army.

St. Jerom informs us, that it was as much in uſe in the fifth century when he flouriſhed. The duty on the importation of this commodity had grown exceſſive towards the end of this or the beginning of the ſixth century; and being aboliſhed by Theodoric king of Italy, Caſſiodorus, in the 38th letter of his 11th book, congratulates the whole world on the diſcharge of an impoſt on a merchandiſe ſo eſſentially neceſſary to mankind.

The fathers Montfaucon and Mabillon mention ſeveral fragments written on this paper in the ſixth century. One of them was a charter of the Emperor Juſtinian, entitled *Charta plenariæ ſecuritatis*. Father Montfaucon ſaw in 1698, in the library of Julio Juſtiniani, three or four fragments of paper of Egypt of the ſame antiquity. And Mabillon ſpeaks of ſome books of the Jewiſh antiquities by Joſephus tranſlated into Latin, which ſeemed to have been written in the ſame century, and which were preſerved in the library of St. Ambroſe of Milan, but he had not ſeen the manuſcripts. The ſame father mentions to have ſeen in the library of St. Martin of Tours the remains of an old Greek manuſcript of the paper of Egypt, and which appeared to him to be of the ſeventh century. He alſo believes, that the copy of St. Mark's goſpel preſerved in the regiſter-office of Venice is written on the ſame paper, that it is the moſt ancient of any of the evangelical manuſcripts, and may be ſuppoſed to be written at the lateſt in the fourth century.

According to the ſame antiquarian, the paper of Egypt was uſed in France, and Italy, and other European countries, both for books of learning and public records; and there ſtill remains, adds he, a great number of theſe in the archives of the church at St. Dennis, at Corbie, in the abbey de Graſſe, and in other convents.

It is probable, that the invention of paper made of cotton, of which we are afterwards to treat, inſenſibly deſtroyed the reputation and manufacture of the paper of Egypt; but it is ſtill a queſtion at what particular period the fabrication of the latter totally ceaſed. Euſtachius, the learned commentator on Homer, aſſures us, that in his time in 1170 it was no longer in uſe; but father Mabillon maintains that many of the popiſh bulls were written on the papyrus in the 11th century.

The Count Maffei, in his *Iſtor. Diplomat.* lib. ii. *Biblioth. Ital.* tom. ii. p. 251. is decidedly of opinion, that the paper of Egypt was not in uſe in the fifth century. He conſiders all records written on this paper dated poſterior to this period as not authentic; and the popiſh bulls mentioned by father Mabillon appear to this learned perſon, as well as the copy of St. Mark's goſpel, to be written on paper manufactured from cotton. To reconcile in ſome meaſure theſe contradictory accounts, it may be obſerved, that on ſome particular occaſion, and by ſome particular perſons, the paper of Egypt might have been employed for ſeveral hundred years after it ceaſed to be of general uſe. Whoever wiſhes for a fuller account of the paper of

Egypt, may conſult among the ancients Pliny, lib. xiii. and Theophraſtus, lib. iv. cap. ix. and among the moderns, Guillandinus, Scaliger, Saumaiſe, Kerchmayer, Nigrifoli; Father Hardouin in his edition of Pliny; Father Mabillon in his work *De re diplomat.*; Montfaucon in his Paleography, and in his Collections; the illuſtrious Maffei in his *Iſtor. Diplomat.* the Count de Caylus in the Memoirs of the Academy of Inſcriptions; and Mr. Bruce in his Travels to diſcover the Source of the Nile.

Paper made from cotton.—It is generally ſuppoſed that the invention of the paper called *charta bombycina* ſupplanted the Egyptian paper in Greece. This paper is incomparably more laſting, and better calculated for all the purpoſes of writing. It is not preciſely known at what period this art, which ſuppoſes a great variety of previous experiments, was firſt reduced to practice. The application of cotton to the purpoſes of paper-making requires as much labour and ingenuity as the uſe of linen rags; and for this reaſon, if we could determine the preciſe time when paper was made from cotton, we ſhould alſo fix the invention of the art of paper-making as it is preſently practiſed in Europe. Father Montfaucon proves, by inconteſtable authorities, that paper from cotton was in uſe in 1100. This paper in the Greek language is called χαρτης βομβυκινος, or βαμβακινος; for although βομβυξ is the Greek word for ſilk, yet in thoſe times it was applied, as well as βαμβαξ, to cotton; and hence the Italians to this day call cotton *bambaccio*.

The moſt ancient manuſcript of this paper which Father Montfaucon ſaw with the date, was that in the French king's library, written A. D. 1050; but as the manuſcripts without date are infinitely more numerous than thoſe which are dated, and as ſome conjecture can be formed concerning them from the manner of writing, this father believes ſome of theſe to have been written in the tenth century.

The reſearches of the ſame learned antiquarian amount almoſt to a proof that this paper was diſcovered towards the end of the ninth century or beginning of the tenth; for before the twelfth century it was commonly uſed in the eaſtern empire, and even in Sicily. Roger king of Sicily ſays, in a diploma written in 1145, that he had renewed on parchment a charter which had been written on paper of cotton, in the year 1100, and another which was dated in the year 1112. About the ſame time the empreſs Irene, in the ſtatutes for ſome religious houſes at Conſtantinople, ſays that ſhe had left three copies of the ſame ſtatutes, two in parchment and one in paper from cotton. From that period this paper was ſtill more in uſe through all the eaſtern empire; and innumerable Greek manuſcripts are found written on it in all the great libraries.

This diſcovery happened at a time when there ſeems to have been a great ſcarcity of parchment; for it was about this period that the Greeks eraſed the writings of Polybius, Diodorus of Sicily, and many valuable ancient authors, for the ſake of the parchment.

It was the invention of this paper of cotton which deſtroyed the manufacture of the paper of Egypt; for, if we may believe Euſtathius, who wrote towards the end of the twelfth century, the latter paper had gone into diſuſe but a little before his time. We may eaſily believe, however, that this new invention, although of great advantage to mankind, was introduced by degrees.

The manufacture of this kind of paper has flouriſhed in the Levant for many ages, and is carried on with great ſucceſs even to this day. It is not neceſſary to ſay any thing farther, than that the paper produced from cotton is extremely white, very ſtrong, and of a fine grain.

Paper from the interior bark of trees, or liber.—This paper of the ancients was made from the white pellicle or inner coat found in many trees between the bark and the wood. The trees commonly in uſe were the maple, the plane-tree, the elm, the beech, the mulberry, and moſt frequently the linden-tree. The ancients wrote on this inner coat after they had ſeparated it from the bark, beat, and dried it.

The fathers Mabillon and Montfaucon ſpeak frequently of manuſcripts and diplomas written on paper made from bark; and poſitively diſtinguiſh it from the Egyptian paper, becauſe it was thicker, and compoſed of parts leſs adhering together.

There are many palm-trees in India and America to which botaniſts have given the name *papyraceous*, becauſe the natives have written with bodkins either on the leaves or the bark. Such is the American palm, called *tal* by the Indians; and of the ſame kind is the guajaraba of New Spain. Every palm the bark of which is ſmooth, and the leaves large and thick, may be uſed for this purpoſe.

Chineſe paper.—The art of making paper from vegetables reduced to ſtuff was known in China long before it was practiſed in Europe; and the Chineſe have carried it to a degree of perfection hitherto unknown to the European artiſts. The fine paper in China is ſofter and ſmoother than that of Europe; and theſe qualities are admirably adapted to the pencil, which the Chineſe uſe in writing. Several kinds of their paper diſcover the greateſt art and ingenuity, and might be applied with much advantage to many purpoſes. They are capable of receiving, for example, the impreſſion of types; and both maps and prints have been executed with ſucceſs on the Chineſe paper.

The different ſorts of paper vary in China according to the materials of which they are compoſed, and to the different manner of manufacturing thoſe materials. Every province has its peculiar paper. That of Sechwen is made of linen rags as in Europe; that of Fo-kien, of young bamboo; that of the northern provinces, of the interior bark of the mulberry; that of the province of Kiang-nan, of the ſkin which is found in the webs of the ſilk-worm; finally, in the province of Hu-quang, the tree chu or ko-chu furniſhes the materials with which they make paper.

The method of fabricating paper with the bark of different trees is nearly the ſame with that which is followed in the bamboo. To give an idea, therefore, of the manner of manufacturing the interior barks of the mulberry, the elm, and the cotton-tree, it will be ſufficient to confine our obſervations to the bamboo.

The bamboo is a kind of cane or hollow reed, divided by knots; but larger, more elaſtic and durable than any other reed.

The whole ſubſtance of the bamboo, compoſed of filaments and a great abundance of fibrous materials, is employed in this operation. The ſhoots of one or two years, nearly the thickneſs of a man's leg, are preferred. They ſtrip the leaves from the ſtem, cut them into pieces of four or five feet long, make them into parcels, and put them into water to macerate. As ſoon as they are ſoftened, which generally happens in five days, they waſh them in pure water; put them into a dry ditch; cover them with lime for ſome days, which they water for the purpoſe of ſlacking: they waſh them carefully a ſecond time; cut every one of the pieces into filaments, which they expoſe to the rays of the ſun to dry and to bleach them. After this they are boiled in large kettles; and then reduced to ſtuff in mortars of wood, by means of a hammer with a long handle, which the workman moves with his foot.

The ſtuff being thus prepared, they take ſome ſhoots of a plant named *koteng*, which, ſteeped in water four or five days, is reduced to an unctuous or glutinous ſubſtance: and when they proceed to make the paper, this is mixed with the ſtuff in certain exact quantities, for on this mixture depends the goodneſs of the paper.

When the extract from the koteng is mixed with ſtuff of the

bamboo, the whole mixture is beat together in mortars till it becomes a thick and viſcous liquor. This is poured into large tubs or reſervoirs, ſo exactly framed as that no part of the liquor can eſcape.

The workmen after this plunge their forms into the liquor; take out what is ſufficient for a ſheet of paper; which immediately, from the glutinous ſubſtance, becomes firm and ſhining; and is detached from the form by turning down the ſheet on the heap of paper already made, without the interpoſition of pieces of woollen cloth, as in Europe.

In order to dry this paper, they have a hollow wall, the two fronts of which are ſmooth and extremely white. At the extremity of this wall is placed a ſtove, the pipes of which are carried in a circular manner through the whole empty ſpace. The ſheets of paper are laid on the ſurface, to which they adhere till they come over them with a ſoft bruſh; and after they are dry, it is eaſy to diſtinguiſh the ſide which received impreſſions from the bruſh from that which adhered to the wall. By means of this ſtove the Chineſe dry their paper as faſt as they can make it; but it is only in cold ſeaſons, or in certain provinces, that they find this expedient neceſſary.

The Chineſe paper muſt be dipped in a ſolution of alum before it can take either ink or colours. They call this operation *fauer*, from the Chineſe word *fan*, which ſignifies alum. The following is the manner of preparing this ſolution: Six ounces of iſinglaſs cut very ſmall is put into boiling water, and conſtantly ſtirred, that it may diſſolve equally. When the iſinglaſs is wholly diſſolved in the water, they throw in twelve ounces of calcined alum, which is alſo ſtirred till it is completely diſſolved and mixed with the iſinglaſs. This compoſition is afterwards poured into a large and deep baſon, at the mouth of which is a little round piece of wood; the extremity of every ſheet of paper is fixed in another piece of wood, with a ſlit made to receive it: by means of this equipage they plunge the ſheet of paper into the compoſition of alum and iſinglaſs; and when it is fully penetrated, they draw it out, making it glide over the little round piece of wood. The long piece of wood which holds the ſheet by one end, and keeps it from tearing, is afterwards ſuſpended with it on a wall till it is ſufficiently dry.

The Chineſe give the paper intended for different purpoſes different preparations. We ſhall confine our obſervations to the ſilver colour which they give to ſome paper. They take two ſcruples of paſte made of cow's hide, one ſcruple of alum, and a pint of water: the whole is boiled on a ſlow fire till the water be evaporated. The ſheets of paper are then ſtretched on a ſmooth table, and covered over with two or three layers of this paſte. They take afterwards a certain quantity of talc, waſhed and boiled in water, with the proportion of one-third of alum: this is dried, reduced to a powder, paſſed through a ſieve, boiled a ſecond time in water, dried in the ſun, and again paſſed through the ſieve. This powder is ſpread equally over the ſheets of paper, prepared as we mentioned above; and then they are dried ſlowly in the ſhade.

The ſheets of paper, covered in this manner with talc, are laid upon a table, and rubbed with a little cotton; which fixes a certain quantity of the talc in the paper, and carries off the overplus to be uſed on another occaſion. By means of this compoſition the Chineſe draw all manner of figures on their paper.

Formerly the Chineſe wrote with a bodkin of iron on tablets of bamboo; afterwards on ſatin with a pencil; and during the dynaſty of their tyrants, about 160 years before Chriſt, they diſcovered the art of making paper.

The paper made from the bamboo is ſufficiently white, ſoft, cloſely united, without the leaſt inequality on the ſurface to interrupt the motion of the pencil, or to occaſion the riſing of the materials which compoſe it. Meanwhile every kind of paper made from the bamboo or the bark of trees, is readier to crack than that made in Europe; beſides, it is more ſuſceptible of moiſture, and ſooner deſtroyed with duſt and worms. To obviate this laſt inconveniency, they are obliged frequently to beat their books in China, and expoſe them to the ſun. It may be obſerved, however, that the Chineſe paper, employed for various purpoſes in Europe, has been preſerved for a long time without receiving damage either from moiſture or inſects.

Japaneſe paper.—According to Kempfer, the bark of the *morus papifera ſativa*, or true paper-tree, is chiefly employed for making paper in Japan. Every year after the fall of the leaves, which happens in the tenth month, correſponding to our December, the Japaneſe cut the young ſhoots of this tree into pieces of about three feet, collect them into parcels, which they boil in water into which they have caſt a certain quantity of aſhes. If the wood is dry, they take care to ſteep it 23 hours in water before it is boiled. The parcels are kept in a cloſe copper till the bark at the extremity of the ſhoots is ſeparated from the ſtem about half an inch; they are then cooled; and the bark alone is fit for making paper. They begin by a preparation which conſiſts of cleaning the bark, and ſeparating the good from the bad. For this purpoſe they ſteep it in water three or four hours; and as ſoon as it is ſoftened they ſcrape off with a knife whatever is blackiſh or green, and at the ſame time ſeparate the ſtrong bark of a year's growth from the ſlender which covers the young ſhoots. The firſt of theſe gives the whiteſt and beſt paper. If there is any of the bark of more than a year's growth, is is laid aſide for the coarſeſt.

After the bark has been culled and cleaned in this manner, it is boiled in a clear ley till the matter is of that conſiſtency, that, being touched gently with the finger, it draws off in the form of hairs, or like a collection of fibres. During the time of boiling it is conſtantly ſtirred with a ſtrong reed, and the waſte by evaporation ſupplied from time to time with additional quantities of the clear ley. To make this ley, they put two pieces of wood acroſs the mouth of a tub, cover them with ſtraw, on which they lay a bed of aſhes a little moiſtened; and pouring boiling water on the aſhes, the ſalts contained in them are carried down to the tub. This is what is called a *clear ley*.

After the bark is in the condition we have juſt now ſtated, it is waſhed with great care; for on this waſhing depends in a great meaſure the goodneſs of the paper. It is put into a kind of ſieve through which the water can flow freely; and great care is taken to turn it with the hand till it is ſufficiently diluted, and reduced to ſoft and tender fibres. For the fineſt paper a ſecond waſhing is requiſite, and a piece of cloth is uſed inſtead of a ſieve.

When the bark is waſhed, it is laid on a ſtrong and ſmooth table, and beat with a kind of batoir of hard wood till it is reduced to a proper conſiſtency. It becomes indeed ſo ſoft, that it reſembles paper ſteeped in water.

The bark prepared in this manner is put into a narrow tub, with a glutinous extract from rice and the root oreni, which is very viſcous. Theſe three ſubſtances, mixed together, are ſtirred with the reed till they form a liquor of an equal and uniform conſiſtency. This compoſition is poured into tubs ſimilar to thoſe uſed for filling the forms in our paper-mills.

As ſoon as the ſheets are made and detached from the form, they are laid in a heap on a table covered with a double mat. A ſmall chip of cane is placed betwixt every ſheet. This piece of cane jutting out, ſerves to diſtinguiſh the ſheets, and afterwards to raiſe them. Every one of the heaps is covered with a plate or thin board of the exact ſize of the paper. In proportion as the paper dries, or is able to bear it without danger of being compreſſed into one maſs, they lay on additional weights. This preſſure, intended to carry off any unneceſſary moiſture,

is continued for 24 hours, when the ſheets are ſuſpended, by means of the little piece of reed, to long plants, in the open air, till they are completely dried.

The extract from rice is made in an unvarniſhed earthen pot. The pot is agitated at firſt gently. then more briſkly: new water is poured in, and then it is filtered through a linen cloth. The finiſhing of the proceſs is determined by the viſcoſity of the ſubſtance.

The infuſion of the root oreni is made in the following manner: the root, peeled and cut into ſmall pieces, is infuſed into water for one night, during which time it communicates a viſcoſity ſufficient for the purpoſe to which it is applied.

The Japaneſe paper is of ſo prodigious a ſtrength, that the materials of which it is compoſed might be manufactured into ropes. There is ſold at erige, the capital city of the province of Japan of that name, a kind of it fit for bed-hangings and wearing apparel; reſembling ſo much ſtuffs of wool and ſilk, that it is often taken for them. The following is Kempfer's catalogue of trees uſed in Japan for the manufactory of paper. 1. The true paper tree, called in the Japaneſe language *kaadſi*, Kempfer characterizes thus: *Papyrus fructu mori celſæ, ſive morus ſativa foliis urticæ mortuæ cortice papifera.* 2. The falſe paper tree, called by the Japaneſe *katſi kadſirc*; by Kempfer, *papyrus procumbens lactescens folio longo lanceata cortice chartaceo.* 3. The plant which the Japaneſe call *oreni* is named by Kempfer *alva radice viſcoſa flore ephemero magno punico.* 4. The fourth tree uſed for paper is the *futokadſura*, named by Kempfer *frutex viſcoſus procumbens folio telephii vulgaris æmulo fructu racemoſo.*

The deſcription of theſe trees, given more particularly by Kempfer than the limits of this work will permit, may be of great ſervice to lead botaniſts to diſcover the European plants and ſhrubs adapted, like the Japaneſe, to the fabrication of paper.

Before finiſhing our reflections on this part of the ſubject, it will be proper to give a juſt idea of the attempts which have been made to increaſe the original materials of paper in Europe.

A ſlight attention to the proceſs in China in reducing the bamboo to a paſte, by a careful and ingenious analyſis, and to the long and proper method of the Japaneſe of ſeparating the principal fibres of the bark of the mulberry, will ſhow the abſurdity not only of taking plants without any kind of choice, but of giving them no preparation except that of pounding them with mallets.

With a proper ſelection, and good principles, it appears not improbable that many of the European plants might be uſed with great advantage in conſtructing ſeveral kinds of paper.

It is evident that the materials uſed by the Chineſe require leſs labour and preparation than the ſtuff of linen rags. The ſheets of the Chineſe paper are eaſily detached from the form; they are laid in heaps without the interpoſition of pieces of woollen cloth; the ſuperfluous water is immediately diſcharged; and they require not, as in Europe, the vigorous action of preſſes to unite the parts more cloſely together.

Paper made from aſbeſtos.—The aſbeſtos is a fibrous ſubſtance of little ſtrength, the threads of which are eaſily broken. This ſubſtance has the peculiar quality of ſupporting the action of fire without receiving any damage; whence pieces of cloth and garters made of it are incombuſtible. From the knowledge of this property paper has been made of the aſbeſtos. Dr. Brukmann, profeſſor at Brunſwic, publiſhed the natural hiſtory of this foſſil; and four copies of his book, in the library of Wolfenbuttle, are on this paper.

The manner of fabricating this paper is deſcribed by Mr. Lloyd in the Philoſophical Tranſactions, N° 166. A certain quantity of the aſbeſtos is pounded in a mortar of ſtone till it be reduced to a ſubſtance like cotton. All the parts of earth or ſtone remaining in the aſbeſtos are then taken off by means of a fine ſieve, and it is formed into ſheets of paper by an ordinary paper-mill. Mixing it with water reduces it to ſtuff; only, as it is heavier than that from linen rags, it requires to be continually ſtirred when they are taking it up with the frames. The only excellence of this paper is, that the writing diſappears when it is caſt into the fire. It muſt be obſerved, at the ſame time, that as it is of a ſlender conſiſtency, and eaſily torn, it is more an object of curioſity than uſe.

Paper made from rags.—This paper is manufactured through all Europe of linen rags collected in the cities and in the country. This kind of paper was utterly unknown to the ancients. The *libri lintei* mentioned by Livy, i. lib. iv. Pliny. xiii. c. xi. and by other Roman writers, are demonſtrated by Guilandin, in his commentary on Pliny, &c. to have been written on pieces of linen cloth, or canvaſs prepared in the manner of painters.

But it is not ſufficient to be certain that paper from linen is a modern invention; it is neceſſary to know by what nation, and at what period, it was diſcovered. Polydore Vergil, *De Inventoribus Rerum*, c. ii. c. viii. confeſſes his ignorance of theſe facts. Scaliger, without any kind of proof, gives the glory to the Germans; and Count Maffei to the Italians. Other writers aſcribe this honour to ſome Greek refugees at Baſil, to whom the manner of making paper from cotton in their own country had ſuggeſted the idea. Du Halde is perſuaded that Europe derived this invention from the Chineſe, who, in ſeveral provinces, make paper of rags nearly in the ſame manner that we do. But this invention was practiſed by the Europeans before they had any communication with China, and before the taking of Conſtantinople, at which time the Greek refugees were ſuppoſed to have retired to Baſil. The preciſe time of this diſcovery in Europe is not exactly known. Father Mabillon believes that it was in the twelfth century; and cites a paſſage of Pierre de Clugny, born A. D. 1100, to prove it. The books which we read every day, ſays that Abbé in his treatiſe againſt the Jews, are written on ſheep's and calf's ſkin; or on oriental plants; or, finally, *ex raſuris veterum pannorum.* If theſe laſt words ſignify paper ſuch as we uſe, there were books of it in the twelfth century. But this citation is the more to be ſuſpected, as Montfaucon himſelf, after the minuteſt ſearch in France and Italy, could find no book on this paper antecedent to the death of St. Louis, A. D. 1270.

The epocha of this invention was not determined till 1762, M. Mierman having propoſed a reward to the perſon who could procure the moſt ancient manuſcript written on this kind of paper. The collection of all the memoirs ſent to him along with the manuſcripts was publiſhed at the Hague in 1767; and it appeared that this paper had been uſed in Europe before the year 1300.

In 1782 the Abbé Andrez publiſhed a work entitled *Dell' Origine, Progreſſi e Stato attuale d' Ogni Letteratura*; wherein he ſpeaks of the diſcovery of many kinds of paper, and particularly of that made of rags. The Abbé Andrez maintains, that paper made from ſilk was very anciently fabricated in China, and in the eaſtern parts of Aſia; that the art of making this paper was carried from China to Perſia about the year 652, and to Mecca in 706. The Arabs ſubſtituted cotton, the commodity of their own country, in place of ſilk, or rather bamboo. This paper of cotton was carried into Africa and Spain by the Arabs. The Spaniards, from the quantity of linen to be found in the kingdom of Valencia, ſeem firſt to have adopted the idea of uſing linen rags; and the moſt ancient paper of this kind is of Valencia and Catalonia. From Spain it paſſed into France, as may be learned from a letter of Joinville to St. Louis about the year 1260. It is diſcovered to have been in Germany in 1312, and in England in 1320 and 1342. In conſequence of the paper made from cotton in the Levant, the paper from linen was introduced much later into Italy. See the work of

Abbé Andrez, printed at Parma, 1782, in 8vo; and Mierman's Collection, publiſhed at the Hague, 1760.

Art of Making Paper in Europe.

To give a conciſe view of this ſubject, it will be neceſſary to proceed with all the important parts of the operation in their order.

The ſelection of the rags is the arranging of them into different lots, according to their quality and to the demand of the paper-mill. In general this ſelection is very much neglected: the degrees of fineneſs and whiteneſs, diſtinguiſhed with little care, are thought to be the only objects of importance; whereas the hardneſs and ſoftneſs, the being more or leſs worn, are much more eſſential in this ſelection. It is certain, that a mixture of ſoft and hard rags occaſions much more loſs in the trituration than a difference in point of fineneſs or of colour. This exactneſs in the ſelection is ſtill more neceſſary where cylinders are uſed inſtead of mallets. We cannot do better than to give the method practiſed in Holland as worthy of imitation.

They begin by a general ſeparation of the rags into four lots; ſuperfine, fine, middle, and coarſe. Theſe lots are given to ſelectors, who ſubdivide each of them into five cheſts. They have beſides a bench, on which is fixed vertically a hook, and a piece of ſcythe which is terminated by a crooked point.

The perſon, for example, who has the charge of the fine lot, puts into one of the cheſts the hard rags, or thoſe which are little uſed, into another the ſoft, into a third the dirty, into a fourth thoſe which are ſtitched or hemmed, and, finally, into the fifth the ſuperfine rags which happen to be among the fine.

After this proceſs, the women who have the charge of it are at extreme pains to pick out every kind of ſewing, and eſpecially the knots of thread and the hems, by means of the hook or ſcythe which they have under their hands. They take care alſo by the ſame means to cut and reduce the rags exactly by the warp and the woof into ſmall pieces. It is of great advantage to cut or tear the pieces of rags by a thread, whether it be by the warp or woof; becauſe, if it is done obliquely, many of the ends are loſt in the operation.

When they have ſelected a certain quantity of each of theſe ſubdiviſions, they are placed on an iron grate, which covers a large cheſt, where they are beat, and otherwiſe turned, till the filth and duſt paſs through the bars of the grate and fall into the cheſt.

The number of lots in the ſelection of rags muſt be proportioned to the maſs from which the ſelection is made, and to the kinds of paper produced by the mill. Some mills, the work of which is conſiderable, make nine lots of their rags, five of which reſpect the fineneſs, and the reſt the cleanneſs and the colour. In ordinary mills there are only four lots, and in ſome two.

We have already obſerved, that the ſelection which regards the hardneſs of the materials is the moſt eſſential; becauſe it is of great importance to obtain ſtuff compoſed of equal parts, and without any loſs. But it is neceſſary to add, that the fineneſs and beauty of the paper depend in ſome caſes on a ſelection not rigorous. Thus, for example, it is of great ſervice to allow the middle to retain ſome part of the fine, and the fine ſome part of the ſuperfine; for without this the inferior kinds of paper can never be of great value. The moſt common fault is to mix the rags of the inferior lots with the ſuperior; which, though it augments the quantity of paper, is extremely injurious to the quality. It does much better to mix part of the ſuperior lots with the inferior. It is the want of attention to this mixture which makes ſome paper-mills excel in the ſuperior ſorts of paper, while the inferior kinds are of a very bad quality.

The ſelection of rags being made with exactneſs, however, and the lots being fermented and triturated ſeparately, the mixture may be made with much greater advantage when they are both reduced to ſtuff: always taking care that it be in the ſame proportion as if it were in the ſtate of rags, and only in the manner which we juſt now mentioned; for the inferior ſorts gain more in beauty and quality by this mixture than is loſt in ſtuff; whereas if the fine ſtuff receives a certain quantity of the inferior, the paper is more damaged in its value than increaſed in quantity. In this manner the intereſt of the manufacturer, as in all caſes, is intimately connected with the goodneſs of his commodities.

In ſome mills the place for fermentation is divided into two parts, one of which ſerves for waſhing away the filth from the rags. After allowing them to ſteep for ſome time in a large ſtone vat, they ſtir them, and pour in freſh water till the impurities connected with the rags run over. When they are as clean as they poſſibly can be made by this kind of waſhing, they are laid in a heap to putrefy. In this condition they experience a degree of fermentation, which is firſt diſcovered by a mouldineſs of the different pieces of cloth. Afterwards the maſs grows warm; and then it is of great conſequence to attend to the progreſs of this heat, in order to moderate its effects: for this purpoſe, the middle of the heap, where the fermentation is ſtrongeſt, is turned out, and *vice verſa*. In mills where mallets are uſed, the putrefaction is carried to a great height, which is frequently attended with two inconveniences. The firſt is, that a part of the rags is reduced to an earthy ſubſtance, which is found in great abundance about the cutting-table, as we ſhall afterwards have occaſion to ſee. But beſides this waſte, exceſſive fermentation makes the ſtuff incapable of ſuſtaining the action of the mallets till it is equally pounded; for which reaſon, it has been of late years wholly omitted.

When it is thought proper to ferment the rags, and they are reduced to a proper ſtate of putrefaction, they are afterwards carried to the cutting-table, which is placed on ſolid treſſels, and incloſed on three ſides to contain the rags cut on it. Before the table is fixed vertically a part of the blade of a ſcythe, the edge of which is turned from the operator. This workman, in a ſituation rather elevated, takes from the left ſide a handful of the putrefied rags, and, arranging them the long way, gives them a gentle twiſt, preſſes the half-formed rope againſt the blade of the ſcythe, and, in the manner of ſawing, cuts it into three or four pieces, which he throws to the right ſide of the table. In this operation the rags loſe part of their filth, and eſpecially of the earthy particles occaſioned by too much putrefaction.

When the rags have been ſubmitted to the foregoing operations, they are in a condition to be reduced into a fibrous ſtuff, of which the paper is made. To obtain this ſtuff, mills are conſtructed on different principles. Thoſe which have been uſed for a long time over all Europe, and which by a ſtatement in the *Encyclopédie Méthodique*, publiſhed at Paris in 1789, are ſtill uſed in France, are mills with mallets. But the mills invented by the Dutch, and uſed in the neighbouring provinces, and, excepting one inſtance, in every part of Great Britain, are mills with cylinders or rollers. In the former of theſe, the mallets are raiſed by knotches fixed at convenient diſtances in a large circular beam of wood. The teeth fixed on the end of the mallet fall into a correſponding gap made the whole breadth of the plate, and the ſtrokes are repeated till the rags are reduced to a proper conſiſtency. On ſupplying the vat with water, and carrying off all the impurities, the operation is nearly ſimilar to that in the mills with cylinders.

Such is the nature of what may be called the *old method of making paper*; it will next be requiſite to ſtate the improvements lately made in the art.

The duſter is now made in the form of a cylinder, four and an half feet in diameter, and five feet in length. It is al-

together covered with a wire-net, and put in motion by its connection with ſome part of the machinery. A convenient quantity of rags before the ſelection are incloſed in the duſter, and the rapidity of its motion ſeparates the duſt from them, and forces it through the wire. It is of conſiderable advantage to uſe the duſter before ſelection, as it makes that operation leſs pernicious to the ſelectors.

The ſelection is performed much in the ſame manner as we have already deſcribed; only it is found more convenient to have the tables for cutting off the knots and ſtitching, and for forming them into a proper ſhape, in the ſame place with the cutting-table. The ſurface both of theſe and of the cutting-table is compoſed of a wire net, which in every part of the operation allows the remaining duſt and refuſe of every kind to eſcape.

The rags, without any kind of putrefaction, are again carried from the cutting-table back to the duſter, and from thence to the engine, where, in general, they are in the ſpace of ſix hours reduced to the ſtuff proper for making paper. The hard and ſoft of the ſame quality are placed in different lots; but they can be reduced to ſtuff at the ſame time, provided the ſoft be put ſomewhat later into the engine.

The engine is that part of the mill which performs the whole action of reducing the rags to paſte, or, as it may be termed, of trituration. The number of the engines depends on the extent of the paper-work, on the force of water, or on the conſtruction of the machinery.

It will afford a ſufficient idea of the work, to give in detail a deſcription of the different parts of the engine. See plate 24. Figure 1. repreſents the chapiter which covers the roller. It is four feet three inches in length, and two feet eight inches in breadth. The ſuperior part is pierced with two openings running croſswiſe, 1, 2, 3, 4, into which enter the chaſſes or wicker frames, figures 6 and 7: the firſt, made of wire-cloth, enters into the opening 3 and 4; the ſecond, made of hair-cloth, and ſtrengthened with ſeveral croſs-bars of wood, enters into the opening 1, 2, ſerves to retain the ſmall pieces of rags which eſcape through the firſt, and prevents them from falling into the dalot or hole-ſcupper, fig. 2. This hole-ſcupper is placed acroſs the vat of the engine, parallel to the axle of the roller; the part 9 enters into the notch *c* of the chapiter; and the extremity *b* enters into the opening *k* of the tunnel *kl* (fig. 3.), by which means the water daſhed through the wicker-frames by every revolution of the roller is precipitated into the canal *f h*, and loſes itſelf below the engine. The figures 4, 9, and 10, repreſent the roller in perſpective, in plane, and in profile. It is two feet in diameter, and two feet three inches in length. The trundle head A is 16 inches in diameter, about half as much in length, and furniſhed with ſeven ſpindles of iron, which are ſcrewed to the end of the trundle head, made alſo of iron. The teeth or blades of the roller are 27 in number, and fitted ſtrongly into the wood which compoſes its body, parallel to its axis. They are of that thickneſs as to leave as much empty ſpace as they occupy. The exterior face of each of the blades ſhould be made round, and divided into two parts, with a longitudinal motion, as in the profile *a a a*, fig. 10.

The axis AB of the roller (fig. 4. and 9.) has two parts perfectly rounded in A and in B, which perform the office of pivots. Theſe pivots reſt in the ſockets A and B (fig. 8.) in the middle of the levers OAH and OBH. It is by means of theſe levers that they raiſe at pleaſure or lower the axis of the roller, and fit it exactly, and in a parallel manner, to the plate. The plates (ſee fig. 5.) are made of ſteel cut into channels, in ſuch a manner as to correſpond with the blades of the roller. Their channels are not perpendicular, but oblique; and there are two rows of them, *bx*, *xd*, conſiſting of ſeven or eight blades each on one plate—Thoſe in *b x*, for the purpoſe of changing the plate, lie in an oppoſite direction to thoſe in *x d*. The levers are kept in their poſition near the vat by bands of iron, MN and *m n*; between which they are made higher or lower by the cogged wheel H, which ſupports one of the extremities. Wedges N *n* are likewiſe employed to fix the levers at a convenient height above the plates. Finally, every vat is ſupplied with a ſmall ſlide-door, which is occaſionally raiſed to carry the prepared ſtuff by means of the ſcuppers of wood to the general repoſitories.

Fig. 5. is placed in the vat fig. 8.; the roller (fig. 4.) is placed above it in ſuch a manner that the pivots reſt in the ſockets of the levers; the ſcupper (fig. 2.) and the chapiter are diſpoſed in the manner above mentioned. The vat is charged with a proper quantity of rags, and freſh water is admitted by a ſpigot placed at one of the corners. In this ſituation, when the engine is put in motion, the roller turning upon its axis draws the water and the rags by the leaſt inclined plane, and, making them paſs between its blades and the channels of the plate, daſhes them againſt the chapiter and the wicker-frames; and, in ſhort, part of them falls back into the vat, and returns into the circulation. The cauſe of this circulation is evidently the continual void occaſioned by the movement of the roller on the one ſide, and the return of the water and the ſtuff on the other.

As all the rags are not thrown towards the part B*d* of the chapiter, from whence they might fall back into the vat, but a part of them to a greater diſtance; it is neceſſary to have the wicker-frames formerly deſcribed, not only to prevent their loſs, but to allow the dirty water to eſcape. The ſpigot at the corner of the vat continually ſupplies this waſte of water. This operation would be ſufficient to whiten the rags, although the rollers were raiſed conſiderably from the plate; and therefore the force and action of the rollers reducing them to ſtuff muſt be much more effectual. It requires great ſkill to conduct the engine, whether it be with regard to the firſt quantity, to the proper time for adding the ſofter rags, to the augmenting or diminiſhing the water in proportion to the trituration; or, finally, to knowing exactly when the ſtuff is reduced to a proper conſiſtency.

In the paper-manufactory at Montargis, it was attempted to introduce rollers of the greateſt ſtrength and the leaſt weight poſſible, in order to give them the greater rapidity; but the experiment did not ſucceed: the rollers of prodigious rapidity were found to produce ſtuff neither in greater quantity nor of ſuperior quality. The moſt experienced artiſts have eſtabliſhed a proportion between the motion of the roller and the greater or leſs reſiſtance of the rags. And the Dutch, who have arrived at very great perfection in this art, have followed a method totally different from that practiſed at Montargis. A roller in Holland complete in all its parts, weighs nearly 30 hundred weight; and they find this neceſſary for cutting the rags, eſpecially if they have not been putrefied. In proportioning the rapidity to the reſiſtance, they have alſo diſcovered, that a ſlow motion is preferable to a rapid one. The rollers at Saardom, by calculation made from the different parts of the machinery, make about 68 revolutions in a minute; thoſe at Montargis about 166.—In Holland, too, this trituration of the rags is divided into two diſtinct operations, performed by rollers conſtructed on different principles: the firſt of them, for cutting the rags and preparing for the other, is furniſhed with blades of ſteel without any moiſture, and with a conſiderable ſpace between them; the ſecond, intended to reduce the ſtuff to the proper conſiſtency, has a greater number of blades, compoſed of a mixture of braſs and copper. The mills with rollers are in every reſpect ſuperior to thoſe formerly in uſe with mallets. Two Dutch rollers of the conſtruction we have juſt now deſcribed will prepare as much ſtuff in the ſame time as 24 mallets; they require infinitely leſs room; they do it without putrefaction; and as they do it in leſs time, and with leſs water, they occaſion much leſs waſte of the ſtuff.

When the ſtuff is brought to perfection, it is conveyed into a general repoſitory, which ſupplies the vat from which the ſheets of paper are formed. This vat is made of wood, and generally about five feet in diameter, and two and an half in depth. It is kept in temperature by means of a grate introduced by a hole, and ſurrounded on the inſide of the vat with a caſe of copper. For fuel to this grate, they uſe charcoal or wood; and, frequently, to prevent ſmoke, the wall of the building comes in contact with one part of the vat, and the fire has no communication with the place where they make the paper.

Every vat is furniſhed on the upper part with planks incloſed inwards, and even railed in with wood, to prevent any of the ſtuff from running over in the operation. Acroſs the vat is a plank which they call the *trapan*, pierced with holes at one of the extremities, and reſting on the planks which ſurround the vat.

The forms or moulds are compoſed of wire-cloth, and a moveable frame. It is with theſe that they fetch up the ſtuff from the vat, in order to form the ſheets of paper. The ſides of the form are made of oak, which is previouſly ſteeped in water, and otherwiſe prepared to prevent warping. The wire-cloth is made larger than the ſheet of paper, and the exceſs of it on all ſides is covered with a moveable frame. This frame is neceſſary to retain the ſtuff of which the paper is made on the cloth; and it muſt be exactly adapted to the form, otherwiſe the edges of the paper will be ragged and badly finiſhed. The wire-cloth of the form is varied in proportion to the fineneſs of the paper and the nature of the ſtuff.

The felts are pieces of woollen cloth ſpread over every ſheet of paper, and upon which the ſheets are laid to ſeparate them from the form, to prevent them from adhering together, to imbibe part of the water with which the ſtuff is charged, and to tranſmit the whole of it when placed under the action of the preſs. The two ſides of the felt are differently raiſed: that of which the hair is longeſt is applied to the ſheets which are laid down; and any alteration of this diſpoſition would produce a change in the texture of the paper. The ſtuff of which the felts are made ſhould be ſufficiently ſtrong, in order that it may be ſtretched exactly on the ſheets without forming into folds; and, at the ſame time, ſufficiently pliant to yield in every direction without injury to the wet paper. As the felts have to reſiſt the reiterated efforts of the preſs, it appears neceſſary that the warp be very ſtrong, of combed wool, and well twiſted. On the other hand, as they have to imbibe a certain quantity of water, and to return it, it is neceſſary that the woof be of carded wool, and drawn out into a ſlack thread.—Theſe are the utenſils, together with the preſs, which are uſed in the apartment where the ſheets of paper are formed.

The vat being furniſhed with a ſufficient quantity of ſtuff and of water, two inſtruments are employed to mix them; the one of which is a ſimple pole, and the other a pole armed with a piece of board, rounded and full of holes. This operation is repeated as often as the ſtuff falls to the bottom. In the principal writing-mills in England, they uſe for this purpoſe what is called a *hog*, which is a machine within the vat, that, by means of a ſmall wheel on the outſide, is made to turn conſtantly round, and keep the ſtuff in perpetual motion. When the ſtuff and water are properly mixed, it is eaſy to perceive whether the previous operations have been complete. When the ſtuff floats cloſe, and in regular flakes, it is a proof that it has been well triturated; and the parts of the rags which have eſcaped the rollers alſo appear.

After this operation the workman takes one of the forms, furniſhed with its frame, by the middle of the ſhort ſides; and fixing the frame round the wire-cloth with his thumbs, he plunges it obliquely four or five inches into the vat, beginning by the long ſide, which is neareſt to him. After the immerſion he raiſes it to a level: by theſe movements he fetches up on the form a ſufficient quantity of ſtuff; and as ſoon as the form is raiſed the water eſcapes through the wire-cloth, and the ſuperfluity of the ſtuff over the ſides of the frame. The fibrous parts of the ſtuff arrange themſelves regularly on the wire-cloth of the form, not only in proportion as the water eſcapes, but alſo as the workman favours this effect by gently ſhaking the form. Afterwards, having placed the form on a piece of board, the workman takes off the frame or deckle, and glides this form towards the coucher; who, having previouſly laid his felt, places it with his left hand in an inclined ſituation, on a plank fixed on the edge of the vat, and full of holes. During this operation the workman applies his frame, and begins a ſecond ſheet. The coucher ſeizes this inſtant, takes with his left hand the form, now ſufficiently dry, and, having laid the ſheet of paper upon the felt, returns the form by gliding it along the trapan of the vat.

They proceed in this manner, laying alternately a ſheet and a felt, till they have made ſix quires of paper, which is called a *poſt*: and this they do with ſuch ſwiftneſs, that, in many ſorts of paper, two men make upwards of 20 poſts in a day. When the laſt ſheet of the poſt is covered with the laſt felt, the workmen about the vat unite together and ſubmit the whole heap to the action of the preſs. They begin at firſt to preſs it with a middling lever, and afterwards with a lever about fifteen feet in length. After this operation another perſon ſeparates the ſheets of paper from the felts, laying them in a heap; and ſeveral of theſe heaps collected together are again put under the preſs.

The ſtuff which forms a ſheet of paper is received, as we have already ſaid, on a form made of wire-cloth, which is more or leſs fine in proportion to the ſtuff, and ſurrounded with a wooden frame, and ſupported in the middle by many croſs bars of wood. In conſequence of this conſtruction, it is eaſy to perceive, that the ſheet of paper will take and preſerve the impreſſions of all the pieces which compoſe the form, and of the empty ſpaces between them.

The traces of the wire-cloth are evidently perceived on the ſide of the ſheet which was attached to the form, and on the oppoſite ſide they form an aſſemblage of parallel and rounded riſings. As in the paper which is moſt highly finiſhed the regularity of theſe impreſſions is ſtill viſible, it is evident that all the operations to which it is ſubmitted have chiefly in view to ſoften theſe impreſſions without deſtroying them. It is of conſequence, therefore, to attend to the combination of labour which operates on theſe impreſſions. The coucher, in turning the form on the felt, flattens a little the rounded eminences which are in relievo on one of the ſurfaces, and occaſions at the ſame time the hollow places made by the wire-cloth to be partly filled up. Meanwhile the effort which is made in detaching the form, produces an infinite number of ſmall hairs on every protuberant part of the ſheet.

Under the action of the preſs, firſt with the felts and then without them, the perfecting of the grain of paper ſtill goes on. The veſtiges of the protuberances made by the wires are altogether flattened, and of conſequence the hollows oppoſite to them diſappear alſo; but the traces formed by the interſtices of the wire, in conſequence of their thickneſs, appear on both ſides, and are rounded by the preſs.

The riſings traced on each ſide of the paper, and which can be diſcovered by the eye on that which is moſt highly finiſhed, form what is called the *grain of paper*. The different operations ought to ſoften but not deſtroy it; which is effectually done by employing the hammer. This grain appears in the Dutch paper; which is a ſufficient proof, that though they have brought this part of the art to the greateſt perfection, they have not employed hammers, but more ſimple and ingenious means. The

grain of paper is often disfigured by the felts when they are too much uſed, or when the wooſ does not cover the thread. In this caſe, when the paper is ſubmitted to the preſs, it takes the additional traces of the warp and the woof, and compoſes a ſurface extremely irregular.

The paper the grain of which is highly ſoftened is much fitter for the purpoſes of writing than that which is ſmoothed by the hammer: on the other hand, a coarſe and unequal grain very much oppoſes the movements of the pen; as that which is beat renders them very uncertain. The art of making paper, therefore, ſhould conſiſt in preſerving, and at the ſame time in highly ſoftening, the grain: the Dutch have carried this to the higheſt perfection.

The exchange ſucceeds the operation laſt deſcribed. It is conducted in a hall contiguous to the vat, ſupplied with ſeveral preſſes, and with a long table. The workman arranges on this table the paper, newly fabricated, into heaps; each heap containing eight or ten of thoſe laſt under the preſs, kept ſeparate by a woollen felt. The preſs is large enough to receive two of them at once, placed the one at the other's ſide. When the compreſſion is judged ſufficient, the heaps of paper are carried back to the table, and the whole turned ſheet by ſheet, in ſuch a manner that the ſurface of every ſheet is expoſed to a new one; and in this ſituation they are again brought under the preſs. It is in conducting theſe two operations ſometimes to four or five times, or as often as the nature of the paper requires, that the perfection of the Dutch plan conſiſts. If the ſtuff be fine, or the paper ſlender, the exchange is leſs frequently repeated. In this operation it is neceſſary to alter the ſituation of the heaps, with regard to one another, every time they are put under the preſs; and alſo, as the heaps are higheſt toward the middle, to place ſmall pieces of felt at the extremities, in order to bring every part of them under an equal preſſure. A ſingle man with four or five preſſes may exchange all the paper produced by two vats, provided the previous preſſing at the vats be well performed. The work of the exchange generally laſts about two days on a given quantity of paper.

When the paper has undergone theſe operations, it is not only ſoftened in the ſurface, but better felted, and rendered more pliant in the interior parts of the ſtuff. In ſhort, a great part of the water which it had imbibed in the operation of the vat is diſſipated. By the felting of paper is underſtood the approximation of the fibres of the ſtuff, and their adhering more cloſely together. The paper is felted in proportion as the water eſcapes; and this effect is produced by the management and reiterated action of the preſs. Were it not for the gradual operation of the preſs, the paper would be porous and compoſed of filaments adhering cloſely together. The ſuperiority of the Dutch over the French paper depends almoſt entirely on this operation.

If the ſheets of paper are found to adhere together, it is a proof that the buſineſs of the preſs has been badly conducted. To avoid this inconveniency, it is neceſſary to bring down the preſs at firſt gently, and by degrees with greater force, and to raiſe it as ſuddenly as poſſible. By this means the water, which is impelled to the ſides of the heaps, and which has not yet eſcaped, returns to the centre; the ſheets are equally dry, and the operation executed without difficulty.

According to the ſtate of dryneſs in which the paper is found when it comes from the apartment of the vat, it is either preſſed before or after the firſt exchange. The operation of the preſs ſhould be reiterated and managed with great care; otherwiſe, in the ſoft ſtate of the paper, there is a danger that its grain and tranſparency be totally deſtroyed. Another eſſential principle to the ſucceſs of the exchange is, that the grain of the paper be originally well raiſed. For this purpoſe the wire-cloth of the Dutch forms is compoſed of a rounder wire than thoſe uſed in France, by which they gain the greateſt degree of tranſparency, and are in no danger of deſtroying the grain. Beſides this, the Dutch take care to proportion the wires even where the forms are equal to the thickneſs of the paper.

Almoſt every kind of paper is conſiderably improved by the exchange, and receives a degree of perfection which renders it more agreeable in the uſe. But it is neceſſary to obſerve at the ſame time, that all papers are not equally ſuſceptible of this melioration; on the contrary, if the ſtuff be unequal, dry, or weakened by the deſtruction of the fine parts, it acquires nothing of that luſtre and ſoftneſs, and appearance of velvet, which the exchange gives to ſtuff properly prepared.

The ſheds for drying the paper are in the neighbourhood of the paper-mill, and are furniſhed with a vaſt number of cords, on which they hang the ſheets both before and after the ſizing. The ſheds are ſurrounded with moveable lattices, to admit a quantity of air ſufficient for drying the paper. The cords of the ſhed are ſtretched as much as poſſible; and the paper, four or five ſheets of it together, is placed on them by means of a wooden inſtrument reſembling a pick-axe. The principal difficulty in drying the paper conſiſts in gradually admitting the external air, and in preventing the cords from imbibing moiſture. With regard to the firſt of theſe, the Dutch uſe very low ſheds, and conſtruct their lattices with great exactneſs. By this means the Dutch paper is dried equally, and is extremely ſupple before the ſizing. They prevent the cords from imbibing the water by covering them with wax. In uſing ſuch cords, the moiſture does not continue in the line of contact between the paper and the cord, which prevents the ſheet from ſtretching in that particular place by its weight, and from the folds which the moiſture in the ſubſequent operations might occaſion. The Dutch alſo employ cords of conſiderable thickneſs, and place fewer of them under the ſheets; by which means they diminiſh the points of contact, and give a freer and more equal circulation to the air.

The ſize for paper is made of the ſhreds and parings got from the tanners, curriers, and parchment-makers. All the putrefied parts and the lime are carefully ſeparated from them, and they are incloſed into a kind of baſket, and let down by a rope and pulley into the cauldron. This is a late invention, and ſerves two valuable purpoſes. It makes it eaſy to draw out the pieces of leather when the ſize is extracted from them by boiling, or eaſy to return them into the boiler if the operation be not complete. When the ſubſtance is ſufficiently extracted, it is allowed to ſettle for ſome time; and it is twice filtered before it is put into the veſſel into which they dip the paper.

Immediately before the operation, a certain quantity of alum is added to the ſize. The workman takes a handful of the ſheets, ſmoothed and rendered as ſupple as poſſible, in his left hand, dips them into the veſſel, and holds them ſeparate with his right, that they may equally imbibe the ſize. After holding them above the veſſel for a ſhort ſpace of time, he ſeizes on the other ſide with his right hand, and again dips them into the veſſel. When he has finiſhed ten or a dozen of theſe handfuls, they are ſubmitted to the action of the preſs. The ſuperfluous ſize is carried back to the veſſel by means of a ſmall pipe. The veſſel in which the paper is ſized is made of copper, and furniſhed with a grate, to give the ſize when neceſſary a due temperature; and a piece of thin board or felt is placed between every handful as they are laid on the table of the preſs.

The Dutch are very careful in ſizing their paper to have every ſheet in the ſame handful of equal dryneſs; becauſe it is found that the dry ſheets imbibe the ſize more ſlowly than thoſe which retain ſome degree of moiſture. They begin by ſelecting the *padges* in the drying-houſe; and after having made them ſupple, and having deſtroyed the adherence between the ſheets, they ſeparate them into handfuls in proportion to the dryneſs, each of

them containing that number which they can dip at one time. Beſides this precaution, they take care to apply two ſheets of brown paper of an equal ſize to every handful. This brown paper, firm, ſolid, and already ſized, is of uſe to ſupport the ſheets.

As ſoon as the paper is ſized, it is the practice at ſome paper-mills to carry it immediately to the drying-houſe, and hang it before it cools ſheet by ſheet on the cords. The paper, unleſs particular attention be paid to the lattices of the drying-houſe, is apt to dry too faſt, whereby a great part of the ſize goes off in evaporation; or, if too ſlow, it falls to the ground. The Dutch drying-houſes are the beſt to prevent theſe inconveniences: but the exchange after the ſizing, which is generally practiſed in Holland, is the beſt remedy. They begin this operation on the handfuls of paper, either while they are ſtill hot, or otherwiſe as they find it convenient. But, after the exchange, they are careful to allow the heaps to be altogether cold before they are ſubmitted to the preſs. Without this precaution, the ſize would either be wholly ſqueezed out by the preſs of the exchange, or the ſurface of the paper become very irregular. It is of conſequence that the paper, ſtill warm from the ſizing, grow gradually firm, under the operation of the exchange, in proportion as it cools. By this method it receives that varniſh which is afterwards brought to perfection under the preſs, and in which the excellency of the paper either for writing or drawing chiefly conſiſts. It is in conſequence of the exchanging and preſſing that the Dutch paper is ſoft and equal, and that the ſize penetrates into the body of it, and is extended equally over its ſurface.

The exchange after the ſizing ought to be conducted with the greateſt ſkill and attention, becauſe the grain of the paper then receives impreſſions which can never be eradicated. When the ſized paper is alſo exchanged, it is poſſible to hang more ſheets together on the cords of the drying houſe. The paper dries better in this condition, and the ſize is preſerved without any ſenſible waſte, becauſe the ſheets of paper mutually prevent the rapid operation of the external air. And as the ſize has already penetrated into the paper, and is fixed on the ſurface, the inſenſible progreſs of a well conducted drying-houſe renders all the good effects more perfect in proportion as it is ſlowly dried.

If to theſe conſiderations be added the damage done to the paper in drying it immediately after the preſs of the ſizing-room, whether it be done in raiſing the hairs by ſeparating the ſheets, or in cracking the ſurface, it is evident that the trouble of the ſecond exchange is infinitely overpaid by the advantage.

When the paper is ſufficiently dry, it is carried to the finiſhing-room, where it is preſſed, ſelected, examined, folded, made up into quires, and finally into reams. It is here put twice under the preſs; firſt, when it is at its full ſize, and ſecondly, after it is folded.

The principal labour of this place conſiſts in aſſorting the paper into different lots, according to its quality and faults; after which it is made up into quires. The perſon who does this muſt poſſeſs great ſkill, and be capable of great attention, becauſe he acts as a check on thoſe who ſeparated the paper into different lots. He takes the ſheets with his right hand, folds them, examines them, lays them over his left arm till he has the number requiſite for a quire, brings the ſides parallel to one another, and places them in heaps under the table. An expert workman, if proper care has been taken in aſſorting the lots, will finiſh in this manner near 600 quires in a day.

The paper is afterwards collected into reams of 20 quires each, and for the laſt time put under the preſs, where it is continued for 10 or 12 hours, or as long as the demand of the paper-mill will permit.

A method has lately been diſcovered of bleaching the rags or ſtuff, which will undoubtedly be adopted every where in the preparation of writing paper, provided the expence of the proceſs be not too great. This diſcovery was made by Scheele, M. Berthollet, and M. Chaptal. The firſt of theſe illuſtrious writers communicated to the Swediſh Academy of Sciences an Eſſay on Manganeſe, containing a numerous ſeries of experiments, intended to inveſtigate the nature and properties of that ſubſtance. Among theſe experiments were ſeveral which pointed out a new ſtate of the muriatic acid, or the acid diſtilled from ſea-ſalt, otherwiſe known under the name of the *acid* or *ſpirit of ſea-ſalt*. This ſtate of the muriatic acid was produced by Mr. Scheele, in conſequence of putting the ſaid acid into a retort or diſtilling veſſel, along with the above-mentioned ſubſtance called *manganeſe*, and diſtilling over the acid into a proper receiver; it was found to have changed its nature and properties in a very remarkable manner, while at the ſame time the manganeſe remaining in the retort had ſuffered a very material alteration.

To the new ſtate of the acid thus produced, in conſequence of certain theoretic ideas which Mr. Scheele entertained reſpecting the mutual action of the original muriatic acid and the manganeſe on each other during the proceſs of diſtillation, he gave the name of *dephlogiſticated muriatic acid*. Since the time of this original diſcovery, in conſequence of certain changes which have occurred in the theory or philoſophy of chemiſtry, this new ſtate of the acid of ſea-ſalt has been called the *oxygenated muriatic acid*. Among many other properties of it diſcovered by Mr. Scheele, the moſt remarkable was, that it deſtroyed the colour of every vegetable ſubſtance which was expoſed to its action; or, in other words, it bleached them; or, in the language of the dyers, it diſcharged their colours; that is to ſay, whatever happened to be the colour of any vegetable body that was ſubmitted to the action of the oxygenated or dephlogiſticated muriatic acid, it always became white, or left its colouring matter.

In the year 1786, Dr. Bedoes, now profeſſor of chemiſtry in the univerſity of Oxford, publiſhed an Engliſh tranſlation of the Chemical Eſſays of Mr. Scheele; and thereby made known to the chemiſts of Great Britain the power of the oxygenated or dephlogiſticated muriatic acid, to bleach or whiten vegetable ſubſtances, or to diſcharge or decompoſe their colours. But M. Berthollet, a celebrated chemiſt in France, and one of the members of the Academy of Sciences at Paris, appears to have been the firſt who thought of rendering the above recited diſcovery ſubſervient to the purpoſes of manufacture.

In 1789, he publiſhed in the *Annales de Chimie* an eſſay calculated entirely for the uſe of manufacturers, by being diveſted of theoretic diſcuſſions; of which the title is, "Method of bleaching linen or cotton cloths, threads, and yarns, by means of oxygenated muriatic acid, and of ſome other properties of that liquor which may be uſeful in manufactures."

In the ſame work, and in the ſame year, M. Chaptal, another French chemiſt, publiſhed an account of ſome experiments, in which, among many other applications of the oxygenated muriatic acid to purpoſes uſeful in the œconomical arts, he gives information of having bleached or whitened coarſe rags uſed by the paper-makers, ſo as greatly to improve the quality of the paper into which they were afterwards manufactured. His preparation of this bleaching liquor differs not from Berthollet's, which is as follows: "Take ſix ounces of manganeſe and ſixteen ounces of ſea-ſalt, both reduced to a fine powder, mix theſe accurately, and introduce them into a retort or diſtilling veſſel: then take twelve ounces of oil of vitriol and eight ounces of water, mixed together, and allowed to cool; add theſe to the other ingredients in the retort, and connect the retort with a caſk or receiver capable of holding twenty-ſeven gallons and a half of water, but only containing twenty-five

gallons, which is to be impregnated with the gas or vapour of the oxygenated muriatic acid; and proceed to diſtillation, firſt without and afterwards with a fire gradually raiſed, till the whole acid comes over."

Experiments have been made with this liquor both by ſome of the principal paper makers in the neighbourhood of Edinburgh, and by Meſſrs. Clement and George Taylors of Maidſtone in Kent. By the former it was found, that paper made of rags and pulp whitened in this manner, was ſuperior to any other made of ſimilar materials, not only in colour but in fineneſs of texture. By the latter, the excellence of the liquor was found to be ſo great, that probably having never heard of Scheele, Berthollet, and Chaptal, and conceiving themſelves to be the firſt inventors of it, they obtained a patent for its excluſive uſe, which other manufacturers will doubtleſs diſregard. It is not to be concealed, however, that, even with all the precautions which can poſſibly be taken at firſt, various circumſtances of imperfection muſt neceſſarily remain to be removed by means of farther experience, both in the perfection of the bleaching proceſs and the œconomy of its application to uſe; but for the attaining of this experience a ſhort time will rarely be ſufficient.

Of the different Kinds of Paper.

The paper proper for writing ſhould be without knots, without any parts of the ſtuff not triturated, without folds, and without wrinkles, of a ſupple texture, its grain uniform and regular, ſoftened in the exchange, and not deſtroyed by ſmoothing. The ground of this paper muſt be extremely white, or ſhaded with a very light blue, which adds to its natural ſplendour. It is of great importance that it be fully and equally ſized, otherwiſe the writing cannot be well finiſhed, and the turnings of the letters will be very imperfect. This paper ſhould be made from ſtuff not putrefied, which takes a better grain, receives more benefit from the exchange, is more equally ſized, and, finally, is leſs ſubject to folds and wrinkles in the different operations. To make paper peculiarly fit for durable writing, Dr. Lewis recommends the impregnation of it with aſtringent materials. "It is obſervable (ſays he) that writings firſt begin to fade or change their colour on the back of the paper, where the larger ſtrokes have ſunk in, or are viſible through it; as if part of the irony matter of the vitriol was in a more ſubtile or diſſolved ſtate than the reſt, and ſunk further, on account of its not being fully diſengaged from the acid, or ſufficiently combined with the aſtringent matter of the galls. Hence, it ſhould ſeem probable, that if the paper was impregnated with aſtringent matter, the colour of the ink would be more durable. To ſee how far this notion was well founded, I dipped ſome paper in an infuſion of galls; and, when dry, repeated the dipping a ſecond and third time. On the paper thus prepared, and ſome that was unprepared, I wrote with different inks; ſeveral of which, that the effects might be more ſenſible, had an over proportion of vitriol. The writings being expoſed to the weather till the beſt of the inks on the unprepared paper had faded and changed their colour, thoſe on the prepared paper were all found to retain their blackneſs. It is therefore recommended to the conſideration of the paper-makers, whether a particular kind of paper might not be prepared for thoſe uſes where the long duration of the writing is of principal importance, by impregnating it with galls or other aſtringents, in ſome of the operations it paſſes through before it receives the glazing; as for inſtance, by uſing an aſtringent infuſion, inſtead of common water, in the laſt operation, when the matter is reduced into a pulp for being formed into ſheets. The browniſh hue which the paper receives from the galling, would not perhaps be any great obſtacle to its uſe; and, if the propoſal ſhould be thought worthy of being carried into execution, further inquiries may poſſibly diſcover the means of obviating the imperfection, and communicating aſtringency without colour."

The paper uſed for drawing, or for coloured maps, is in ſome mills made from one kind of white ſtuff, either fine or middling; in others, from a mixture of three or four kinds of ſtuff of different colours. The Dutch were not long ago almoſt wholly in poſſeſſion of this manufacture. The ſame qualities are neceſſary in this paper as in that for writing. The grain, however, muſt be a little more raiſed, although ſoftened by the exchange; for, without this grain, the pencil would leave with difficulty the traces of the objects. Great care is alſo neceſſary in the ſizing of this paper, that the drawing be neatly performed, and alſo that the ſinking of the ink or colours into the irregularities of the ſtuff be prevented.

Furniture paper is alſo made in greateſt perfection by ſtuffs not rotted. Theſe take a more even gloſs, and are in better condition to receive all the impreſſions of the painter. It is alſo neceſſary that furniture paper be well ſoftened, and ſubmitted to the exchange, to take more exactly the outlines of the figures. The French have carried this part of the manufacture of paper to the higheſt ſtate of perfection.

The Britiſh and Dutch have had the greateſt ſucceſs in manufacturing paſteboard uſed in the making of woollen cloth, which they make either from a ſingle maſs of ſtuff on the form, or from a collection of ſeveral ſheets paſted together. In both caſes, the ſheets of paſteboard are made of ſtuff not rotted, and triturated with rollers furniſhed with blades of well tempered ſteel. By the operation of the exchange, and ſmoothing continued for a long time, the Britiſh and Dutch obtain ſolid and ſmooth ſtuffs, which neither break under the folds of cloth nor adhere to them. The ſtuffs not putrefied have another advantage in this ſpecies of paſteboard, namely, that of reſiſting the action of heat, which they experience between the folds of cloth, without waſting or tarniſhing, and of conſequence they may be uſed for a long time.

Printing Paper. In England they have at leaſt equalled any other nation in the manufacture of this paper; and even in Scotland they have arrived to ſuch a degree of perfection in this art, that great part of what they manufacture is ſent into England. It requires to be made of a ſoft and equal ſtuff, without folds or wrinkles, of a natural whiteneſs, and with a ſhade of blue. It muſt be ſized leſs ſtrongly than writing paper, but ſufficiently well to give neatneſs to the characters. The paper thus properly prepared yields eaſily to the printing-preſs, and takes a ſufficient quantity of ink. The ſtuff muſt be without greaſe, and wrought with that degree of ſlowneſs as to make it ſpread equally over the form, and take a neat and regular grain: without this the characters will not be equally marked in every part of the page; and the ſmalleſt quantity of greaſe renders the ſizing unequal and imperfect. Some artiſts with conſiderable ſucceſs, both to meliorate the grain, and to reduce the inequalities of the ſurface, have ſubmitted this paper to the exchange. And it is proper to add, that a moderate degree of exchanging and of preſſing may be of great ſervice after the ſheets are printed, to deſtroy the hollow places occaſioned by the preſs, and the relievo of the letters.

Paper for Engraving. Engraving requires a paper of the ſame qualities with the laſt-mentioned, with reſpect to the ſtuff, which muſt be pure, without knots, and equally reduced; the grain uniform, and the ſheets without folds or wrinkles. To preſerve the grain, it is neceſſary that it be dried ſlowly in the loweſt place of the drying-houſe. If it is ſubmitted to the exchange, the effects of it muſt be moderated with the greateſt care, and the action of the two firſt preſſes muſt be equally diſtributed over the whole maſs, otherwiſe the inequality of the moiſture at the middle and ſides will expoſe it to wrinkles in

the drying. The ſizing of this paper muſt alſo be moderate. Theſe circumſtances are neceſſary to make it receive with neatneſs all the ſoft and delicate touches of the plate. The ſoft and yielding paper of Auvergne poſſeſſes all thoſe advantages: and accordingly a great quantity of this and of printing paper were formerly imported into Britain and Holland from France, where they ſtill continue to rot the materials from which they make engraving paper. The wire-wove frame, though but lately invented, is, we are told, peculiarly adapted to this kind of paper.

Paper for cards muſt be manufactured from a pretty firm ſtuff, in order to take that degree of ſmoothneſs which makes the cards glide eaſily over one another in uſing. For this reaſon the cardmakers reject every kind of paper which is ſoft and without ſtrength. This paper requires to be very much ſized, ſince the ſizing holds the place of varniſh, to which the ſmoothing gives a glazed and ſhining ſurface. To anſwer all theſe purpoſes, the rags require to be a little rotted, and the mallets ſtrongly armed with iron ſtuds. At preſent Angoumois is almoſt the only province in France which ſells card-paper to the Dutch and the other northern nations. The rags of Angoumois have the peculiar quality of not turning too ſoft in the putrefaction, and the mills of that province reduce them to ſtuff though they be not much putrefied. The French, we believe, excell every other nation in this branch of the manufacture of paper.

Miscellaneous Observations on Paper.

To hinder paper from ſinking, take about the ſize of a nut of rock alum, diſſolve it in a glaſs of clear water, and apply it to the paper, which has not been ſufficiently ſized, with a fine ſponge. It is in this manner that the paper-manufacturers of Paris prepare the paper for drawing called *papiers lavés*. When there is occaſion to write on a printed book, or on paper too freſh, it is ſufficient to mix a little gum with ordinary ink.

To give to writing paper a brilliant varniſh, take that which is of an ordinary fineneſs, very ſmooth, without any kind of ſtain or hairs on its ſurface; ſtretch it on a ſmooth plank, and by means of a hare's foot cover it with a thin and equal layer of ſandarac finely powdered. Afterwards, if a whole ream is to be varniſhed, take eight ounces of rock alum and one ounce of white ſugarcandy; bring them to boil in ſix pints of water; and when the liquor is lukewarm, wet that ſide of the ſheet which has been covered with the ſandarac with a fine ſponge; lay the ſheets in a heap, one ſheet exactly above another; and ſubmit the ream to the preſs for the ſpace of twelve hours: hang them afterwards ſheet by ſheet on the cords of the drying-houſe; put them again under the preſs for ſome days to ſtretch them; and, finally, beat them with a book-binder's mallet. This paper can only be uſed for three or four months after it is prepared.

Painters prepare their paper for drawing, and give it a dark ground, which ſpares them much labour of the pencil afterwards in thoſe places where ſhade is neceſſary. For this purpoſe they take white paper and paſs a ſponge over it which has imbibed water impregnated with ſoot, leaving the light places to be formed afterwards. They uſe alſo a kind of paper for drawing, which is called teinted paper. A light colour is paſſed over the whole ground, which deprives the paper of its original brightneſs, and makes the light places of the print appear more in relievo, and more luminous.

The method moſt common and moſt convenient for copying a print, is to uſe oiled paper. The manner of preparing this paper is to take that which is thin and ſmooth, known commonly by the name of *ſerpent paper*, and moiſten it with a compoſition, two parts of the oil of walnuts and one part of the oil of turpentine mixed well together. A ſheet of paſteboard and a ſheet of paper are laid on a ſmooth table; above them are placed two ſheets of paper to be prepared; and a layer of the oil applied to the uppermoſt is ſufficient to penetrate both. This may be done to any number of ſheets, and a ſtrong ſheet of paſteboard is placed over the whole. The heap is afterwards ſubmitted to the preſs, under which it remains for two or three days till the oil be completely dry. Paper prepared in this manner ſerves to copy very readily and exactly all kinds of figures and plans; becauſe, being altogether tranſparent, all the parts of the drawing, whether of light or ſhade, are eaſily diſtinguiſhed.

Beſides the paper made from the aſbeſtos, it is neceſſary, for wrapping up gunpowder and valuable writings, to have a paper that will not eaſily take fire. The manner in which this is prepared is extremely ſimple. Ordinary paper is dipped into boiling liquid, conſiſting of three fourths of water and one fourth of diſſolved alum. This ſalt, which is not inflammable, covers the ſurface of the paper, and renders it in ſome meaſure incombuſtible.

In the ſeaſon of verjuice, a little of it diluted with water is ſufficient for obliterating any freſh ſpot of ink. The ſalt of the verjuice diſſolved in water anſwers the purpoſe equally well, and the ſalt of the ſorrel is alſo employed, though with leſs effect. If the ſpots be dry, and the above acids are inſufficient to eradicate them, a little aquafortis diluted in water, and applied with the feather of a quill or a fine hair pencil, will make them entirely diſappear.

Books and manuſcripts are ſometimes defaced by accidental ſtains with oil. To remove ſuch blemiſhes, burn ſheep's bones, and reduce them to a fine powder; lay a quantity of this powder on each ſide of the ſtain; place it between two ſheets of white paper, and ſubmit it for twelve hours to the preſs. If the ſtains have not diſappeared, it will be neceſſary to reiterate the proceſs.

To make oiled papers take colours; mix with the colours a very ſmall quantity of the gall of either a pike or carp; and as theſe ſubſtances are of the nature of ſoap, they diſſolve the greaſe that is in the paper, and permit the colours to be ſpread over the ſurface

Emery paper, which is employed for taking the ruſt from iron without waſting it, is made by impregnating coarſe paper with gummed water or any other tenacious ſubſtance, and then covering it over with the fineſt emery.

The colours proper for ſtaining or colouring paper are not different from thoſe uſed for other ſubſtances, and are enumerated under the article Colour-*Making*. They are applied with ſoft bruſhes, after being tempered to a due degree with ſize or gum-water. If the paper on which they are to be laid is ſoft, ſo that the colours are apt to go through, it muſt alſo be ſized before they are laid on, or a proportionably larger quantity muſt be uſed along with the colours themſelves. If a conſiderable extent of the paper is to be done over with one colour, it muſt receive ſeveral coatings, as thin as poſſible, letting each coat dry before another is put on, otherwiſe the colour will be unequal.

To gild paper.—Take yellow ochre, grind it with rain-water, and lay a ground with it upon the paper all over; when dry, take the white of eggs, beat it clear with white ſugarcandy, and ſtrike it all over: then lay on the leaf gold; and when dry, poliſh it with a tooth. Some take ſaffron, boil it in water, and diſſolve a little gum with it; then they ſtrike it over the paper, lay on the gold; and when dry, they poliſh it.

To ſilver paper after the Chineſe method without ſilver.—Take two ſcruples of clear glue made of neats leather, one ſcruple of white alum, and half a pint of clear water; ſimmer the whole over a ſlow fire, till the water is conſumed, or the ſteam ceaſes: then, your ſheets of paper being laid on a ſmooth table, you dip a pretty large pencil into that glue, and daub it over as even as you can, repeating this two or three times: then ſift the powder

of tale through a fine ſieve, made of horſe-hair or gauze, over it; and then hang it up to dry; and, when dry, rub off the ſuperfluous talc, which ſerves again for the ſame purpoſe. The talc you prepare in the following manner: Take fine white tranſparent Muſcovy talc; boil it in clear water for four hours; then take it off the fire and let it ſtand ſo for two days: then take it out, waſh it well, and put it into a linen rag, and beat it to pieces with a mallet: to 10 pounds of talc add 3 pounds of white alum, and grind them together in a little hand-mill; ſift it through a gauze-ſieve; and being thus reduced to a powder, put it into water, and juſt boil it up: then let it ſink to the bottom, pour off the water from it, place the powder in the ſun to dry, and it will become a hard conſiſtence. This beat in a mortar to an impalpable powder, and keep it, for the uſe above mentioned, free from duſt.

White and coloured grounds for paper-hangings.—The common grounds laid in water are made by mixing whiting with the common glovers ſize, and laying it on the paper with a proper bruſh in the moſt even manner. This is all that is required, where the ground is to be left white; and the paper being then hung on a proper frame till it be dry, is fit to be painted. When coloured grounds are required, the ſame method muſt be purſued, and the ground of whiting firſt laid; except in pale colours, ſuch as ſtraw-colours or pink, where a ſecond coating may ſometimes be ſpared, by mixing ſome ſtrong colour with the whiting.

There are three methods by which paper-hangings are painted; the firſt by *printing* on the colours; the ſecond by uſing the *ſtencil*; and the third by laying them on with a *pencil*, as in other kinds of painting.

When the colours are laid on by printing, the impreſſion is made by wooden prints; which are cut in ſuch a manner, that the figure to be expreſſed is made to project from the ſurface by cutting away all the other part; and this, being charged with the colours tempered with their proper vehicle, by letting it gently down on a block on which the colour is previouſly ſpread, conveys it from thence to the ground of the paper, on which it is made to fall more forcibly by means of its weight, and the effort of the arm of the perſon who uſes the print. It is eaſy to conclude, that there muſt be as many ſeparate prints as there are colours to be printed. But where there are more than one, great care muſt be taken, after the firſt, to let the print fall exactly in the ſame part of the paper as that which went before; otherwiſe the figure of the deſign would be brought into irregularity and confuſion. In common paper of low price, it is uſual, therefore, to print only the outlines, and lay on the reſt of the colours by ſtencilling; which both ſaves the expence of cutting more prints, and can be practiſed by common workmen, not requiring the great care and dexterity neceſſary to the uſing ſeveral prints.

The manner of *ſtencilling* the colours is this: The figure, which all the parts of any particular colour make in the deſign to be painted, is to be cut out, in a piece of thin leather or oil-cloth, which pieces of leather or oil-cloth are called *ſtencils*; and being laid flat on the ſheets of paper to be printed, ſpread on a table or floor, are to be rubbed over with the colour, properly tempered, by means of a large bruſh. The colour paſſing over the whole is conſequently ſpread on thoſe parts of the paper where the cloth or leather is cut away, and gives the ſame effect as if laid on by a print. This is nevertheleſs only practicable in parts where there are only detached maſſes or ſpots of colours; for where there are ſmall continued lines, or parts that run one into another, it is difficult to preſerve the connexion or continuity of the parts of the cloth, or to keep the ſmaller corners cloſe down to the paper; and therefore, in ſuch caſes, prints are preferable. Stencilling is indeed a cheaper method of ridding coarſe work than printing: but without ſuch extraordinary attention and trouble as render it equally difficult with printing, it is far leſs beautiful and exact in the effect. For the outlines of the ſpots of colour want that ſharpneſs and regularity that are given by prints, beſides the frequent extralineations, or deviations from the juſt figure, which happen by the original miſplacing of the ſtencils, or the ſhifting the place of them during the operation.

Pencilling is only uſed in the caſe of nicer work, ſuch as the better imitations of the India paper. It is performed in the ſame manner as other paintings in water or varniſh. It is ſometimes uſed only to fill the outlines already formed by printing, where the price of the colour, or the exactneſs of the manner in which it is required to be laid on, renders the ſtencilling or printing it leſs proper; at other times, it is uſed for forming or delineating ſome parts of the deſign, where a ſpirit of freedom and variety, not to be had in printed outlines, are deſired to be had in the work.

Management of the flock paper.—The paper deſigned for receiving the flock is firſt prepared with a varniſh-ground with ſome proper colour, or by that of the paper itſelf. It is frequently practiſed to print ſome moſaic, or other ſmall-running figure in colours, on the ground, before the flock be laid on; and it may be done with any pigment of the colour deſired, tempered with varniſh, and laid on by a print cut correſpondently to that end.

The method of laying on the flock is this: A wooden print being cut, as is above deſcribed, for laying on the colour in ſuch manner that the part of the deſign which is intended for the flock may project beyond the reſt of the ſurface, the varniſh is put on a block covered with leather or oil-cloth, and the print is to be uſed alſo in the ſame manner, to lay the varniſh on all the parts where the flock is to be fixed. The ſheet, thus prepared by the varniſhed impreſſion, is then to be removed to another block or table, and to be ſtrewed over with flock; which is afterwards to be gently compreſſed by a board, or ſome other flat body, to make the varniſh take the better hold of it: and then the ſheet is to be hung on a frame till the varniſh be perfectly dry; at which time the ſuperfluous part of flock is to be bruſhed off by a ſoft camel's-hair bruſh; and the proper flock will be found to adhere in a very ſtrong manner.

The method of preparing the flock is, by cutting woollen-rags or pieces of cloth with the hand, by means of a large bill or chopping-knife; or by means of a machine worked by a horſe-mill.

There is a kind of counterfeit flock paper, which, when well managed, has very much the ſame effect to the eye as the real, though done with leſs expence. The manner of making this ſort is, by laying a ground of varniſh on the paper; and having afterwards printed the deſign of the flock in varniſh, in the ſame manner as for the true; inſtead of the flock, ſome pigment, or dry colour, of the ſame hue with the flock required by the deſign, but ſomewhat of a darker ſhade, being well-powdered, is ſtrewed on the printed varniſh, and produces nearly the ſame appearance.

PAPER-*Money* is a term frequently made uſe of for bank bills, which paſs currently in trade inſtead of gold and ſilver. Concerning this ſpecies of currency, the national utility of which has been controverted by ſome, we have the following obſervations in Dr. Smith's Treatiſe on the Wealth of Nations: "The ſubſtitution of paper in the room of gold and ſilver money replaces a very expenſive inſtrument of commerce with one much leſs coſtly, and ſometimes equally convenient. Circulation comes to be carried on by a new wheel, which it coſts leſs both to erect and maintain than the old one.

"When the people of any particular country have ſuch confidence in the fortune, probity, and prudence of a particular banker, as to believe that he is always ready to pay upon demand ſuch of his promiſſory notes as are likely at any time to be preſented to him, thoſe notes come to have the ſame currency as gold and ſilver money, from the confidence that ſuch money can at any time be had for them.

"A particular banker lends among his cuſtomers his own promiſſory notes, to the amount, we ſhall ſuppoſe, of 100,000l. As thoſe notes ſerve all the purpoſes of money, his debtors pay him the ſame intereſt as if he had lent them ſo much money. This intereſt is the ſource of his gain. Though ſome of thoſe notes are continually coming back upon him for payment, part of them continue to circulate for months and years together. Though he has generally in circulation, therefore, notes to the amount of 100,000l. 20,000l. in gold and ſilver may frequently be a ſufficient proviſion for anſwering occaſional demands. By this operation, therefore, 20,000l in gold and ſilver perform all the functions which 100,000l. could otherwiſe have performed. Eighty thouſand pounds of gold and ſilver can therefore, in this manner, be ſpared from the circulation of the country; and if different operations of the ſame kind ſhould at the ſame time be carried on by many different banks and bankers, the whole circulation may be thus conducted with a fifth part only of the gold and ſilver.

"Let us ſuppoſe, for example, that the whole circulating money of ſome particular country amounted, at a particular time, to 1,000,000l. ſterling, that ſum being then ſufficient for circulating the whole annual produce of their land and labour. Let us ſuppoſe too, that, ſome time thereafter, different banks and bankers iſſued promiſſory notes, payable to the bearer, to the extent of 1,000,000l. reſerving in their different coffers 200,000l. for anſwering occaſional demands. There would remain, therefore, in circulation 800,000l. in gold and ſilver, and 1,000,000l. of bank notes, or 1,800,000l. of paper and money together. But the annual produce of the land and labour of the country had before required only 1,000,000l. to circulate and diſtribute it to its proper conſumers, and that annual produce cannot be immediately augmented by thoſe operations of banking. One million, therefore, will be ſufficient to circulate it after them. The goods to be bought and ſold being preciſely the ſame as before, the ſame quantity of money will be ſufficient for buying and ſelling them. The channel of circulation, if I may be allowed ſuch an expreſſion, will remain preciſely the ſame as before. One million we have ſuppoſed ſufficient to fill that channel. Whatever, therefore, is poured into it beyond this ſum, cannot run in it, but muſt overflow. One million eight hundred thouſand pounds are poured into it. Eight hundred thouſand pounds, therefore, muſt overflow, that ſum being over and above what can be employed in the circulation of the country. But though this ſum cannot be employed at home, it is too valuable to be allowed to lie idle. It will therefore be ſent abroad, in order to ſeek that profitable employment which it cannot find at home. But the paper cannot go abroad; becauſe, at a diſtance from the banks which iſſue it, and from the country in which payment of it can be exacted by law, it will not be received in common payments. Gold and ſilver, therefore, to the amount of 800,000l. will be ſent abroad, and the channel of home circulation ſtill remain filled with 1,000,000l. of paper inſtead of 1,000,000l. of thoſe metals which filled it before.

"But though ſo great a quantity of gold and ſilver is thus ſent abroad, we muſt not imagine that it is ſent abroad for nothing, or that its proprietors make a preſent of it to foreign nations. They will exchange it for foreign goods of ſome kind or another, in order to ſupply the conſumption either of ſome other foreign country or of their own.

"If they employ it in purchaſing goods in one foreign country in order to ſupply the conſumption of another, or in what is called the *carrying trade*, whatever profit they make will be an addition to the neat revenue of their own country. It is like a new fund, created for carrying on a new trade; domeſtic buſineſs being now tranſacted by paper, and the gold and ſilver being converted into a fund for this new trade.

"If they employ it in purchaſing foreign goods for home-conſumption, they may either firſt purchaſe ſuch goods as are likely to be conſumed by idle people who produce nothing, ſuch as foreign wines, foreign ſilks, &c.; or, ſecondly, they may purchaſe an additional ſtock of materials, tools, and proviſions, in order to employ an additional number of induſtrious people, who reproduce, with a profit, the value of their annual conſumption.

"So far as it is employed in the firſt way, it promotes prodigality, increaſes expence and conſumption, without increaſing production, or eſtabliſhing any permanent fund for ſupporting that expence, and is in every reſpect hurtful to the ſociety.

"So far as it is employed in the ſecond way, it promotes induſtry; and though it increaſes the conſumption of the ſociety, it provides a permanent fund for ſupporting that conſumption, the people who conſume, reproducing, with a profit, the whole value of their annual conſumption. The groſs revenue of the ſociety, the annual produce of their land and labour, is increaſed by the whole value which the labour of thoſe workmen adds to the materials upon which they are employed; and their neat revenue, by what remains of this value, after deducting what is neceſſary for ſupporting the tools and inſtruments of their trade.

"That the greater part of the gold and ſilver which, being forced abroad by thoſe operations of banking, is employed in purchaſing foreign goods for home-conſumption, is and muſt be employed for purchaſing thoſe of this ſecond kind, ſeems not only probable, but almoſt unavoidable. Though ſome particular men may ſometimes increaſe their expence very conſiderably, though their revenue does not increaſe at all, we may be aſſured that no claſs or order of men ever does ſo; becauſe, though the principles of common prudence do not always govern the conduct of every individual, they always influence that of the majority of every claſs or order. But the revenue of idle people, conſidered as a claſs or order, cannot in the ſmalleſt degree be increaſed by thoſe operations of banking. Their expence in general, therefore, cannot be much increaſed by them, though that of a few individuals among them may, and in reality, ſometimes is. The demand of idle people, therefore, for foreign goods being the ſame, or very nearly the ſame, as before, a very ſmall part of the money which, being forced abroad by thoſe operations of banking, is employed in purchaſing foreign goods for home-conſumption, is likely to be employed in purchaſing thoſe for their uſe. The greater part of it will naturally be deſtined for the employment of induſtry, and not for the maintenance of idleneſs.

"When we compute the quantity of induſtry which the circulating capital of any ſociety can employ, we muſt always have regard to thoſe parts of it only which conſiſt in proviſions, materials, and finiſhed work: the other, which conſiſts in mo-

ney, and which ſerves only to circulate thoſe three, muſt always be deducted. In order to put induſtry into motion, three things are requiſite; materials to work upon, tools to work with, and the wages or recompenſe for the ſake of which the work is done. Money is neither a material to work upon, nor a tool to work with; and though the wages of the workman are commonly paid to him in money, his real revenue, like that of all other men, conſiſts, not in the money, but in the money's worth; not in the metal pieces, but in what can be got for them.

"The quantity of induſtry which any capital can employ, muſt evidently be equal to the number of workmen whom it can ſupply with materials, tools, and a maintenance ſuitable to the nature of the work. Money may be requiſite for purchaſing the materials and tools of the work, as well as the maintenance of the workmen. But the quantity of induſtry which the whole capital can employ, is certainly not equal both to the money which purchaſes, and to the materials, tools, and maintenance, which are purchaſed with it; but only to one or other of thoſe two values, and to the latter more properly than to the former.

"When paper is ſubſtituted in the room of gold and ſilver money, the quantity of the materials, tools, and maintenance, which the whole circulating capital can ſupply, may be increaſed by the whole value of gold and ſilver which uſed to be employed in purchaſing them. The whole value of the great wheel of circulation and diſtribution is added to the goods which are circulated and diſtributed by means of it. The operation, in ſome meaſure, reſembles that of the undertaker of ſome great work, who, in conſequence of ſome improvement in mechanics, takes down his old machinery, and adds the difference between its price and that of the new to his circulating capital, to the fund from which he furniſhes materials and wages to his workmen.

"What the proportion is which the circulating money of any country bears to the whole value of the annual produce circulated by means of it, it is, perhaps, impoſſible to determine. It has been computed by different authors at a fifth, at a tenth, at a twentieth, and at a thirtieth part of that value. But how ſmall ſoever the proportion which the circulating money may bear to the whole value of the annual produce, as but a part, and frequently but a ſmall part, of that produce is ever deſtined for the maintenance of induſtry, it muſt always bear a very conſiderable proportion to that part. When, therefore, by the ſubſtitution of paper, the gold and ſilver neceſſary for circulation is reduced to perhaps a fifth part of the former quantity, if the value of only the greater part of the other four-fifths be added to the funds which are deſtined for the maintenance of induſtry, it muſt make a very conſiderable addition to the quantity of that induſtry, and conſequently to the value of the annual produce of land and labour.

"That part of his capital which a dealer is obliged to keep by him unemployed, for anſwering occaſional demands, is ſo much dead ſtock, producing nothing either to him or to his country. The judicious operations of banking enable him to make it active and productive. The gold and ſilver money which circulates in any country, and by means of which the produce of its land and labour is annually circulated and diſtributed to the proper conſumers, is, in the ſame manner as the ready money of the dealer, all dead ſtock. It is a very valuable part of the capital of the country, which produces nothing to the country. The judicious operations of banking, by ſubſtituting paper in the room of a great part of it, enables the country to make a great part of this dead ſtock active and productive. The gold and ſilver money which circulates in any country, may very properly be compared to a highway, which, while it circulates and carries to market all the graſs and corn of the country, produces itſelf not a ſingle pile of either. The judicious operations of banking, by providing, if I may be allowed ſo violent a metaphor, a ſort of waggon-way through the air, enable the country to convert, as it were, a great part of its highways into good paſtures and corn-fields, and thereby to increaſe very conſiderably the annual produce of its land and labour. The commerce and induſtry of the country, however, it muſt be acknowledged, though they may be ſomewhat augmented, cannot be altogether ſo ſecure, when they are thus, as it were, ſuſpended upon the Dædalian wings of paper-money, as when they travel about upon the ſolid ground of gold and ſilver.

"The whole paper-money of every kind which can eaſily circulate in any country, never can exceed the value of the gold and ſilver, of which it ſupplies the place, or which (the commerce being ſuppoſed the ſame) would circulate there if there was no paper-money. If twenty-ſhilling notes, for example, are the loweſt paper-money current in Scotland, the whole of that currency, which can eaſily circulate there, cannot exceed the ſum of gold and ſilver which would be neceſſary for tranſacting the annual exchanges of twenty ſhillings and upwards, uſually tranſacted within that country. Should the circulating paper at any time exceed that ſum, as the exceſs could neither be ſent abroad, nor be employed in the circulation of the country, it muſt immediately return upon the banks to be exchanged for gold and ſilver. Many people would immediately perceive that they had more of this paper than was neceſſary for tranſacting their buſineſs at home; and as they could not ſend it abroad, they would immediately demand payment of it from the banks. When this ſuperfluous paper was converted into gold and ſilver, they could eaſily find a uſe for it by ſending it abroad; but they could find none while it remained in the ſhape of paper. There would immediately, therefore, be a run upon the banks to the whole extent of this ſuperfluous paper, and, if they ſhowed any difficulty or backwardneſs in payment, to a much greater extent; the alarm which this would occaſion neceſſarily increaſing the run." See BANK and TRADE.

PAPER-*Office*, an office in the palace of Whitehall, in which all the public writings, matters of ſtate and council, proclamations, letters, intelligences, negotiations abroad, and generally all diſpatches that paſs through the offices of the ſecretaries of ſtate, are lodged by way of library.

PAPIER MACHE. This is a ſubſtance made of cuttings of white or brown paper, boiled in water, and beaten in a mortar till they are reduced into a kind of paſte; and then boiled with a ſolution of gum arabic or of ſize, to give tenacity to the paſte, which is afterwards formed into different toys, &c. by preſſing it into oiled moulds. When dry, it is done over with a mixture of ſize and lamp-black, and afterwards varniſhed. The black varniſh for theſe toys, according to Dr. Lewis, is prepared as follows: Some colophony, or turpentine boiled down till it becomes black and friable, is melted in a glazed earthen veſſel, and thrice as much amber in fine powder ſprinkled in by degrees, with the addition of a little ſpirit or oil of turpentine now and then: when the amber is melted, ſprinkle in the ſame quantity of farcocolla, continuing to ſtir them, and to add more ſpirit of turpentine, till the whole becomes fluid; then ſtrain out the clear through a coarſe hair-bag, preſſing it gently between hot boards. This varniſh, mixed with ivory-black in fine powder, is applied, in a hot room, on the dried paper-paſte; which is then ſet in a gently heated oven, next day in a hotter oven, and the third day in a very hot one, and let ſtand each time till the oven grows cold. The paſte thus varniſhed is hard, durable, gloſſy, and bears liquors hot or cold.

PAPHLAGONIA (anc. geog.), a country of the Hither Aſia, beginning at Parthenius, a river of Bithynia, on the weſt, and extending in length to the Halys, eaſtward, with the Euxine

to the north, and Galatia to the ſouth. Pliny enlarges the limits on the weſt ſide to the river Billis, on this ſide the Parthenius. It is called *Pylæmenia* by ſome (Pliny). *Paphlagones*, the people, mentioned by Homer, and therefore of no ſmall antiquity. A ſuperſtitious and ſilly people (Lucian); a brave people (Homer); taking their name from Phaleg (Bochart).

PAPHOS (anc. geog.), two adjoining iſlands on the weſt ſide of the iſland of Cyprus; the one called *Halæ Paphos* (Strabo, Ptolemy, Pliny); the other *Nea Paphos*; and when mentioned without an adjunct, this latter is always underſtood. Both dedicated to Venus, and left undiſtinguiſhed by the poets (Virgil, Horace). Hence Venus is ſurnamed *Paphia*. *Paphii*, the people, (Coins, Stephanus). It was reſtored by Auguſtus, after a ſhock of an earthquake, and called *Auguſta* (Dio). The Abbé Mariti, in his Travels through Cyprus, gives an account of the iſland of Paphos; and Mr. Bruce informs us, that in the neighbourhood of this place many ſilver medals of excellent workmanſhip are dug up. Theſe are, however, but of little eſtimation among the antiquarians, being chiefly of towns of the ſize of thoſe found at Crete and Rhodes, and in all the iſlands of the Archipelago. There are ſome excellent Greek intaglios; generally upon better ſtones than uſual in the iſlands. This illuſtrious traveller informs us, that he has ſeen ſome heads of Jupiter, remarkable for buſhy hair and a beard, which were of excellent workmanſhip, and worthy of any price.

PAPIAS, biſhop of Hieropolis, a city of Phrygia, was the diſciple of St. John the Evangeliſt, and the companion of Polycarp, as St. Jerome obſerves, and not of John the Ancient, as ſome other authors have maintained. He compoſed a work in five books, entitled *Expoſitions of the Diſcourſes of our Lord*, of which there are only ſome fragments now remaining. He it was who introduced the opinion of the Millenarians.

PAPILIO, the BUTTERFLY, in zoology; a genus of inſects belonging to the order of lepidoptera. It has four wings, imbricated with a kind of downy ſcales; the tongue is convoluted in a ſpiral form; and the body is hairy. The antennæ grow thicker towards their extremity, and are in moſt ſubjects terminated by a kind of capitulum or head. The wings, when ſitting, are erect, inſomuch that their extremities meet or touch one another above the body. They fly in the day-time. There are 273 ſpecies, principally diſtinguiſhed by the colour of their wings. Mr. Barbut has divided them into four ſections, which he thus characterizes: 1. The equites, or riders, the upper wings being longer from the hindermoſt angle to the point than to the baſe: their antennæ are often filiform. They are divided into Trojans; which for the moſt part are black, with blood-like ſpots on the breaſt: and Greeks, whoſe breaſt has no ſuch marks; the ſmall eye being placed at the angle of the anus; and of theſe ſome are without bands or fillets, others with bands or fillets. 2. The heliconians, whoſe wings are narrow throughout, often bare; the upper oblong, the under ones very ſhort. 3. The Danai, whoſe wings are entire; the candidi, with whitiſh wings; the feſtivi, with variegated wings. 4. The nymphals, whoſe wings are denticulated: divided into the gemmati, whoſe wings have eyes; ſubdivided into thoſe which have eyes on all the wings; thoſe which have them on the upper wings; thoſe which have them on the under ones; and the phalerati, whoſe wings are without eyes. 5. The plebeians, whoſe larva is often contracted: divided into the rurales, with darkiſh ſpots on their wings; and the urbicolæ, with ſpots generally tranſparent on their wings.

The beauties of this elegant part of the creation are well known; and there are few who can contemplate them without aſtoniſhment. We have the following account of their various ſtages of exiſtence in Barbut: "The caterpillar (ſays he) informs us in what manner it prepares for the lethargic ſleep, which is to ſerve as a tranſition to its metamorphoſis. The period of its reptile life being accompliſhed, it changes its form to become an inhabitant of the air. The chryſalis is at once the tomb of the caterpillar and the cradle of the butterfly. It is within a ſilken cod, or under a tranſparent veil, that this great miracle of nature is daily wrought. But how does the weak defenceleſs butterfly, ſcarce unfolded into exiſtence, go about to make its way through the impenetrable walls that preſerved it from inſult during its torpid ſtate? How will it bear the effulgence of the light, and keenneſs of the air? Take one of their cods, make an aperture in it with a pair of ſciſſars, fix it againſt a glaſs; obſerve the inſect, you will perceive the organs gradually diſplaying themſelves: follow his operations with your eye; he ſtruggles to break looſe from his confinement. Obſerve the frothy liquor which it diſgorges; that liquor ſerves to ſoften the end of the cod, which at length yields to the butting of the inſect's head. By degrees the bar is removed, and the butterfly ſprings forth; the impreſſion of the air acts upon its wings, ſlightly apparent at firſt, but which afterwards expand with remarkable rapidity. The diſplay of them is ſometimes checked by drought, in which caſe the inſect is deprived of the faculty of flying. The roſtrum, extended under the covering of the chryſalis, is in this laſt ſtate rolled up into ſpiral, and lodged in a receſs prepared for it. The fly is now perfectly formed; it gently flutters, then takes its flight, and purſues its mazy wanderings over the enamelled meads, plunging its roſtrum into the cups of nectareous flowers."

Of papilio, fig. 1. pl. 25. Barbut gives the following account: "The ground colour of the inſect is a beautiful gloſſy black; the ſuperior wings are ornamented with white forked clouds; the inferior ones are adorned with ſpots of a blood-colour, thoſe neareſt the extremities being of a lunular form, and are indented, terminating in an extended tail, and are edged with white. The apex, or crown of the head, is tipt with the ſame red colour which encircles the ſhoulders, and terminates the abdomen for the ſpace of about five rings."

Of fig. 2. he ſpeaks thus: "The form of the wings reſembles the preceding inſects. They are beautifully variegated with black and yellow; the inferior ones terminate in a tail, and, according to the character of the ſection, are adorned with an eye of a yellowiſh red colour, encircled with blue, which is ſituated at the edge, neareſt the extremity of the abdomen. This is the largeſt, and one of the moſt beautiful inſects England produces. The caterpillar is large and ſmooth, of a bright green colour, with tranſverſal bands, of a deep gloſſy purple upon every ring, which bands are enriched with yellow ſpots; it feeds on wild fennel and other umbelliferous plants; changes into the chryſalis in July, aſſumes the winged ſtate in Auguſt, and frequents meadows. It ſometimes appears in May."

And of fig. 3. we have this account: "The peacock, or peacock's eye, is eaſily known by the peacock's eyes which it bears above, four in number, one upon each wing, which has given it the name it has. Its wings, very angulous, are black underneath; above they are of a reddiſh dun colour. The upper ones have on their ſuperior edge two black oblong ſpots, with a yellow one between the two. At their extremity is found the eye, large, reddiſh in the middle, ſurrounded with a yellow circle, accompanied by a ſmall portion of blue towards the exterior ſide. On that ſame ſide, following the direction of the margin, there are five or ſix white ſpots, ſet in order. The inferior wings are browner, and have each a large eye of a very dark blue in the middle, ſurrounded by an aſh-colour circle. The caterpillar is of a deep black, dotted with a little white."

We cannot conclude this article without noticing ſome very ſingular ſpecies; of which Mr. Reaumur has given an account, and which deſerve particular regard. One ſpecies of theſe he has called the *bundle of dry leaves*. This, when it is in a ſtate of reſt, has wholly the appearance of a little cluſter of the de-

cayed leaves of ſome herb. The poſition and colour of its wings greatly favour this reſemblance, and they have very large ribs; wholly like thoſe of the leaves of plants, and are indented in the ſame manner at their edges as the leaves of many plants are. This ſeems to point out the care of nature for the animal, and frequently may preſerve it from birds, &c.

The ſkull butterfly is another ſingular ſpecies, ſo called from its head reſembling in ſome degree a death's head or human ſkull. This very remarkable appearance is terrible to many people; but it has another yet greater ſingularity attending it, which is, that, when frighted, it has a mournful and harſh voice. This appeared the more ſurpriſing to Mr. Reaumur, as no other known butterfly had any the leaſt voice at all; and he was not ready of belief that it was a real voice, but ſuſpected the noiſe, like that of the cicadæ, to be owing to the attrition of ſome part of the body; and, in fine, he, by great pains, diſcovered that this noiſe was not truly vocal, but was made by a hard and briſk rubbing of the trunk againſt two other hard bodies between which it is placed.

Another butterfly there is, ſo ſmall that it might be miſtaken for a ſmall fly. This is certainly the extreme in degree of ſize of all the known butterflies, and cannot but have been proportionably ſmall in the ſtate of a caterpillar and chryſalis: this creature ſpends its whole life in all the three ſtages of caterpillar, chryſalis, and butterfly, on the leaf of the celandine. It lives on the under ſide of the leaf; and though in the caterpillar ſtate it feeds on it, yet it does no damage. It does not eat the ſubſtance of the leaf, but draws from it only a fine juice, which is ſoon repaired again, without occaſioning any change in the appearance of the leaf. This ſpecies is very ſhort-lived; and paſſes through its three ſtates in ſo ſhort a time, that there are frequently ten generations of it in one year; whereas, in all the other butterflies, two generations in the year are all that are to be had. Theſe two generations are ſufficient to make a prodigious increaſe: in a large garden, if there are twenty caterpillars in ſpring, theſe may be overlooked, and there may be eaſily concluded to be none there, even on a narrow ſearch; but if theſe twenty caterpillars afterwards become twenty butterflies, ten of which are male and ten female, and each female lay the ſame number of eggs that the common ſilk-worm does, that is, four hundred; if all the caterpillars hatched of theſe become butterflies, and theſe lay eggs in the ſame proportion, which remain the winter, and come to be hatched in the ſucceeding ſpring; then from theſe twenty, in only one year, you will have eight hundred thouſand; and if we add to this the increaſe of theſe in a ſucceeding year, the account muſt appear terrible, and ſuch as no art could guard againſt. The great Ruler of the world has put ſo many hinderances in the way of this over-abundant production, that it is very rare ſuch years of deſtruction happen. Some ſuch have happened, however; and much miſchief has been dreaded from them, not only from their eating all the herbage, but from themſelves being eaten with herbs in ſallads and otherwiſe: but experiments have proved this to be an erroneous opinion, and they are found to be innocent, and eatable as ſnails or oyſters.

PAPILIONACEOUS, among botaniſts, an appellation given to the flowers of plants belonging to various claſſes, from their reſembling the wings of a butterfly.

PAPINIAN, a celebrated Roman lawyer of the third century, under the Emperor Severus; who had ſo high an opinion of his worth, that he recommended his ſons Caracalla and Geta to his care. Caracalla having firſt murdered his brother, ordered Papinian to compoſe a diſcourſe to excuſe this murder to the ſenate and people; which when he refuſed to undertake, the brutal emperor ordered him to be beheaded; and his body was dragged through the ſtreets of Rome. Papinian wrote ſeveral treatiſes in the line of his profeſſion.

PAPISTS, are thoſe who believe the pope or biſhop of Rome to be the ſupreme paſtor of the univerſal church, who profeſs to believe all the articles of pope Pius's creed, and who promiſe implicit obedience to the edicts of the church, eſpecially the decrees of the council of Trent. See POPE and TRENT.

PAPPENHEIM, a town of Germany, in the circle of Franconia, and capital of a county of the ſame name, with a caſtle, where the counts reſide. It is ſeated near the river Altmal, 17 miles north-weſt of Neuburg, and 32 ſouth of Nuremberg; is ſubject to its own count. E. lon. 10. 51. N. lat. 48. 58. The count of Pappenheim is hereditary marſhal of the empire, and performs his office at the coronation of the emperor.

PAPPUS, an eminent philoſopher of Alexandria, ſaid by Suidas to have flouriſhed under the Emperor Theodoſius the Great, who reigned from A. D. 379 to 395. His writings ſhow him to have been a conſummate mathematician. Many of them are loſt; the reſt continued long in manuſcript, detached parts only having been occaſionally publiſhed in the laſt century, until Carolus Manoleſſius publiſhed his remains entire at Bologna in 1660, in folio.

PAPPUS, in botany, a ſoft downy ſubſtance that grows on the ſeeds of certain plants, as thiſtles, hawkweed, &c. ſerving to ſcatter and buoy them up in the air.

PAPYRUS, the famous reed from which was made the far-famed paper of Egypt. Before entering on the deſcription of the papyrus, it is natural to ſay a word or two on the opinion generally received in Europe concerning the loſs of this plant. Suppoſing this loſs poſſible, the date of it muſt be fixed at no diſtant period; for it is not 200 years ſince Guillandin and Proſper Alpin obſerved the papyrus on the banks of the Nile. Guillandin ſaw the inhabitants of the country eating the inferior and ſucculent part of the ſtem in the manner of the ancients; a fact which alone ſhows it to be the papyrus, and of which other travellers ſeem not to have availed themſelves. This practice, together with thoſe related by Proſper Alpin, are ſufficient to convince us, that this plant is not wholly uſeleſs, although it is not now employed in the fabrication of paper. The alteration on the ſoil of Egypt, and on the methods of agriculture, have in all probability rendered this plant leſs common; but cauſes altogether local could not occaſion the deſtruction of the papyrus, eſpecially as its reſidence in the marſhes would prevent their operation. But it is needleſs to reaſon from probabilities or analogy. Mr. Bruce not only ſaw the papyrus growing both in Egypt and Abyſſinia, but actually made paper of it in the manner in which it was made by the ancients. He tells us likewiſe, that, ſo far from any part of it being uſeleſs, the whole plant is at this day uſed in Abyſſinia for making boats, a piece of the acacia tree being put in the bottom to ſerve as a keel. That ſuch were the boats of ancient Egypt, we know from the teſtimony of Pliny, who informs us, that the plants were firſt ſewed together, and then gathered up at ſtem and ſtern, and tied faſt to the keel: "Conſeritur bibula Memphitis cymba papyro."

"The bottom, root, or woody part of this plant was likewiſe of ſeveral uſes before it turned abſolutely hard; it was chewed in the manner of liquorice, having a conſiderable quantity of ſweet juice in it. This we learn from Dioſcorides; it was, I ſuppoſe, chewed, and the ſweetneſs ſucked out in the ſame manner as is done with ſugar-cane. This is ſtill practiſed in Abyſſinia, where they likewiſe chew the root of the Indian corn, and of every kind of cyperus; and Herodotus tells us, that about a cubit of the lower part of the ſtalk was cut off, and roaſted over the fire, and eaten.

"From the ſcarcity of wood, which was very great in Egypt, this lower part was likewiſe uſed in making cups, moulds, and other neceſſary utenſils: we need not doubt, too,

one uſe of the woody part of this plant was, to ſerve for what we call *boards* or *covers* for binding the leaves, which were made of the bark; we know that this was anciently one uſe of it, both from Alcæus and Anacreon."

The papyrus, ſays Pliny, grows in the marſhes of Egypt, or in the ſtagnant places of the Nile, made by the flowing of that river, provided they are not beyond the depth of two cubits. Its roots are tortuous, and in thickneſs about four or five inches; its ſtem is triangular, riſing to the height of ten cubits. Proſper Alpin gives it about ſix or ſeven cubits above the water; the ſtem tapers from the bottom, and terminates in a point. Theophraſtus adds, that the papyrus carries a top or plume of ſmall hairs, which is the *thyrſus* of Pliny. Guillandin informs us, that its roots throw to the right and left a great number of ſmall fibres, which ſupport the plant againſt the violence of the wind, and againſt the waters of the Nile. According to him, the leaves of the plant are obtuſe, and like the typha of the marſhes. Mr. Bruce, on the other hand, aſſures us, that it never could have exiſted in the Nile. "Its head (ſays he) is too heavy; and in a plain country the wind muſt have had too violent a hold of it. The ſtalk is ſmall and feeble, and withal too tall; the root too ſhort and ſlender to ſtay it againſt the violent preſſure of the wind and current; therefore, I do conſtantly believe it never could be a plant growing in the river Nile itſelf, or in any very deep or rapid river;" but in the caliſhes or places where the Nile had overflowed and was ſtagnant.

The Egyptians made of this plant paper fit for writing (ſee PAPER), which they call βιβλος or *philuria*, and alſo χαρτης, and hence the Latin *charta*; for in general the word *charta* is uſed for the paper of Egypt.

The papyrus was produced in ſo great quantities on the banks of the Nile, that Caſſiodorus (lib. xi. 38) compares it to a foreſt. There, ſays he, riſes to the view, this foreſt without branches, this thicket without leaves, this harveſt of the waters, this ornament of the marſhes. Proſper Alpin is the firſt who gives us a plate of the papyrus, which the Egyptians call *berdi*. However badly this may be executed, it correſponds in ſome degree with the deſcription of the plant mentioned by Theophraſtus; but by much the beſt drawing of it has been given by Mr. Bruce. See plate 26.

The ancient botaniſts placed the papyrus among the graminous plants or dog-graſs; ignorant of the particular kind to which it belonged, they were contented to ſpecify it under the name of *papyrus*, of which there were two kinds, that of Egypt, and that of Sicily. The moderns have endeavoured to ſhow, that theſe two plants are one and the ſame ſpecies of cyperus. It is under this genus that they are found in the catalogues and deſcriptions of plants publiſhed ſince the edition of Moriſon's work, where the papyrus is called *cyperus Niloticus vel Syriacus maximus papyraceus*.

In the manuſcripts of the letters and obſervations of M. Lippi phyſician at Paris, who accompanied the envoy of Louis XIV. to the emperor of Abyſſinia, we find the deſcription of a cyperus which he had obſerved on the banks of the Nile in 1704. After having deſcribed the flowers, he ſays that many ears covered with young leaves are ſupported by a pretty long pedicle; and that many of thoſe pedicles, equally loaded and coming from one joint, form a kind of paraſol. The diſk of this paraſol is ſurrounded with a quantity of leaves which form a crown to the ſtem which ſupports it. The ſtem is a pretty long priſm, the corners of which are a little rounded; and the leaves, not at the top but at the ſide, are formed like the blade of a ſword; the roots are black and full of fibres; and this plant is called *cyperus Nilæacus major, umbella multiplici*.

The ſame Lippi deſcribes another kind which riſes not ſo high: the ſtem and leaves correſpond with the former, but the ears form rather a kind of head than any thing like the ſpreading of an umbrella; this head was very ſoft, ſhining, and gilded rich and airy, much loaded, ſupported by pedicles which were joined together at the bottom like the knitting of a paraſol. It is called by him *cyperus Nilæacus major aurea, diviſa panicula*. Theſe two kinds of cyperus have a marked reſemblance in their leaves, their ſtem, their foliage, and the marſhy places where they grow. The only difference conſiſts in their ſize, and in the poſition of the ears, which ſerve to diſtinguiſh them; and they ſeem to bear a reſemblance to the papyrus and the ſari, deſcribed by ancient authors. The firſt is perhaps the papyrus, and the ſecond the ſari; but this is only conjecture.

The papyrus, which grew in the waters, is ſaid to have produced no ſeed; but this Mr. Bruce very properly calls an abſurdity. "The form of the flower (ſays he) ſufficiently indicates, that it was made to reſolve itſelf into the covering of one, which is certainly very ſmall, and, by its exalted ſituation and thickneſs of the head of the flower, ſeems to have needed the extraordinary covering it has had to protect it from the violent hold the wind muſt have had upon it. For the ſame reaſon, the bottom of the filaments compoſing the head is ſheathed in four concave leaves, which keep them cloſe together, and prevent injury from the wind getting in between them." Its plume was compoſed of ſlender pedicles, very long, and ſomewhat like hair, according to Theophraſtus. The ſame peculiarity exiſts in the papyrus of Sicily; and the ſame is found to exiſt in another kind of papyrus ſent from Madagaſcar by M. Poivre, correſpondent of the academy of ſciences.

It is impoſſible to determine whether the papyrus of Sicily was uſed in any way by the Romans. In Italy it is called *papero*, and, according to Ceſalpin, *pipero*. This papyrus of Sicily has been cultivated in the garden of Piſa; and if we can depend on the authority of Ceſalpin, who himſelf examined the plant, it is different from the papyrus of Egypt.

The papyrus, ſays he, which is commonly called *pipero* in Sicily, has a longer and thicker ſtem than the plant cyperus. It riſes ſometimes to four cubits; the angles are obtuſe, and the ſtem at the baſe is ſurrounded with leaves growing from the root; there are no leaves on the ſtem even when the plant is at the greateſt perfection, but it carries at the top a large plume which reſembles a great tuft of diſhevelled hairs; this is compoſed of a great number of triangular pedicles, in the form of reeds; at the extremity of which are placed the flowers, between two ſmall leaves of a reddiſh colour like the cyperus. The roots are woody, about the thickneſs of reeds, jointed, and they throw out a great number of branches which extend themſelves in an oblique direction. Theſe are ſcented ſomewhat like the cyperus, but their colour is a lighter brown; from the lower part iſſue many ſmall fibres, and from the higher a number of ſtems ſhoot up, which in proportion as they are tender contain a ſweet juice.

The plume of the papyrus of Sicily is pretty well deſcribed in a ſhort account of it in the ſecond part of the *Muſæum de Baccone*. This plume is a tuft or aſſemblage of a great number of long ſlender pedicles, which grow from the ſame point of diviſion, are diſpoſed in the manner of a paraſol, and which carry at the top three long and narrow leaves, from which iſſue other pedicles, ſhorter than the former, and terminating in ſeveral knots of flowers. Micheli, in his *Nova Plantarum Genera*, printed at Florence 1728, has given an engraving of one of the long pedicles in its natural length: it is ſurrounded at the baſe with a caſe of about one inch and a half in height; towards the extremity it carries three long and narrow leaves, and four pedicles, to which are fixed the knots of flowers. Every pedicle has alſo a ſmall caſe ſurrounding its baſe. In ſhort, we find in the *Groſto-Graphia* of Scheuchzer a very particular deſcription of the plume of a kind of cyperus, which

appears to be the Sicilian plant. From this account it appears that the papyrus of Sicily is well known to botaniſts. It were to be wiſhed that we had as particular a deſcription of the papyrus of Egypt; but meanwhile it may be obſerved, that theſe two plants have a near affinity to one another; they are confounded together by many authors; and according to Theophraſtus, the *ſari* and the *papyrus nilotica* have a decided character of reſemblance, and only differ in this, that the papyrus ſends forth thick and tall ſtems, which being divided into ſlender plates, are fit for the fabrication of paper; whereas the ſari has ſmall ſtems, conſiderably ſhorter, and altogether uſeleſs for any kind of paper.

The papyrus which ſerved anciently to make paper muſt not be confounded with the papyrus of Sicily, found alſo in Calabria; for, according to Strabo, the papyrus was to be found in no place excepting Egypt and India. The greateſt part of botaniſts have believed that the Sicilian plant is the ſame with the ſari of Theophraſtus; others have advanced that the papyrus of Egypt and the ſari were the ſame plant in two different ſtages of its exiſtence, or conſidered with reſpect to the greater or leſs height; which, according to them, might depend on the qualities of the ſoil, the difference of the climate, or other accidental cauſes. In proof of this, it is maintained, that there is an eſſential difference between the papyrus growing in the waters and the ſame plant growing on the banks of rivers and in marſhes. The firſt of theſe have thick and tall ſtems, and a plume in the form of a tuft of hair very long and ſlender, and without any ſeed: the ſecond differs from the firſt in all theſe particulars; it has a ſhorter and more ſlender ſtem, its plume is loaded with flowers, and of conſequence it produces ſeed. In whatever way we conſider theſe facts, it is ſufficient for us to know, that the difference between the papyrus and the ſari neither depends on climate, nor ſoil, nor on ſituation. The plants whoſe difference depended on theſe circumſtances, both grew in Egypt, and were both employed in the manufacture of paper. But it is an eſtabliſhed fact, that the ſari cannot be employed for this purpoſe.

Finally, the papyrus of Sicily began to be known by botaniſts in 1570, 1572, 1583, at which periods the works of Lobel, of Guillandin, and of Ceſalpin, firſt appeared. The ancients had no manner of knowledge of this plant. Pliny makes no mention of it in his Natural Hiſtory; from which it is evident that it was neither uſed in Rome nor in Sicily. If he had ſeen this plant, he muſt have been ſtruck with its reſemblance to the papyrus and the ſari, as they were deſcribed by Theophraſtus; and ſince he gives a particular deſcription of theſe laſt mentioned, he would have moſt naturally hinted at their conformity to the Sicilian papyrus.

Among many dried plants collected in the Eaſt Indies by M. Poivre, there is a kind of papyrus very different from that of Sicily. It carries a plume compoſed of a conſiderable tuft of pedicles, very long, weak, ſlender, and delicate, like ſingle threads, terminating moſt frequently in two or three ſmall narrow leaves, without any knot of flowers between them; hence this plume muſt be altogether barren. Thoſe pedicles or threads are furniſhed with a pretty long membranous caſe, in which they are inſerted; and they iſſue from the ſame point of direction, in the manner of a paraſol. The plume, at its firſt appearance, is ſurrounded with leaves like the radii of a crown. The ſtem which ſupports it is, according to M. Poivre, about ten feet in height, where there is two feet under water; it is of a triangular form, but the angles are rounded; its thickneſs is about the ſize of a walking-ſtaff which fills the hand.

The interior ſubſtance, although ſoft and full of fibres, is ſolid and of a white colour. By this means the ſtem poſſeſſes a certain degree of ſtrength, and is capable of reſiſtance. It bends without breaking; and as it is extremely light, it ſerves in ſome ſort for a cane. The ſame M. Poivre uſed no other during a reſidence of ſeveral months at Madagaſcar. This ſtem is not of equal thickneſs in its whole length; it tapers inſenſibly from the thickeſt part towards the top. It is without knots, and extremely ſmooth. When this plant grows out of the waters, in places ſimply moiſt, it is much ſmaller, the ſtems are lower, and the plume is compoſed of ſhorter pedicles or threads, terminating at the top in three narrow leaves, a little longer than thoſe at the plume when the plant grows in the water. From the baſe of theſe leaves iſſue ſmall knots of flowers, arranged as they are in the cyperus; but theſe knots are not elevated above the pedicles, they occupy the centre of the three leaves between which they are placed, and form themſelves into a ſmall head. The leaves which ſpring from the root and the lower part of the ſtem reſemble exactly thoſe in the cyperus. This plant, which the inhabitants call *ſanga-ſangá*, grows in great abundance in their rivers and on their banks, but particularly in the river Tartas, near the Foule-point in Madagaſcar. The inhabitants of theſe cantons uſe the bark of this plant for mats; they make it alſo into ſails, into cordage for their fiſhing-houſes, and into cords for their nets.

This kind of papyrus, ſo lately diſcovered, and different from the papyrus of Sicily by the diſpoſition of its flowers, ſhows, that there are two kinds of the cyprus which might eaſily be confounded with the papyrus of Egypt; whether we conſider, on the one hand, to what purpoſes the inhabitants of the places where they grow have made them ſubſervient; or, on the other, compare their form, their manner of growth, and the points in which they reſemble each other. This compariſon can be eaſily made from the accounts which Pliny and Theophraſtus gave of the papyrus of Egypt, and by the figure and deſcription given by Proſper Alpin, after having obſerved the plant on the banks of the Nile. But if we can depend on the teſtimony of Strabo, who affirms that the papyrus is found nowhere but in Egypt and in India, it is perhaps poſſible that the papyrus of the iſle of Madagaſcar, ſituated at the mouth of India, is the ſame with that of Egypt.

Whatever truth may be in this conjecture, the inhabitants of this iſland have never derived from it thoſe advantages which have immortalized the papyrus of Egypt. They have not made that celebrated paper *quo uſu maxime humanitas, vita, conſtat et memoria*. This remarkable expreſſion of Pliny not only characterizes the Egyptian paper, but every kind which art and induſtry have ſubſtituted in its place.

PAR, in commerce, ſignifies any two things equal in value. See EXCHANGE.

PARABLE, a fable or allegorical inſtruction, founded on ſomething real or apparent in nature or hiſtory, from which a moral is drawn by comparing it with ſomething in which the people are more immediately concerned; ſuch are the parables of Dives and Lazarus, of the Prodigal Son, of the Ten Virgins, &c. Dr. Blair obſerves, that "of parables, which form a part of allegory, the prophetical writings are full; and if to us they ſometimes appear obſcure, we muſt remember, that in thoſe early times it was univerſally the mode throughout all the eaſtern nations to convey ſacred truths under myſterious figures and repreſentations."

PARABOLA. See CONIC *Sections*.

PARABOLE. See ORATORY.

PARACELSUS (AURELIUS PHILIP THEOPHRASTUS-BOMBASTUS DE HOHENHEIM), a famous phyſician, born at Einſidlen, a town in the canton of Schwitz in Swiſſerland. He was educated with great care by his father, who was the natural ſon of a prince, and in a little time made a great progreſs in the ſtudy of phyſic. He afterwards travelled into France, Spain, Italy, and Germany, in order to become acquainted with the moſt celebrated phyſicians. At his return to Swiſſer-

land, he ſtopped at Baſil, where he read lectures on phyſic in the German tongue. He was one of the firſt who made uſe of chemical remedies with ſucceſs, by which he acquired a very great reputation. Paracelſus gloried in deſtroying the method eſtabliſhed by Galen, which he believed to be very uncertain; and by this means drew upon himſelf the hatred of the other phyſicians. It is ſaid, that he boaſted of being able, by his remedies, to preſerve the life of man for ſeveral ages: but he himſelf experienced the vanity of his promiſes, by his dying at Saltzburg, in 1524, at 37 years of age according to ſome, and at 48 according to others. The beſt edition of his works is that of Geneva in 1658, in 3 vols. folio.

PARACENTESIS, an operation in ſurgery, commonly called *taping*. See SURGERY.

PARACLET, the COMFORTER, a name given to the Holy Ghoſt.

PARADE, in a military ſenſe, the place where troops aſſemble or draw together, to mount guard, or for any other purpoſe.

PARADE, in fencing, implies the action of parrying or turning off any thruſt.

PARADIS (FRANCIS AUGUSTINE) de MONCRIF. See MONCRIF.

PARADISE, a term principally uſed for the garden of Eden, in which Adam and Eve were placed immediately upon their creation. As to this terreſtrial paradiſe, there have been many inquiries about its ſituation. It has been placed in the third heaven, in the orb of the moon, in the moon itſelf, in the middle region of the air, above the earth, under the earth, in the place poſſeſſed by the Caſpian ſea, and under the arctic pole. The learned Huetius places it upon the river that is produced by the conjunction of the Tigris and Euphrates, now called the *river of the Arabs*, between this conjunction and the diviſion made by the ſame river before it falls into the Perſian ſea. Other geographers have placed it in Armenia, between the ſources of the Tigris, the Euphrates, the Araxis, and the Phaſis, which they ſuppoſe to be the four rivers deſcribed by Moſes. But concerning the exact place we muſt neceſſarily be very uncertain, if indeed it can be thought at all to exiſt at preſent, conſidering the many changes which have taken place on the ſurface of the earth ſince the creation.

It may not be improper, however, in this place to give a deſcription of the paradiſe of the Mohammedans. The ſenſuality and abſurdity of that impoſtor muſt be apparent to all men. Their religion has no conſiſtency in its parts, and the deſcriptions of the future enjoyment of the faithful are miſerable inſtances of human weakneſs and folly. "The paradiſe of the Mohammedans is ſaid by them to be ſituated above the ſeven heavens, or in the ſeventh, and next under the throne of God; and to expreſs the amenity of the place, they tell us that the earth of it is of the fineſt wheat flour, or of the pureſt muſk, or of ſaffron; and that its ſtones are pearls and jacinths, the walls of its buildings enriched with gold and ſilver, and the trunks of all its trees of gold, amongſt which the moſt remarkable is the tree *tuba*, or tree of happineſs. They pretend that this tree ſtands in the palace of Mohammed, though a branch of it will reach to the houſe of every true believer, loaded with pomegranates, dates, grapes, and other fruits of ſurpriſing bigneſs, and delicious taſtes, unknown to mortals. If a man deſires to eat of any particular kind of fruit, it will immediately be preſented to him; or if he chooſes fleſh, birds ready dreſſed will be ſet before him, and ſuch as he may wiſh for. They add, that this tree will ſupply the bleſſed, not only with fruit, but with ſilk garments alſo, and beaſts to ride on, adorned with rich trappings, all which will burſt forth from the fruit; and that the tree is ſo large, that a perſon mounted on the fleeteſt horſe would not be able to gallop from one end of its ſhade to the other in 100 years. Plenty of water being one of the greateſt additions to the pleaſantneſs of any place, the Alcoran often ſpeaks of the rivers of paradiſe as the principal ornament. Some of theſe rivers are ſaid to flow with water, ſome with milk, ſome with wine, and others with honey: all of them have their ſources in the root of this tree of happineſs; and, as if theſe rivers were not ſufficient, we are told that the garden of this paradiſe is alſo watered by a great number of leſſer ſprings and fountains, whoſe pebbles are rubies and emeralds, their earth of camphor, their beds of muſk, and their ſides of ſaffron. But all thoſe glories will be eclipſed by the reſplendent and exquiſite beauty of the girls of paradiſe, the enjoyment of whoſe company will conſtitute the principal felicity of the faithful. Theſe (they ſay) are not formed of clay, as mortal women, but of pure muſk; and are, as their prophet often affirms in his Alcoran, free from all the natural defects and inconveniences incident to the ſex. Being alſo of the ſtricteſt modeſty, they keep themſelves ſecluded from public view in pavilions of hollow pearls, ſo large, that, as ſome traditions have it, one of them will be no leſs than 16, or, as others ſay, 60 miles long, and as many broad. With theſe the inhabitants of paradiſe may taſte pleaſures in their height; and for this purpoſe will be endowed with extraordinary abilities, and enjoy a perpetual youth."

Bird of PARADISE. See the following article.

PARADISEA, in ornithology; a genus of birds belonging to the order of picæ. The beak is covered with a belt or collar of downy feathers at the baſe; and the feathers on the ſides are very long. See pl. 27.

"Birds of this genus (ſays Latham) have the bill ſlightly bending; the baſe covered with velvet-like feathers. The noſtrils are ſmall, and concealed by the feathers. The tail conſiſts of 10 feathers; the two middle ones, and ſometimes more in ſeveral of the ſpecies, are very long, and webbed only at the baſe and tips. The legs and feet are very large and ſtrong: they have three toes forward, one backward, and the middle connected to the outer one as far as the firſt joint. The whole of this genus have, till lately, been very imperfectly known; few cabinets poſſeſſing more than one ſpecies, viz. the Greater, or what is called the *common bird of Paradiſe*; nor has any ſet of birds given riſe to more fables, the various tales concerning which are to be found in every author; ſuch as, their never touching the ground from their birth to death; living wholly on the dew; being produced without legs; and an hundred ſuch ſtories, too ridiculous even to mention. This laſt error is ſcarcely at this moment wholly eradicated. The circumſtance which gave riſe to it did not indeed at firſt proceed from an intention to deceive, but merely from accident. In the parts of the world which produce theſe birds, the natives made uſe of them as *aigrets*, and other ornaments of dreſs; and in courſe threw away the leſs brilliant parts. The whole trouble they were at on this occaſion, was merely to ſkin the bird, and, after pulling off the legs, coarſer parts of the wings, &c. thruſt a ſtick down the throat into the body, letting an inch or two hang out of the mouth, beyond the bill; on the bird's drying, the ſkin collapſed about the ſtick, which became fixed, and ſupported the whole. They had then no more to do than to put this end of it into a ſocket fitted to receive it, or faſten it in ſome manner to the turban, &c. By degrees theſe were imported into the other iſles for the ſame uſes, and afterwards were coveted by the Japaneſe, Chineſe, and Perſians, in whoſe countries they are frequently ſeen, as well as in many parts of India; the grandees of theſe laſt parts not only ornamenting themſelves with theſe beautiful plumes, but adorning even their horſes with the ſame."

The Portugueſe firſt found theſe birds on the iſland of Gilolo, the Papua iſlands, and New Guinea; and they were known

by the name of *birds of the ſun*. The inhabitants of Ternate call them *manuco dewata*, the "bird of God;" whence the name *manuco diata*, uſed by ſome naturaliſts, is derived. According to ſome fabulous accounts, this bird has no legs, lives conſtantly on wing, and in the air; and, in confirmation of theſe accounts, the legs of all the dead birds offered to ſale were cut off. But the inhabitants of Aroo, who reſort yearly to Banda, undeceived the Dutch, and freed them from thoſe prejudices. Another reaſon for cutting off the legs is, that the birds are more eaſily preſerved without them; beſides that the Moors wanted the birds without legs, in order to put them on in their mock fights as ornaments to their helmets. The inhabitants of Aroo, however, have brought the birds with legs for 80 or 90 years; and Pijafetta, ſhipmate of Ferdinand Magellan, proved, about the year 1525; an eye witneſs that theſe creatures were not without legs. However, the peculiar length and ſtructure of their ſcapular feathers hinders them from ſettling, in high winds, on trees; and when they are thrown on the ground by theſe winds, they cannot riſe again. If taken by the natives, they are immediately killed, as their food is not known; and they defend themſelves with great courage with their formidable bills.

Latham enumerates eight ſpecies, but ſuſpects there may be more. We ſhall ſatisfy ourſelves with the following:

1. The largeſt bird of Paradiſe is commonly two feet four inches in length; the head is ſmall; the bill hard and long, of a pale colour. The head and back-part of the neck is lemon-coloured, a little black about the eyes; about the neck the bird is of the brighteſt gloſſy emerald green, ſoft like velvet; as is alſo the breaſt, which is black: the wings are large, and cheſnut-coloured; the back part of the body is covered with long, ſtraight, narrow feathers, of a pale brown colour, ſimilar to the plumes of the oſtrich. Theſe feathers are ſpread when the bird is on the wing; for which reaſon he can keep very long in the air. On both ſides of the belly are two tufts of ſtiff and ſhorter feathers, of a golden yellow, and ſhining. From the rump proceed two long ſtiff ſhafts, which are feathered on their extremities.

Theſe birds are not found in Key, an iſland fifty Dutch miles eaſt of Banda; but they are found at the Aroo iſlands, lying 15 Dutch miles farther eaſt than Key, during the weſterly or dry monſoon; and they return to New Guinea as ſoon as the eaſterly or wet monſoon ſets in. They come always in a flock of 30 or 40, and are led by a bird which the inhabitants of Aroo call the *king*. This leader is black, with red ſpots; and conſtantly flies higher than the reſt of the flock, which never forſake him, but ſettle as ſoon as he ſettles: a circumſtance that frequently proves their ruin when the king lights on the ground, whence they are not able to riſe on account of the ſingular ſtructure and diſpoſition of their plumage. They are likewiſe unable to fly with the wind, which would ruin their looſe plumage; but take their flight conſtantly againſt it, cautious not to venture out in hard-blowing weather, as a ſtrong wind frequently obliges them to come to the ground. During their flight they cry like ſtarlings. Their note, however, approaches more to the croaking of ravens; which is heard very plainly when they are in diſtreſs from a freſh gale blowing on the back of their plumage. In Aroo, theſe birds ſettle on the higheſt trees, eſpecially on the ficus benjamina of the Hortus Malabaricus, commonly called the *waringa tree*. The natives catch them with bird-lime or in nooſes, or ſhoot them with blunt arrows; but though ſome are ſtill alive when they fall into their hands, the catchers kill them immediately, and ſometimes cut the legs off; then they draw out the entrails, dry and fumigate the bodies with ſulphur or ſmoke only, and ſell them at Banda for half a rixdollar each; but at Aroo they may be bought for a ſpike-nail or a piece of old iron. Flocks of theſe birds are often ſeen flying from one iſland to the other againſt the wind. In caſe they find the wind become too powerful, they fly ſtraight up into the air, till they come to a place where it is leſs agitated, and then continue their flight. During the eaſtern monſoon their tails are moulted, ſo that they have them only during four months of the weſtern monſoon.

2. The ſmaller bird of Paradiſe is about 20 inches long. His beak is lead-coloured, and paler at the point. The eyes are ſmall, and incloſed in black about the neck. The head and back of the neck are of a dirty yellow; the back of a greyiſh yellow; the breaſt and belly of a duſky colour; the wings ſmall, and cheſnut-coloured. The long plumage is about a foot in length, and paler than in the large ſpecies; as in general the colours of this bird are leſs bright than the former. The two long feathers of the tail are conſtantly thrown away by the natives. This is in all reſpects like the greater ſort; and they likewiſe follow a king or leader, who is, however, blacker, with a purpliſh caſt, and finer in colour than the reſt. The neck and bill are larger in the male than in the female. They rooſt on the tops of the higheſt trees, and do not migrate like the other kind. Some ſay, that the birds of this ſpecies, finding themſelves weak through age, ſoar ſtraight towards the ſun till they are tired, and fall dead to the ground. The natives draw the entrails, ſear the birds with a hot iron, and put them in a tube of bamboo for preſervation.

3. and 4. The large black bird of Paradiſe is brought without wings or legs for ſale; ſo that no accurate deſcription of it hath yet been given. Its figure, when ſtuffed, is narrow and round, but ſtretched in length to the extent of four ſpans. The plumage on the head, neck, and belly, is black and velvet-like, with a hue of purple and gold, which appears very ſtrong. The bill is blackiſh, and one inch in length. On both ſides are two bunches of feathers, which have the appearance of wings, although they are very different, the wings being cut off by the natives. This plumage is ſoft, broad, ſimilar to peacocks feathers, with a glorious gloſs and greeniſh hue, and all bent upwards; which Valentine thinks is occaſioned by the birds being kept in hollow bamboo-reeds. The feathers of the tail are of unequal length; thoſe next to the belly are narrow, like hair; the two uppermoſt are much longer, and pointed; thoſe immediately under them are a ſpan and a half longer than the upper ones; they are ſtiff, on both ſides fringed with a plumage like hair, black above, but gloſſy below. Birds of this kind are brought only from one particular place of New Guinea. Beſides the large black bird of Paradiſe, there is ſtill another ſort, whoſe plumage is equal in length, but thinner in body, black above, and without any remarkable gloſs, not having thoſe ſhining peacock-feathers which are found on the greater ſpecies. This wants likewiſe the three long pointed feathers of the tail belonging to the larger black ſpecies.

5. The white bird of Paradiſe is the moſt rare, and has two varieties; one quite white, and the other black and white. The former is very rare. The ſecond has the fore-part black, and the back part white; with 12 crooked wiry ſhafts, which are almoſt naked, though, in ſome places, covered with hairs.

6. In the year 1689 a new ſpecies of the black bird of Paradiſe was ſeen in Amboyna. This was only one foot in length, with a fine purple hue, a ſmall head, and a ſtraight bill. On its back, near the wings, are feathers of a blue and purple colour, as on the other birds of Paradiſe; but under the wings and over all the belly they are yellow-coloured, as in the common ſort: on the back of the neck they are mouſe-coloured mixed with green. It is remarkable in this ſpecies, that there are before the wings two roundiſh tufts of feathers, which are green-edged, and may be moved at pleaſure by the bird, like

wings. Inſtead of a tail, he has 12 or 13 black, naked, wire-like ſhafts, hanging promiſcuouſly like feathers. His legs are ſtrong, and have ſharp claws. The head is remarkably ſmall; and the eyes are alſo ſmall, and ſurrounded with black.

7. The laſt ſpecies we ſhall mention is the king's bird. This creature is about ſeven inches long, and ſomewhat larger than a titmouſe. Its head and eyes are ſmall; the bill ſtraight; the eyes included in circles of black plumage; the crown of the head is flame-coloured; the back of the neck blood-coloured; the neck and breaſt of a cheſtnut colour, with a ring of the brighteſt emerald-green. Its wings are in proportion ſtrong; and the quill-feathers dark, with red ſhining plumes, ſpots, and ſtripes. The tail is ſtraight, ſhort, and brown. Two long naked black ſhafts project from the rump, at leaſt a hand-breadth beyond the tail; having at their extremities ſemilunar twiſted plumage, of the moſt glaring green colour above, and duſky below. The belly is white and green ſprinkled; and on each ſide is a tuft of long plumage, feathered with a broad margin, being on one ſide green and on the other duſky. The back is blood-red and brown, ſhining like ſilk. The legs are in ſize like thoſe of a lark, three fore-toes and one back-toe. This bird aſſociates not with any of the other birds of Paradiſe; but flits ſolitary from buſh to buſh, wherever he ſees red berries, without ever getting on tall trees.

Thoſe who wiſh for minuter information reſpecting this curious genus, we muſt refer to Latham's Synopſis, and Buffon's Birds, vol. ix. &c.

PARADOX, *παραδοξον*, in philoſophy, a propoſition ſeemingly abſurd, as being contrary to ſome received opinions, but yet true in fact. The vulgar and illiterate take almoſt every thing, even the moſt important, upon the authority of others, without ever examining it themſelves. Although this implicit confidence is ſeldom attended with any bad conſequences in the common affairs of life, it has nevertheleſs, in other things, been much abuſed; and in political and religious matters has produced fatal effects. On the other hand, knowing and learned men, to avoid this weakneſs, have fallen into the contrary extreme: ſome of them believe every thing to be unreaſonable, or impoſſible, that appears ſo to their firſt apprehenſion; not adverting to the narrow limits of the human underſtanding, and the infinite variety of objects, with their mutual operations, combinations, and affections, that may be preſented to it.

It muſt be owned, that credulity has done much more miſchief in the world than incredulity has done, or ever will do; becauſe the influences of the latter extend only to ſuch as have ſome ſhare of literature, or affect the reputation thereof. And ſince the human mind is not neceſſarily impelled, without evidence, either to belief or unbelief, but may ſuſpend its aſſent to, or diſſent from, any propoſition till after a thorough examination; it is to be wiſhed that men of learning, eſpecially philoſophers, would not haſtily, and by firſt appearances, determine themſelves with reſpect to the truth or falſehood, poſſibility or impoſſibility, of things.

A perſon who has made but little progreſs in the mathematics, though in other reſpects learned and judicious, would be apt to pronounce it impoſſible that two lines, which were nowhere two inches aſunder, may continually approach toward one another, and yet never meet, though continued to infinity: and yet the truth of this propoſition may be eaſily demonſtrated. And many, who are good mechanics, would be as apt to pronounce the ſame, if they were told, that though the teeth of one wheel ſhould take equally deep into the teeth of three others, it ſhould affect them in ſuch a manner, that, in turning it any way round its axis, it ſhould turn one of them the ſame way, another the contrary way, and the third no way at all.

No ſcience abounds more with paradoxes than geometry: thus, that a right line ſhould continually approach to the hyperbola, and yet never reach it, is a true paradox; and in the ſame manner a ſpiral may continually approach to a point, and yet not reach it in any number of revolutions, however great.

The Copernican ſyſtem is a paradox to the common people; but the learned are all agreed as to its truth. Geometricians have of late been accuſed of maintaining paradoxes; and ſome do indeed uſe very myſterious terms in expreſſing themſelves about aſymptotes, the ſums of infinite progreſſions, the areas comprehended between curves and their aſymptotes, and the ſolids generated from theſe areas, the length of ſome ſpirals, &c. But all theſe paradoxes and myſteries amount to no more than this; that the line or number may be continually acquiring increments, and thoſe increments may decreaſe in ſuch a manner, that the whole line or number ſhall never amount to a given line or number. The neceſſity of admitting it is obvious from the nature of the moſt common geometrical figures: thus, while the tangent of a circle increaſes, the area of the correſponding ſector increaſes, but never amounts to a quadrant. Neither is it difficult to conceive, that if a figure be concave towards a baſe, and have an aſymptote parallel to the baſe (as it happens when we take a parallel to the aſymptote of the logarithmic curve, or of the hyperbola, for a baſe), that the ordinate in this caſe always increaſes while the baſe is produced, but never amounts to the diſtance between the aſymptote and the baſe. In like manner, a curvilinear area may increaſe while the baſe is produced, and approach continually to a certain finite ſpace, but never amount to it; and a ſolid may increaſe in the ſame manner, and yet never amount to a given ſolid. See *M'Laurin's Fluxions*. See LOGARITHMIC *Curve*.

PARADOXI, a ſort of mimes or buffoons among the ancients, who entertained the people with extempore effuſions of drollery. They were alſo called *Paradoxologi*, *Ordonarii*, *Neanicologi*, and *Aretalogi*. See MIMI.

PARAGAUDÆ, among the Romans, were wreaths of gold, or ſilk and gold, interwoven in, not ſewed to, their garments. The garment was ſometimes of one colour, with one paragauda; ſometimes of two colours, with two paragaudæ; or three colours, with three paragaudæ, &c. They were worn both by men and women.

PARAGOGE, in grammar, a figure whereby a letter or ſyllable is added to the end of a word; as *med*, for *me*; *dicier*, for *dici*, &c.

PARAGRAPH, in general, denotes a ſection or diviſion of a chapter; and in references is marked thus, ¶.

PARAGUAY, or LA PLATA, a large country of South America, bounded on the north by Amazonia, on the eaſt by Braſil, on the ſouth by Patagonia, and on the weſt by Chili and Peru. It contains ſix provinces; namely, Paraguay Proper, Parana, Guaria, Uraguay, Tucuman, and La Plata, from which the whole country is alſo called La Plata. It has numerous lakes and rivers: of the latter, the three principal are the Paraguay, Uragua, and Parana; the united ſtreams of which form the celebrated Rio-de-la-Plata. Theſe rivers annually overflow their banks; and, on their receſs, leave them enriched by a ſlime that renders the ſoil extremely fertile. This vaſt country is far from being wholly ſubdued or planted by the Spaniards; many parts being ſtill unknown. The principal province of which we have any knowledge is that called La Plata, toward the mouth of the Rio-de-la Plata. This province, with all the adjacent parts, is one continued plain for ſeveral hundred miles; extremely fertile, and producing cotton in great abundance, tobacco, and the valuable herb called Paraguay, which is peculiar to this country, and the infuſion of which is drunk, in all the Spaniſh provinces of South America, inſtead of tea. They have alſo a variety of fruits, and very rich paſtures; but the country is deſtitute of woods. The air is remarkably ſweet and ſerene. The Spaniards diſ-

covered this country, by ſailing up the Rio-de-la-Plata, in 1515, and founded the town of Buenos Ayres. In 1580 the Jeſuits were admitted into theſe fertile regions, and in the next century founded the famous miſſions of Paraguay; which were a number of colonies, each governed by two Jeſuits, one of whom was rector, the other his curate. They undertook, not only to make proſelytes, but to open a new ſource of wealth to the mother country. To this end they repreſented, that they ought to be independent of the Spaniſh governors; and that, as the vices of the Europeans might contaminate their new converts, and deſtroy the great objects of the miſſions, no other Spaniards ſhould be permitted to enter the country. To theſe terms the court agreed; the holy fathers conſenting to a certain capitation tax on the natives, and two other ſtipulations in favour of the crown. In proceſs of time, merely by the moſt wonderful addreſs, they acquired an abſolute dominion, both ſpiritual and temporal, over the natives. In 1757, Spain exchanged the colonies on the eaſt ſhore of the Uraguay, for the Portugueſe colony of St. Sacrament, which cauſed that river to become the boundary of the reſpective poſſeſſions of the two crowns. In 1767 the court expelled the Jeſuits, and the natives were put upon the ſame footing with the other Indians of the Spaniſh part of South America.

PARALEIPOMENA, in matters of literature, denotes a ſupplement of things omitted in a preceding work.

PARALEPSIS. See ORATORY.

PARALLACTIC, in general, ſomething relating to the parallax of heavenly bodies. See PARALLAX.

PARALLAX, in aſtronomy, is the difference between the places of any celeſtial object as ſeen from the ſurface, and from the centre of the earth at the ſame inſtant.

Let E in figure of parallax given in Plate 24, repreſent the centre of the earth, O the place of an obſerver on its ſurface, whoſe viſible horizon is OH, and true horizon EF: Now let ZDT be a portion of a great circle in the heavens, and A the place of any object in the viſible horizon; join EA, and produce it to C; then C is the *true* place of the object, and H is its *apparent* place, and the angle CAH is the parallax; or, becauſe the object is in the horizon, it is called the *horizontal parallax*. But OAE, the angle which the earth's radius ſubtends at the object, is equal to CAH: Hence the horizontal parallax of an object may be defined to be the angle which the earth's ſemidiameter ſubtends at that object. For the various methods hitherto propoſed to find the quantity of the horizontal parallax of an object, ſee ASTRONOMY.

The whole effect of parallax is in a vertical direction: For the parallactic angle is in the plane paſſing through the obſerver and the earth's centre; which plane is neceſſarily perpendicular to the horizon, the earth being conſidered a ſphere.

The more elevated an object is above the horizon, the leſs is the parallax, its diſtance from the earth's centre continuing the ſame. When the object is in the zenith, it has no parallax; but when in the horizon, its parallax is greateſt. The horizontal parallax being given, the parallax at any given altitude may be found by the following rule:

To the logarithmic coſine of the given altitude, add the log. ſine of the horizontal parallax, the ſum, rejecting 10 from the index, will be the log. ſine of the parallax in altitude.

Demonſtration. Let B be the place of an object; produce OB, ED to F and D; then the angle BOZ will be the apparent altitude of the object, BEZ the true altitude, and OBE the parallax in altitude. Now in the triangle AOE,

R : ſine OAE : : EA : EO.

And in the triangle OBE

BE (=EA) : EO : : ſine BOE : ſine OBE.

Hence R : coſine BOA : : ſine OAE : ſine OBE.

As the two laſt terms are generally ſmall quantities, the arch may be ſubſtituted in place of its ſine without any ſenſible error.

Example. Let the apparent altitude of the moon's centre be 39° 25′, and the moon's horizontal parallax 56′ 54″. Required the parallax in altitude?

Moon's apparent alt.	39° 25′	coſine 9.8879260
Moon's horizontal par.	56′ 54″	ſine 8.2188186
Moon's par. in altitude	43′ 57″	ſine 8.1067446

As the apparent place of an object is nearer the horizon than its true place, the parallax is therefore to be added to the apparent altitude, to obtain the true altitude. Hence alſo an object will appear to riſe later and ſet ſooner.

The ſine of the parallax of an object is inverſely as its diſtance from the earth's centre.

Demonſtration. Let A be the place of an object, and H the place of the ſame object at another time, or that of another object at the ſame inſtant; join EH, then in the triangles AOE, HOE,

R : ſine OAE : : AE : OE

ſine OHE : R : : OE : EH.

Hence ſine OHE : ſine OAE : : AE : EH.

The parallax of an object makes it appear more diſtant from the meridian than it really is.

Demonſtration. The true and apparent places of an object are in the ſame vertical, the apparent place being lower than the true; and all verticals meet at the zenith: hence the apparent place of an object is more diſtant from the plane of the meridian than the true place.

The longitude, latitude, right aſcenſion, and declination of an object are affected by parallax. The difference between the true and apparent longitudes is called the *parallax in longitude*; in like manner, the differences between the true and apparent latitudes, right aſcenſions, and declinations, are called the *parallax in latitude*, *right aſcenſion*, and *declination*, reſpectively.—When the object is in the nonageſimal, the parallax in longitude is nothing, but that in latitude is greateſt: and when the object is in the meridian, the parallax in right aſcenſion vaniſhes, and that in declination is a maximum. The apparent longitude is greater than the true longitude, when the object is eaſt of the nonageſimal, otherwiſe leſs; and when the object is in the eaſtern hemiſphere, the apparent right aſcenſion exceeds the true, but is leſs than the true right aſcenſion when the object is in the weſtern hemiſphere. The apparent place of an object is more diſtant from the elevated poles of the ecliptic and equator than the true place: hence, when the latitude of the place and elevated pole of the ecliptic are of the ſame name, the apparent latitude is leſs than the true latitude, otherwiſe greater; and the apparent declination will be leſs or greater than the true declination, according as the latitude of the place, and declination of the object, are of the ſame or of a contrary denomination.

The parallaxes in longitude, latitude, right aſcenſion, and declination, in the ſpheroidal hypotheſis, may be found by the following formulæ; in which L repreſents the latitude of the place, diminiſhed by the angle contained between the vertical and radius of the given place; P the horizontal parallax for that place; a the altitude of the nonageſimal at the given inſtant; d the apparent diſtance of the object from the nonageſimal; l λ the true and apparent latitudes of the object; D δ the true and apparent declinations reſpectively; and m its apparent diſtance from the meridian.

Then par. in long. = P. ſine a. ſine d. ſecant l, to radius unity; and par. in lat. = P. coſine a. coſine $\lambda \mp p$ coſine d. ſine a. ſine λ.

The ſign − is uſed when the apparent diſtance of the object from the nonageſimal and from the elevated pole of the ecliptic is of the ſame affection, and the ſign + if of different affection. If the greateſt preciſion be required, the following quantity 0.00000121216. par. lon. ^{2}, ſine $2l$, is to be applied

to the parallax in latitude found as above, by addition or subtraction, according as the true diſtance of the object from the elevated pole of the ecliptic is greater or leſs than 90°.

Again, par. in right aſcen. = P. coſine L. ſine *m*. ſecant D, to radius unity; and par. in declination = P. ſine L. coſine $\delta \mp$ P. coſine L. ſine δ, coſine *m*.

The upper or lower ſign is to be uſed according as the diſtance of the object from the meridian and from the elevated pole of the equator is of the ſame or different affection. Part 2d of par. in declination = 0.00 00 12 21 6 par. in right aſcen. ^{2}, ſine 2 D; which is additive to, or ſubtractive from, part firſt of parallax in declination, according as the true diſtance of the object from the elevated pole of the equator is greater or leſs than 90°. For the moon's parallax, ſee ASTRONOMY. There is alſo a curious paper in the firſt volume of Aſiatic Reſearches, p. 320, &c. on the ſame ſubject, to which we refer our readers.

PARALLAX *of the Earth's annual Orbit*, is the difference between the places of a planet as ſeen from the ſun and earth at the ſame inſtant. The difference between the longitudes of the planet as ſeen from the ſun and earth is called the *parallax in longitude*; and the difference between its latitudes is the *parallax in latitude*.

PARALLAX is alſo uſed to denote the change of place in an object ariſing from viewing it obliquely with reſpect to another object. Thus the minute hand of a watch is ſaid to have a parallax when it is viewed obliquely; and the difference between the inſtants ſhown by it, when viewed directly and obliquely, is the quantity of parallax in time.

PARALLEL, in geometry, an appellation given to lines, ſurfaces, and bodies, every where equidiſtant from each other. See GEOMETRY.

PARALLEL *Sphere*, that ſituation of the ſphere wherein the equator coincides with the horizon, and the poles with the zenith and nadir.

PARALLEL *Sailing*. See NAVIGATION.

PARALLELS *of Latitude*, in aſtronomy, are leſſer circles of the ſphere parallel to the ecliptic, imagined to paſs through every degree and minute of the colures.

PARALLELS *of Altitude*, or *Almucantars*, are circles parallel to the horizon, imagined to paſs through every degree and minute of the meridian between the horizon and zenith, having their poles in the zenith.

PARALLELS *of Declination*, in aſtronomy, are the ſame with parallels of latitude in geography.

PARALLELOPIPED, in geometry, a regular ſolid comprehended under ſix parallelograms, the oppoſite ones whereof are ſimilar, parallel, and equal to each other.

PARALLELOPIPEDIA, in natural hiſtory, a genus of ſpars, externally of a determinate and regular figure, always found looſe, detached, and ſeparate from all other bodies, and in form of an oblique parallelopiped, with ſix parallelogram ſides and eight ſolid angles; eaſily fiſſile either in an horizontal or perpendicular direction; being compoſed of numbers of thin plates, and thoſe very elegantly and regularly arranged bodies, each of the ſame form with the whole maſs, except that they are thinner in proportion to their horizontal planes, and naturally fall into theſe and no other figures, on being broken with a ſlight blow.

PARALOGISM, in logic, a falſe reaſoning, or a fault committed in demonſtration, when a conſequence is drawn from principles that are falſe; or, though true, are not proved; or when a propoſition is paſſed over that ſhould have been proved by the way.

PARALYSIS, the PALSY. See MEDICINE.

PARAMECIA, in natural hiſtory, a name given to ſuch animalcules as have no viſible limbs or tails, and are of an irregularly oblong figure.

PARAMOUNT (compounded of two French words, *par*, i. e. *per*, and *monter*, *aſcendere*), ſignifies in our law the "higheſt lord of the fee of lands, tenements, and hereditaments." As there may be a lord meſne where lands are held of an inferior lord, who holds them of a ſuperior under certain ſervices; ſo this ſuperior lord is lord *paramount*. Alſo the king is the chief lord, or lord *paramount* of all the lands in the kingdom. *Co. Lit.* 1.

PARANYMPH, among the ancients, the perſon who waited on the bridegroom, and directed the nuptial ſolemnities; called alſo *pronubus* and *auſper*, becauſe the ceremonies began by taking auſpicia. As the paranymph officiated only on the part of the bridegroom, a woman called *pronuba* officiated on the part of the bride.

PARAPET, in fortification, an elevation of earth deſigned for covering the ſoldiers from the enemy's cannon or ſmall-ſhot. See FORTIFICATION.

PARAPHERNALIA, or PARAPHERNA, in the civil law, thoſe goods which a wife brings her huſband beſides her dower, and which are ſtill to remain at her diſpoſal excluſive of her huſband, unleſs there is ſome proviſion made to the contrary in the marriage contract. Some of our Engliſh civilians define the paraphernalia to be ſuch goods as a wife challengeth over and above her dower or jointure, after her huſband's death; as furniture for her chamber, wearing apparel, and jewels, which are not to be put into the inventory of her huſband's goods; and a French civilian calls paraphernalia the moveables, linen and other female neceſſaries, which are adjudged to a wife in prejudice of the creditors, when ſhe renounces the ſucceſſion of her huſband.

PARAPHIMOSIS, a diſorder of the penis, wherein the prepuce is withdrawn behind the glans, ſo as not to be capable of being brought to cover the ſame; which generally happens in venereal diſorders, See SURGERY.

PARAPHRASE, an explanation of ſome text in clearer and more ample terms, whereby is ſupplied what the author might have ſaid or thought on the ſubject. Such are eſteemed Eraſmus's paraphraſe on the New Teſtament, the Chaldee Paraphraſe on the Pentateuch, &c.

PARAPHRENITIS, an inflammation of the diaphragm. See DIAPHRAGM, and MEDICINE.

PARAPHROSYNE, a word uſed by medical writer to denote a delirium, or an alienation of mind in fevers, or from whatever other cauſe.

PARAPLEGIA, a ſpecies of *Palſy*. See Palſy under the article MEDICINE.

PARASANG, an ancient Perſian meaſure, different at different times, and in different places; being uſually 30, ſometimes 40, and ſometimes 50 ſtadia or furlongs. The word, according to Littleton, has its riſe from *paraſch angarius*, *q. d.* the ſpace a poſt-man rides from one ſtation, *angaria*, to another.

PARASCENIUM, in the Grecian and Roman theatres, was a place behind the ſcenes whither the actors withdrew to dreſs and undreſs themſelves. The Romans more frequently called it *Poſtſcenium*. See THEATRE.

PARASELENE, in natural philoſophy, a mock moon; a meteor or phenomenon encompaſſing or adjacent to the moon, in form of a luminous ring; wherein are obſerved ſometimes one and ſometimes two or more images of the moon.

PARASEMON, among the Greeks, was the figure carved on the prow of the ſhips to diſtinguiſh them from each other. This figure was generally that of a bull, lion, or other animal; ſometimes the repreſentation of a mountain, tree, flower, &c.

PARASITE, among the Greeks, was originally a very reputable title; the paraſites being a kind of prieſts, at leaſt miniſters, of the gods, in the ſame manner as the epulones were

at Rome. They took care of the ſacred corn, or the corn deſtined for the ſervice of the temples and the gods, *viz.* ſacrifices, feaſts, &c. They had even the intendance over ſacrifices; and took care that they were duly performed. At Athens there was a kind of college of 12 paraſites; each people of Attica furniſhing one, who was always choſen out of the beſt families. Polybius adds, that a paraſite was alſo an honourable title among the ancient Gauls, and was given to their poets. But of late it has been made a term of reproach, and uſed for a flatterer or mean dependent.

PARASITES, or PARASITICAL *Plants*, in botany, ſuch plants as are produced out of the trunk or branches of other plants, from whence they receive their nouriſhment, and will not grow on the ground. Such are the Miſletoe, &c.

PARASTATÆ, in anatomy. See PROSTATE.

PARATALASSIA. See PRIMORIE.

PARBUNCLE, in a ſhip, the name of a rope almoſt like a pair of ſlings: it is ſeized both ends together, and then put almoſt double about any heavy thing that is to be hoiſted in or out of the ſhip; having the hook of the runner hitched into it, to hoiſt it up by.

PARCÆ, in heathen mythology, goddeſſes who were ſuppoſed to preſide over the accidents and events, and to determine the date or period of human life. The Parcæ were three, Clotho, Lacheſis, and Atropos; becauſe, forſooth, all things have their beginning, progreſs, and end. Hence the poets tell us, the Parcæ ſpun the thread of men's lives; that Clotho held the diſtaff, and drew the thread; Lacheſis twirled the ſpindle and ſpun it, and Atropus cut it. *Clotho colum retinet, Lacheſis net, Atropos occat.* The ancients repreſent the Parcæ divers ways: Lucian, in the ſhape of three poor old women, having large locks of wool mixed with daffodils on their heads; one of which holds a diſtaff, the other a wheel, and the third a pair of ſciſſars, wherewith to cut the thread of life. Others repreſent them otherwiſe: Clotho appearing in a long robe of divers colours, wearing a crown upon her head adorned with ſeven ſtars, and holding a diſtaff in her hand; Lacheſis in a robe beſet with ſtars, with ſeveral ſpindles in her hand; and Atropos, clad in black, cutting the thread with a pair of large ſciſſars. The ancients imagined that the Parcæ uſed white wool for a long and happy life, and black for a ſhort and unfortunate one. See MYTHOLOGY.

PARCHMENT, the ſkins of ſheep or goats prepared after ſuch a manner as to render it proper for writing upon, covering books, &c. The word comes from the Latin *pergamena*, the ancient name of this manufacture; which is ſaid to have been taken from the city Pergamos, to Eumenes king whereof its invention is uſually aſcribed; though, in reality, that Prince appears rather to have been the improver than the inventor of parchment. For the Perſians of old, according to Diodorus, wrote all their records on ſkins; and the ancient Ionians, as we are told by Herodotus, made uſe of ſheep-ſkins and goat-ſkins in writing, many ages before Eumenes's time. Nor need we doubt that ſuch ſkins were prepared and dreſſed for that purpoſe, after a manner not unlike that of our parchment; though probably not ſo artificially.—The manufacture of parchment is begun by the ſkinner, and finiſhed by the parchment-maker.

The ſkin having been ſtripped of its wool, and placed in the lime-pit, in the manner deſcribed under the article SHAMMY, the ſkinner ſtretches it on a kind of frame, and pares off the fleſh with an iron inſtrument; this done, it is moiſtened with a rag; and powdered chalk being ſpread over it, the ſkinner takes a large pumice-ſtone, flat at bottom, and rubs over the ſkin, and thus ſcowers off the fleſh; he then goes over it again with the iron inſtrument, moiſtens it as before, and rubs it again with the pumice-ſtone without any chalk underneath: this ſmooths and ſoftens the fleſh-ſide very conſiderably. He then drains it again, by paſſing over it the iron inſtrument as before. The fleſh-ſide being thus drained by ſcraping off the moiſture, he in the ſame manner paſſes the iron over the wool or hair-ſide; then ſtretches it tight on a frame, and ſcrapes the fleſh-ſide again: this finiſhes its draining; and the more it is drained the whiter it becomes. The ſkinner now throws on more chalk, ſweeping it over with a piece of lamb-ſkin that has the wool on; and this ſmooths it ſtill farther. It is now left to dry, and, when dried, taken off the frame by cutting it all round. The ſkin thus far prepared by the ſkinner, is taken out of his hands by the parchment-maker, who firſt, while it is dry, pares it on a ſummer, (which is a calf-ſkin ſtretched in a frame,) with a ſharper inſtrument than that uſed by the ſkinner; and working with the arm from the top to the bottom of the ſkin, takes away about one half of its thickneſs. The ſkin thus equally pared on the fleſh-ſide, is again rendered ſmooth, by being rubbed with the pumice-ſtone, on a bench covered with a ſack ſtuffed with flocks; which leaves the parchment in a condition fit for writing upon. The parings thus taken off the leather are uſed in making glue, ſize, &c. See the article GLUE, &c.

What is called *vellum* is only parchment made of the ſkins of abortives, or at leaſt ſucking calves. This has a much finer grain, and is whiter and ſmoother than parchment; but is prepared in the ſame manner, except its not being paſſed through the lime-pit.

PARDALIS, in natural hiſtory. See FELIS.

PARDIES (IGNATIUS GASTON), an ingenious and learned French Jeſuit, born at Paris in 1636. He taught polite literature for ſeveral years; during which time he compoſed ſeveral ſmall pieces, both in proſe and verſe, with peculiar delicacy of thought and ſtyle. At length he devoted himſelf entirely to mathematics and natural philoſophy, and read all authors, ancient as well as modern, in thoſe branches of knowledge. He died in 1673, of an infectious diſorder contracted by confeſſing and preaching to the priſoners in the Bicetre during the Eaſter holidays. Father Pardies publiſhed ſeveral works; of which his Elements of Geometry are well known in this country, where a tranſlation of them has gone through ſeveral editions. In 1672 he had a diſpute with Sir Iſaac Newton reſpecting his Theory of Light and Colours; which may be ſeen in the Philoſophical Tranſactions for that year.

PARDON, in criminal law, is the remitting or forgiving an offence committed againſt the king.

Law (ſays *Beccaria*) cannot be framed on principles of compaſſion to guilt; yet juſtice, by the conſtitution of England, is bound to be adminiſtered in mercy: this is promiſed by the king in his coronation oath; and it is that act of his government which is the moſt perſonal and moſt entirely his own. The king condemns no man; that rugged taſk he leaves to his courts of juſtice: the great operation of his ſceptre is mercy. His power of pardoning was ſaid by our Saxon anceſtors to be derived *à lege fuæ dignitatis*; and it is declared in parliament, by ſtat. 27 Hen. VIII. c. 24. that no other perſon hath power to pardon or remit any treaſon or felonies whatſoever; but that the king hath the whole and ſole power thereof, united and knit to the imperial crown of this realm.

This is indeed one of the great advantages of monarchy in general above any other form of government, that there is a magiſtrate who has it in his power to extend mercy wherever he thinks it is deſerved; holding a court of equity in his own breaſt, to ſoften the rigour of the general law, in ſuch criminal caſes as merit an exemption from puniſhment. Pardons (according to ſome theoriſts) ſhould be excluded in a perfect legiſlation, where puniſhments are mild, but certain; for that the clemency of the prince ſeems a tacit diſapprobation of the laws. But the excluſion of pardons muſt neceſſarily introduce a very dangerous power in the judge or jury; that of conſtruing the criminal law by the ſpirit inſtead of the letter; or elſe it muſt be holden, what no man will ſeriouſly avow, that the ſituation

and circumſtances of the offender (though they alter not the eſſence of the crime) ought to make no diſtinction in the puniſhment. In democracies, however, this power of pardon can never ſubſiſt; for there nothing higher is acknowledged than the magiſtrate who adminiſters the laws: and it would be impolitic for the power of judging and of pardoning to centre in one and the ſame perſon. This (as the preſident Monteſquieu obſerves) would oblige him very often to contradict himſelf, to make and to unmake his deciſions: it would tend to confound all ideas of right among the maſs of people; as they would find it difficult to tell whether a priſoner were diſcharged by his innocence, or obtained a pardon through favour. In Holland, therefore, if there be no ſtadtholder, there is no power of pardoning lodged in any other member of the ſtate. But in monarchies the king acts in a ſuperior ſphere; and though he regulates the whole government as the firſt mover, yet he does not appear in any of the diſagreeable or invidious parts of it. Whenever the nation ſee him perſonally engaged, it is only in works of legiſlature, magnificence, or compaſſion. To him, therefore, the people look up as the fountain of nothing but bounty and grace; and theſe repeated acts of goodneſs, coming immediately from his own hand, endear the ſovereign to his ſubjects, and contribute more than any thing to root in their hearts that filial affection and perſonal loyalty which are the ſure eſtabliſhment of a prince.

The king may pardon all offences merely againſt the crown or the public; excepting, 1. That, to preſerve the liberty of the ſubject, the committing any man to priſon out of the realm, is by the *Habeas Corpus* act, 31 Car. II. c. 2. made a *præmunire*, unpardonable even by the king. Nor, 2. can the king pardon, where private juſtice is principally concerned in the proſecution of offenders: *Non poteſt rex gratiam facere cum injuria et damno aliorum.* Therefore, in appeals of all kinds (which are the ſuit, not of the king, but of the party injured), the proſecutor may releaſe; but the king cannot pardon. Neither can he pardon a common nuiſance, while it remains unredreſſed, or ſo as to prevent an abatement of it; though afterwards he may remit the fine: becauſe, though the proſecution is veſted in the king to avoid the multiplicity of ſuits, yet (during its continuance) this offence ſavours more of the nature of a *private* injury to each individual in the neighbourhood, than of a *public* wrong. Neither, laſtly, can the king pardon an offence againſt a popular or penal ſtatute, after information brought; for thereby the informer hath acquired a private property in his part of the penalty.

There is alſo a reſtriction of a peculiar nature, that affects the prerogative of pardoning, in caſe of parliamentary impeachments, viz. that the king's pardon cannot be pleaded to any ſuch impeachment, ſo as to impede the inquiry, and ſtop the proſecution of great and notorious offenders. Therefore, when, in the reign of Charles II. the earl of Danby was impeached by the houſe of commons of high treaſon and other miſdemeanors, and pleaded the king's pardon in bar of the ſame, the commons alleged, "That there was no precedent that ever any pardon was granted to any perſon impeached by the commons of high treaſon, or other high crimes, depending the impeachment;" and thereupon reſolved, "That the pardon ſo pleaded was illegal and void, and ought not to be allowed in bar of the impeachment of the commons of England;" for which reſolution they aſſigned this reaſon to the houſe of lords, "That the ſetting up a pardon to be a bar of an impeachment defeats the whole uſe and effect of impeachments: for ſhould this point be admitted, or ſtand doubted, it would totally diſcourage the exhibiting any for the future; whereby the chief inſtitution for the preſervation of the government would be deſtroyed." Soon after the Revolution, the commons renewed the ſame claim, and voted, "That a pardon is not pleadable in bar of an impeachment." And at length it was enacted by the Act of Settlement, 12 & 13 W. III. c. 2. "That no pardon under the great ſeal of England ſhall be pleadable to an impeachment by the commons in parliament." But, after the impeachment has been ſolemnly heard and determined, it is not underſtood that the king's royal grace is farther reſtrained or abridged: for, after the impeachment and attainder of the ſix rebel lords in 1715, three of them were from time to time reprieved by the crown; and at length received the benefit of the king's moſt gracious pardon.

The effect of ſuch pardon by the king, is to make the offender a new man; to acquit him of all corporal penalties and forfeitures annexed to that offence for which he obtains his pardon; and not ſo much to reſtore his former, as to give him a new credit and capacity. But nothing can reſtore or purify the blood when once corrupted, if the pardon be not allowed till after attainder, but the high and tranſcendent power of parliament. Yet if a perſon attainted receives the king's pardon, and afterwards hath a ſon, that ſon may be heir to his father; becauſe the father being made a new man, might tranſmit new inheritable blood; though, had he been born before the pardon, he could never have inherited at all.

Such is the nature of pardons in this kingdom. Theſe, like other good things, may doubtleſs be abuſed; and if they are in any inſtance, their abuſe deſerves cenſure: but that in their nature they ſhould be accounted abſurd, arbitrary, and deſtructive of morality, can, we ſuſpect, proceed from nothing but from the preſumptive petulance of modern reformers, or from the new ſyſtem of civil equality.

PAREGORICS, in pharmacy, medicines that aſſuage pain, otherwiſe called ANODYNES.

PAREIRA BRAVA, in the materia medica, a kind of oblong and large root brought from the Braſils. It is certainly a diuretic of no mean character, and has done great ſervice in nephritic caſes. In pleuriſies and quinſies, it has been attended with more ſucceſs than almoſt any medicine we know of ſingly.

PARELCON, in grammar, a figure by which a word or ſyllable is added to the end of another.

PAREMBOLE, in rhetoric, a figure wherein ſomething relating to the ſubject is inſerted in the middle of a period. All the difference between the parembole and parentheſis, according to Voſſius, is, that the former relates to the ſubject in hand, whereas the latter is foreign to it.

PARENCHYMA, in anatomy, a term introduced by Eraſiſtratus, ſignifying all that ſubſtance which is contained in the interſtices betwixt the blood-veſſels of the viſcera, which he imagined to be extravaſated and concreted blood.

PARENCHYMA *of Plants.* Grew applies the term *parenchyma* to the pith or pulp, or that inner part of a fruit or plant through which the juice is ſuppoſed to be diſtributed. See PLANTS.

PARENT, a term of relation applicable to thoſe from whom we immediately derive our being. See MORAL *Philoſophy*. To this article belongs an inquiry into, 1. The legal duties of parents to their legitimate children. 2. Their power over them.

I. The duties of parents to legitimate children conſiſt in three particulars; their *maintenance*, their *protection*, and their *education*.

1. The duty of parents to provide for the *maintenance* of their children, is a principle of natural law; an obligation, ſays Puffendorff, laid on them not only by Nature herſelf, but by their own proper act in bringing them into the world; for they would be in the higheſt manner injurious to their iſſue, if they only gave their children life, that they might afterwards ſee them periſh. By begetting them, therefore, they have entered into a voluntary obligation, to endeavour, as far as in

them lies, that the life which they have beſtowed ſhall be ſupported and preſerved. And thus the children will have a perfect right of receiving maintenance from their parents. And the preſident Monteſquieu has a very juſt obſervation upon this head, that the eſtabliſhment of marriage, in all civilized ſtates, is built on this natural obligation of the father to provide for his children; for that aſcertains and makes known the perſon who is bound to fulfil this obligation: whereas, in promiſcuous and illicit conjunctions, the father is unknown, and the mother finds a thouſand obſtacles in her way; ſhame, remorſe, the conſtraint of her ſex, and the rigour of laws, that ſtifle her inclinations to perform this duty; and beſides, ſhe generally wants ability.

The municipal laws of all well regulated ſtates have taken care to enforce this duty: though providence has done it more effectually than any laws, by implanting in the breaſt of every parent that natural στοργη, or inſuperable degree of affection, which not even the deformity of perſon or mind, not even the wickedneſs, ingratitude, and rebellion of children, can totally ſuppreſs or extinguiſh.

The civil law obliges the parent to provide maintenance for his child; and if he refuſes, *judex de ea re cognoſcet*. Nay, it carries this matter ſo far, that it will not ſuffer a parent at his death totally to diſinherit his child, without expreſsly giving his reaſon for ſo doing; and there are 14 ſuch reaſons reckoned up, which may juſtify ſuch diſinheriſon. If the parent alleged no reaſon, or a bad, or a falſe one, the child might ſet the will aſide, *tanquam teſtamentum inofficioſum*, a teſtament contrary to the natural duty of the parent. And it is remarkable under what colour the children were to move for relief in ſuch a caſe; by ſuggeſting, that the parent had loſt the uſe of his reaſon when he made the *inofficious* teſtament. And this, as Puffendorff obſerves, was not to bring into diſpute the teſtator's power of diſinheriting his own offspring; but to examine the motives upon which he did it; and if they were found defective in reaſon, then to ſet them aſide. But perhaps this is going rather too far: every man has, or ought to have, by the laws of ſociety, a power over his own property: and, as Grotius very well diſtinguiſhes, natural right obliges to give a *neceſſary* maintenance to children; but what is more than that they have no right to, than as it is given by the favour of their parents, or the poſitive conſtitutions of the municipal law.

Let us next ſee what proviſion our own laws have made for this natural duty. It is a principle of law, that there is an obligation on every man to provide for thoſe deſcended from his loins; and the manner in which this obligation ſhall be performed, is thus pointed out. The father and mother, grandfather and grandmother, of poor impotent perſons, ſhall maintain them at their own charges, if of ſufficient ability, according as the quarter ſeſſions ſhall direct; and, if a parent runs away, and leaves his children, the church-wardens and overſeers of the pariſh ſhall ſeize his rents, goods, and chattels, and diſpoſe of them toward their relief. By the interpretations which the courts of law have made upon theſe ſtatutes, if a mother or grandmother marries again, and was before ſuch ſecond marriage of ſufficient ability to keep the child, the huſband ſhall be charged to maintain it; for this being a debt of her's, when ſingle, ſhall, like others, extend to charge the huſband. But at her death, the relation being diſſolved, the huſband is under no farther obligation.

No perſon is bound to provide a maintenance for his iſſue, unleſs where the children are impotent and unable to work, either through infancy, diſeaſe, or accident; and then is only obliged to find them with neceſſaries, the penalty on refuſal being no more than 20s. a-month. For the policy of our laws, which are ever watchful to promote induſtry, did not mean to compel a father to maintain his idle and lazy children in eaſe and indolence; but thought it unjuſt to oblige the parent, againſt his will, to provide them with ſuperfluities and other indulgences of fortune; imagining they might truſt to the impulſe of nature, if the children were deſerving of ſuch favours. Yet, as nothing is ſo apt to ſtifle the calls of nature as religious bigotry, it is enacted, that if any Popiſh parent ſhall refuſe to allow his Proteſtant child a fitting maintenance, with a view to compel him to change his religion, the lord chancellor ſhall by order of court conſtrain him to do what is juſt and reaſonable. But this did not extend to perſons of another religion, of no leſs bitterneſs and bigotry than the Popiſh: and therefore, in the very next year, we find an inſtance of a Jew of immenſe riches, whoſe only daughter having embraced Chriſtianity, he turned her out of doors; and on her application for relief, it was held ſhe was entitled to none. But this gave occaſion to another ſtatute, which ordains, that if Jewiſh parents refuſe to allow their Proteſtant children a fitting maintenance, ſuitable to the fortune of the parent, the lord chancellor, on complaint, may make ſuch order therein as he ſhall ſee proper.

Our law has made no proviſion to prevent the diſinheriting of children by will; leaving every man's property in his own diſpoſal, upon a principle of liberty in this as well as every other action; though perhaps it had not been amiſs if the parent had been bound to leave them at the leaſt a neceſſary ſubſiſtence. Indeed, among perſons of any rank or fortune, a competence is generally provided for younger children, and the bulk of the eſtate ſettled upon the eldeſt by the marriage-articles. Heirs alſo, and children, are favourites of our courts of juſtice, and cannot be diſinherited by any dubious or ambiguous words; there being required the utmoſt certainty of the teſtator's intentions to take away the right of an heir.

2. From the duty of maintenance we may eaſily paſs to that of *protection*; which is alſo a natural duty, but rather permitted than enjoined by any municipal laws; nature, in this reſpect, working ſo ſtrongly as to need rather a check than a ſpur. A parent may, by our laws, maintain and uphold his children in their law-ſuits, without being guilty of the legal crime of maintaining quarrels. A parent may alſo juſtify an aſſault and battery in defence of the perſons of his children; nay, where a man's ſon was beaten by another boy, and the father went near a mile to find him, and there revenged his ſon's quarrel by beating the other boy, of which beating he afterwards unfortunately died; it was not held to be murder, but manſlaughter merely. Such indulgence does the law ſhow to the frailty of human nature, and the workings of parental affection.

3. The laſt duty of parents to their children is that of giving them an *education* ſuitable to their ſtation in life: a duty pointed out by reaſon, and of far the greateſt importance of any. For, as Puffendorff very well obſerves, it is not eaſy to imagine or allow, that a parent has conferred any conſiderable benefit upon his child by bringing him into the world, if he afterwards entirely neglects his culture and education, and ſuffers him to grow up like a mere beaſt, to lead a life uſeleſs to others, and ſhameful to himſelf. Yet the municipal laws of moſt countries ſeem to be defective in this point, by not conſtraining the parent to beſtow a proper education upon his children. Perhaps they thought it puniſhment enough to leave the parent who neglects the inſtruction of his family, to labour under thoſe griefs and inconveniences which his family, ſo uninſtructed, will be ſure to bring upon him. Our laws, though their defects in this particular cannot be denied, have in one inſtance made a wiſe proviſion for breeding up the riſing generation; ſince the poor and laborious part of the community, when paſt the age of nurture, are taken out of the hands of their parents, by the ſtatutes for apprenticing poor children; and are placed out by the public in ſuch a manner as may ren-

der their abilities, in their ſeveral ſtations, of the greateſt advantage to the commonwealth. The rich indeed are left at their own option, whether they will breed up their children to be ornaments or diſgraces to their family. Yet in one caſe, that of religion, they are under peculiar reſtrictions: for it is provided, that if any perſon ſends any child under his government beyond the ſeas, either to prevent its good education in England, or in order to enter into, or reſide in, any Popiſh college, or to be inſtructed, perſuaded, or ſtrengthened in the Popiſh religion; in ſuch caſe, beſides the diſabilities incurred by the child ſo ſent, the parent or perſon ſending ſhall forfeit 100l. which ſhall go to the ſole uſe and benefit of him that ſhall diſcover the offence. And if any parent, or other, ſhall ſend or convey any perſon beyond ſea, to enter into, or be reſident in, or trained up in, any priory, abbey, nunnery, Popiſh univerſity, college, or ſchool, or houſe of Jeſuits or prieſts, or in any private Popiſh family, in order to be inſtructed, perſuaded, or confirmed, in the Popiſh religion; or ſhall contribute any thing towards their maintenance when abroad by any pretext whatever, the perſon both ſending and ſent ſhall be diſabled to ſue in law or equity, or to be executor or adminiſtrator to any perſon, or to enjoy any legacy or deed of gift, or to bear any office in the realm, and ſhall forfeit all his goods and chattels, and likewiſe all his real eſtate for life. See NONCONFORMISTS.

II. The *power* of parents over their children is derived from the former conſideration, their *duty*; this authority being given them, partly to enable the parent more effectually to perform his duty, and partly as a recompence for his care and trouble in the faithful diſcharge of it. And upon this ſcore the municipal laws of ſome nations have given a much larger authority to the parents than others. The ancient Roman laws gave the father a power of life and death over his children; upon this principle, that he who gave, had alſo the power of taking away. But the rigour of theſe laws was ſoftened by ſubſequent conſtitutions: ſo that we find a father baniſhed by the emperor Hadrian for killing his ſon, though he had committed a very heinous crime; upon this maxim, that *patris poteſtas in pietate debet, non in atrocitate, conſiſtere.* But ſtill they maintained to the laſt a very large and abſolute authority: for a ſon could not acquire any property of his own during the life of his father; but all his acquiſitions belonged to the father, or at leaſt the profits of them, for his life.

The power of a parent by the Engliſh law is much more moderate; but ſtill ſufficient to keep the child in order and obedience. He may lawfully correct his child, being under age, in a reaſonable manner: for this is for the benefit of his education. The conſent or concurrence of the parent to the marriage of his child under age, was alſo directed by our ancient law to be obtained: but now it is abſolutely neceſſary; for without it the contract is void. And this alſo is another means which the law has put into the parent's hands, in order the better to diſcharge his duty; firſt, of protecting his children from the ſnares of artful and deſigning perſons; and next, of ſettling them properly in life, by preventing the ill conſequences of too early and precipitate marriages. A father has no other power over his ſon's eſtate, than as his truſtee or guardian; for though he may receive the profits during the child's minority, yet he muſt account for them when he comes of age. He may indeed have the benefit of his children's labour while they live with him, and are maintained by him; but this is no more than he is entitled to from his apprentices or ſervants. The legal power of a father (for a mother, as ſuch, is entitled to no power, but only to reverence and reſpect), the power of a father, we ſay, over the perſons of his children ceaſes at the age of 21; for they are then enfranchiſed by arriving at years of diſcretion, or that point which the law has eſtabliſhed (as ſome muſt neceſſarily be eſtabliſhed) when the empire of the father, or other guardian, gives place to the empire of reaſon. Yet, till that age arrives, this empire of the father continues even after his death; for he may by his will appoint a guardian to his children. He may alſo delegate part of his parental authority, during his life, to the tutor or ſchoolmaſter of his child; who is then *in loco parentis*, and has ſuch a portion of the power of the parent committed to his charge, *viz.* that of reſtraint and correction, as may be neceſſary to anſwer the purpoſes for which he is employed.

The power of a parent in China is very great; for a father, while living, has the power of an abſolute deſpotic tyrant, and after his death is worſhipped as a god. Let a ſon become ever ſo rich, and a father ever ſo poor, there is no ſubmiſſion, no point of obedience, that the latter cannot command, or that the former can refuſe. The father is abſolute maſter, not only of his ſon's eſtate, but alſo of his concubines and children, whom, whenever they diſpleaſe him, he may ſell to ſtrangers. If a father accuſes his ſon before a mandarine, there needs no proof of his guilt; for they cannot believe that any father can be ſo unnatural as to bring a falſe accuſation againſt his own ſon. But ſhould a ſon be ſo inſolent as to mock his father, or arrive at ſuch a pitch of wickedneſs as to ſtrike him, all the province where this ſhameful act of violence is committed is alarmed; it even becomes the concern of the whole empire; the emperor himſelf judges the criminal. All the mandarines near the place are turned out of their poſts, eſpecially thoſe of the town where he lived, for having been ſo negligent in their inſtructions; and all the neighbours are reprimanded for neglecting, by former puniſhments, to put a ſtop to the wickedneſs of the criminal before it arrived to ſuch flagitiouſneſs. As to the unhappy wretch himſelf, they cut him into a thouſand pieces, burn his bones, level his houſe to the ground, and even thoſe houſes that ſtand near it, and ſet up monuments and memorials of the horrid deed.

The emperor of China, who is one of the moſt powerful and deſpotic monarchs upon earth, pays the greateſt attention to his mother. An inſtance of this Pere Amyot relates as having happened at Pekin, A. D. 1752, when the emperor's mother entered her 60th year, which, among the Chineſe, is accounted a very remarkable period. Groſier likewiſe particularly deſcribes the homage the emperor pays to his mother every new-year's day in the palace, at which ceremony all the great officers of his court attend and aſſiſt. See CHILDREN, FILIAL *Piety*, &c.

PARENT (Unſoine), a mathematician, was born at Paris in 1666. He ſhowed an early propenſity to mathematics. He accuſtomed himſelf to write remarks upon the margins of the books which he read; and he had filled a variety of books with a kind of commentary at the early age of thirteen. At fourteen he was put under a maſter, who taught rhetoric at Chartres. It was here that he happened to ſee a dodecaëdron, upon every face of which was delineated a ſun-dial, except the loweſt, whereon it ſtood. Struck as it were inſtantaneouſly with the curioſity of theſe dials, he attempted drawing one himſelf: but having a book which only ſhowed the practical part without the theory, it was not till after his rhetoric maſter came to explain the doctrine of the ſphere to him that he began to underſtand how the projection of the circles of the ſphere formed ſun-dials. He then undertook to write a Treatiſe upon Gnomonics. The piece was indeed rude and unpoliſhed; but it was entirely his own, and not borrowed. About the ſame time he wrote a book of Geometry, in the ſame taſte, at Beauvois. His friends then ſent for him to Paris to ſtudy the law; and, in obedience to them, he ſtudied a courſe in that faculty: which was no ſooner finiſhed than, urged by his paſſion for mathematics, he ſhut himſelf up in the college of Dormans, that he

avocation might take him from his beloved ſtudy: and, with an allowance of leſs than 200 livres a year, he lived content in this retreat, from which he never ſtirred but to the Royal College, in order to hear the lectures of M. De la Hire or M. De Sauveur. When he found himſelf capable of teaching others, he took pupils: and fortification being a branch of mathematics which the war had brought into particular notice, he turned his attention to it; but after ſome time began to entertain ſcruples about teaching what he had never ſeen, and knew only by the force of imagination. He imparted this ſcruple to M. Sauveur, who recommended him to the Marquis d'Aligre, who luckily at that time wanted to have a mathematician with him. Parent made two campaigns with the marquis, by which he inſtructed himſelf ſufficiently in viewing fortified places; of which he drew a number of plans, though he had never learned the art of drawing. From this period he ſpent his time in a continual application to the ſtudy of natural philoſophy, and mathematics in all its branches, both ſpeculative and practical; to which he joined anatomy, botany, and chemiſtry. His genius managed every thing, and yet he was inceſſant and indefatigable in his application. M. De Billettes, who was admitted in the academy of ſciences at Paris in 1699, with the title of their mechanician, nominated for his diſciple Parent, who excelled chiefly in this branch. It was ſoon diſcovered in this ſociety, that he engaged in all the various ſubjects which were brought before them; and indeed that he had a hand in every thing. But this extent of knowledge, joined to a natural impetuoſity of temper, raiſed in him a ſpirit of contradiction, which he indulged on all occaſions; ſometimes to a degree of precipitancy highly culpable, and often with but little regard to decency. Indeed the ſame behaviour was ſhown to him, and the papers which he brought to the academy were often treated with much ſeverity. He was charged with obſcurity in his productions; and he was indeed ſo notorious for this fault, that he perceived it himſelf, and could not avoid correcting it. The king had, by a regulation in 1716, ſuppreſſed the claſs of ſcholars of the academy, which ſeemed to put too great an inequality betwixt the members. Parent was made a joint or aſſiſtant member for geometry: but he enjoyed this promotion but a ſhort time; for he was taken off by the ſmall-pox the ſame year, at the age of 50. He was author of a great many pieces, chiefly on mechanics and geometry.

PARENTALIA, in antiquity, funeral obſequies, or the laſt duties paid by children to their deceaſed parents.

PARENTHESIS, in grammar, certain intercalary words inſerted in a diſcourſe, which interrupt the ſenſe or thread, but ſeem neceſſary for the better underſtanding of the ſubject.

PARENZO, a ſmall but ſtrong town of Italy, and in Iſtria, with a biſhop's ſee and a good harbour; ſeated on the gulf of Venice, in E. lon. 13. 46. N. lat. 39. 28. It ſubmitted to the Venetians in 1267.

PARESIS, in medicine, a palſy of the bladder, wherein the urine is either ſuppreſſed or diſcharged involuntarily.

PARETONIUM, in natural hiſtory, the name of an earth found on the ſhores of Egypt, Cyrene, and the iſland of Crete, uſed by the ancients in painting. It had its name either from a part of Egypt, near which it was gathered, or from the name of a town in that kingdom, where it was uſually ſold. Vitruvius is of the firſt opinion, and Volaternus of the other. Of late it was thought to be loſt; but it is ſtill common on the ſhores of moſt of the iſlands of the Archipelago, though not obſerved or regarded; and is truly a very heavy and tough clay of a fine white colour, found in maſſes of different ſizes, generally as ſoft as the ſofter clays within the ſtrata; and, by rolling about on the beach in this ſtate, it gathers up the ſand, ſmall ſhells, and other foulneſſes we always find about it. It is likely that there are ſtrata of it fine and pure in the cliffs there, and that the ſea waſhes off maſſes of them in ſtorms and high tides, which are what we find.

PARGET, in natural hiſtory, a name given to ſeveral kinds of gypſum, or plaſter-ſtone.

PARGETING, in building, is uſed for the plaſtering of walls, and ſometimes for plaſter itſelf. Pargeting is of various kinds: as, 1. White-lime and hair-mortar laid on bare walls. 2. On bare laths, as in partitioning and plain cieling. 3. Rendering the inſides of walls, or doubling partition walls. 4. Rough-caſting on heart-laths. 5. Plaſtering on brick-work, with finiſhing mortar, in imitation of ſtone-work; and the like upon heart-laths.

PARHELION, or PARHELIUM, formed from παρα *near*, and ἡλιος *ſun*, in natural philoſophy, a mock-ſun or meteor, in form of a very bright light appearing on one ſide of the ſun. Appearances of this kind have been made mention of both by the ancients and moderns. Ariſtotle obſerves, that in general they are ſeen only when the ſun is near the horizon, though he takes notice of two that were ſeen in Boſphorus from morning to evening; and Pliny has related the times when ſuch phenomena were obſerved at Rome. Gaſſendi ſays, that in 1635 and 1636 he often ſaw one mock-ſun. Two were obſerved by M. De la Hire in 1689; and the ſame number by Caſſini in 1693, Mr. Grey in 1700, and Dr. Halley in 1702: but the moſt celebrated appearances of this kind were ſeen at Rome by Scheiner, by Muſchenbroeck at Utrecht, and by Hevelius at Sedan. By the two former, four mock-ſuns were obſerved, and by the latter ſeven.

Parhelia are apparently of the ſame ſize with the ſun, though not always of the ſame brightneſs, nor even of the ſame ſhape; and when a number appear at once, there is ſome difference in both theſe reſpects among them. Externally they are tinged with colours like the rainbow; and many have a long fiery tail oppoſite to the ſun, but paler towards the extremity. Parhelia are generally accompanied with coronas, ſome of which are tinged with rainbow colours, but others are white. They differ in number and ſize; but all agree in breadth, which is that of the apparent diameter of the ſun.

A very large white circle, parallel to the horizon, generally paſſes through all the parhelia; and, if it were entire, it would go through the centre of the ſun. Sometimes there are arcs of leſſer circles concentric to this, touching thoſe coloured circles which ſurround the ſun. They are alſo tinged with colours, and contain other parhelia. There are alſo ſaid to have been other circles obliquely ſituated with reſpect to all thoſe we have mentioned; but of this we have met with no authentic account. The order of the colours in theſe circles is the ſame as in the rainbow; but on the inſide, with reſpect to the ſun, they are red, as is alſo obſerved in many other coronas.

Parhelia have been viſible for 1, 2, 3, and 4 hours together; and in North America they are ſaid to continue ſome days, and to be viſible from ſunriſe to ſunſet. When the parhelia diſappear, it ſometimes rains, or there falls ſnow in the form of oblong ſpiculæ, as Maraldi, Weidler, Krafft, and others, have obſerved; and becauſe the air in North America abounds with ſuch frozen ſpiculæ, which are even viſible to the eye, according to Ellis and Middleton, ſuch particles have been thought to be the cauſe of all coronas and parhelia.

Mr. Wales ſays, that, at Churchill in Hudſon's Bay, the riſing of the ſun is always preceded by two long ſtreams of red light, one on each ſide of him, and about 20° diſtant from him. Theſe riſe as the ſun riſes; and as they grow longer begin to bend towards each other, till they meet directly over the ſun, juſt as he riſes, forming there a kind of parhelion or mock-ſun. Theſe two ſtreams of light, he ſays, ſeem to have their ſource in two other parhelia, which riſe with the true ſun; and in the winter-ſeaſon, when the ſun never riſes above the haze or fog,

which he says is constantly found near the horizon, all these accompany him the whole day, and set with him in the same manner as they rise. Once or twice he saw a fourth parhelion directly under the true sun; but this, he says, is not common. These facts being constant, are very valuable, and may throw great light on the theory of these remarkable phenomena.

Sometimes parhelia appear in a different manner; as when three suns have been seen in the same vertical circle, well defined, and touching one another. The true sun was in the middle, and the lowest touched the horizon; and they set one after the other. This appearance was seen by M. Maleziew in 1722. Other appearances similar to this are recited by M. Muschenbroeck. Sometimes the sun has risen or set with a luminous tail projecting from him, of the same breadth with his diameter, and perpendicular to the horizon. Such an appearance was seen by Cassini in 1672 and 1692, by De la Hire in 1702, and by Mr. Ellis in Hudson's Bay. As M. Feuille was walking on the banks of the river La Plata, he saw the sun rising over the river with a luminous tail projecting downwards, which continued till he was six degrees high.

Parasclenæ, or mock moons, have also been seen, accompanied with tails and coloured circles, like those which accompany the parhelia. An account of several, and a particular description of a fine appearance of this kind, may be seen in Muschenbroeck.

The Roman phenomenon, observed by Scheiner, is famous on account of its having been the first appearance of the kind that engaged the attention of philosophers. It is represented in pl. 24. fig. 1.; in which A is the place of the observer, B his zenith, C the true sun, AB a plane passing through the observer's eye, the true sun, and the zenith. About the sun C, there appeared two concentric rings, not complete, but diversified with colours. The lesser of them, DEF, was fuller, and more perfect; and though it was open from D to F, yet those ends were perpetually endeavouring to unite; and sometimes they did so. The outer of these rings was much fainter, so as scarcely to be discernible. It had, however, a variety of colours; but was very inconstant. The third circle, KLMN, was very large, and all over white, passing through the middle of the sun, and everywhere parallel to the horizon. At first this circle was entire; but towards the end of the appearance it was weak and ragged, so as hardly to be perceived from M towards N.

In the intersection of this circle, and the outward iris GKI, there broke out two parhelia or mock-suns, N and K, not quite perfect; K being rather weak, but N shone brighter and stronger. The brightness of the middle of them was something like that of the sun; but towards the edges they were tinged with colours like those of the rainbow; and they were uneven and ragged. The parhelion N was a little wavering, and sent out a spiked tail, NP, of a colour somewhat fiery, the length of which was continually changing.

The parhelia at L and M in the horizontal ring were not so bright as the former; but were rounder, and white, like the circle in which they were placed. The parhelion N disappeared before K; and while M grew fainter, K grew brighter, and vanished the last of all.

It is to be observed farther, that the order of the colours in the circles DEF, GKN, was the same as in the common halos, namely red next the sun; and the diameter of the inner circle was also about 45 degrees, which is the usual size of a halo.

The reverend Dr. Hamilton sent the following account of parhelia seen at Cookstown to the Royal Irish Academy. "Wednesday September 24th, 1783, as I was preparing to observe the sun passing the meridian, before the first limb touched the centre wire, it was obscured by a dark well-defined cloud, about 10° in diameter. Upon going to the door of the transit room, to see if it was likely soon to pass off the disk of the sun, I observed the following phenomena: From the western edge of the cloud issued a luminous arc parallel to the horizon, perfectly well defined, extending exactly to the northern meridian; it was about 30' broad, white, and ended in a blunted termination. On it were two parhelia; the nearest to the sun displaying the prismatic colours; the remote one white, and both ill defined. In a short time the cloud had passed off, and showed the luminous almicantar, reaching perfect to the true sun. While things were thus situated, I measured with an accurate sextant the distances of the parhelia; I found the coloured one 26°, the remoter one 90°, from the true sun. Just as I had done this, a new and prismatic circle surrounded the sun, immediately within the prismatic parhelion. And now another coloured parhelion appeared on the eastern board. The sextant with its face up and down, exactly measured this and the former at the original distance of 26°; the luminous almicantar still remaining perfect. In about 10 or 12 minutes whitish hazy clouds came on, and obscured all these uncommon appearances.—I did not observe that the atmospherical phenomena before or after were at all uncommon. The wind a light breeze at SSW. Bar. 29,6 rising. Thermometer 55.

In fig. 2. SM represents the south meridian; NM north meridian; PP the prismatic circle, with two prismatic suns or parhelia, at 26° distance on each side the true sun; W the white parhelion, at 90° distance from the true sun; LA the luminous almicantar; and HO the horizon.

Various hypotheses have been framed by philosophers to account for this phenomenon, particularly by M. Marriotte, Descartes, and Huygens. None of them, however, are satisfactory: but those readers who wish to become acquainted with them may consult Huygens's Dissertation on this subject, in Smith's Optics, book i. chap. 11. Muschenbroeck's Introduction, &c. vol. xi. p. 1038, &c. 4to.; but especially Dr. Priestley's History of Vision, Light, and Colours, vol. ii. p. 613, &c.

PARIA, or New Andalusia, a country of Terra Firma in South America; bounded on the north by the north sea; on the east by Surinam; on the west by New Granada and the Caraccas; and on the south by Guiana. It produces colouring drugs, gums, medicinal roots, Brazil-wood, sugar, tobacco, and some valuable timber; the inland parts being woody and mountainous, but interspersed with fine valleys that yield corn and pasturage. Comana is the capital town.

PARIAN Chronicle. See Arundelian-*Marbles*, and *Parian* Chronicle. Under the latter article, we have been as full as the subject seemed to require, or as the nature of our work would admit. It is unnecessary, therefore, to resume it in this place. Such of our readers, however, as wish for further information on this subject (which is equally interesting to the scholar and to the antiquarian) we must refer to Robertson's attack upon their authenticity, and to Gough's learned and judicious vindication of the authenticity, published in the *Archæologia* for 1789. The extent of his learning, and the solidity of his arguments, appear upon the whole to outweigh the objections of his sensible and plausible opponent. Hewlett's ingenious book upon the same side of the question may command some degree of attention. See Sandwich-*Marble*.

Parian-*Marble*, in the natural history of the ancients, the white marble used then, and to this day, for carving statues, &c. and called by us at this time *statuary marble*. Too many of the later writers have confounded all the white marbles under the name of the *Parian*; and among the workmen, this and all the other white marbles have the common name of *alabasters*; so that it is in general forgotten among them, that there is such a thing as alabaster different from marble; which,

however, is truly the caſe. Almoſt all the world alſo have confounded the Carrara marble with this, though they are really very different; the Carrara kind being of a finer ſtructure and clearer white than the Parian; but leſs bright and ſplendid, harder to cut, and not capable of ſo glittering a poliſh. The true Parian marble has uſually ſomewhat of a faint blueiſh tinge among the white, and often has blue veins in different parts of it. It is ſuppoſed by ſome to have had its name from the iſland PAROS, one of the Cyclades in the Ægean Sea, where it was firſt found; but others will have it to have been ſo called from Agoracritus Parius, a famous ſtatuary, who ennobled it by cutting a ſtatue of Venus in it.

PARIAS, or PERREAS, a tribe of Hindoos, ſo peculiarly diſtinguiſhed from all others, that they live by themſelves in the out-ſkirts of towns; and, in the country, build their houſes apart from the villages, or rather have villages of their own, furniſhed with wells; for they dare not ſo much as fetch water from thoſe which other families make uſe of; and, leſt theſe latter ſhould inadvertently go to one of theirs, they are obliged to ſcatter the bones of dead cattle about their wells, that they may be known. They dare not in cities paſs through the ſtreets where the Bramins live; nor ſet foot in the villages where they dwell.—They are likewiſe forbidden to enter a temple, either of their god Wiſtnow or Eſwara; becauſe they are held impure. They get their bread by ſowing, digging, and building the walls of mud-houſes; moſt of thoſe inhabited by the common people being raiſed by theſe Parias, who alſo do ſuch kinds of dirty work as other people do not care to meddle with. Nor is their diet much more cleanly; for they do not ſcruple to eat cows, horſes, fowl, or other carrion, which die of themſelves, and even ſtink. One would ſcarce imagine, that contentions for precedency ſhould ever enter into the thoughts of a people who have renounced all cleanlineſs, and, like ſwine, wallow in filth; and yet pride has divided the Parias into two claſſes: the firſt are ſimply called *Parias*, the other *Seriperes*. The employment of theſe latter is to go about ſelling leather, which they dreſs; alſo to make bridles, and ſuch kind of things: ſome of them likewiſe ſerve for ſoldiers. The Parias, who reckon themſelves the better family, will not eat in the houſe of the Seriperes; but the Seriperes will readily eat with the Parias. For this reaſon they are obliged to pay them reſpect, by lifting their hands aloft, and ſtanding upright before them. Theſe Seriperes, when they marry, cannot ſet up a pandal, a kind of garland, before their doors, made with more than three ſtakes or trees; ſhould they exceed that number, the whole city would be in motion. The Seriperes are likewiſe ſubject to ſome ſort of ſlavery; for when any perſon of credit or authority dies in the families of the Komitis, Sittis, Palis, farriers, or goldſmiths, and the friends have a mind to be at the expence of ſome clothes to give the Seriperes, theſe latter muſt ſuffer their beards to be ſhaven; and when the corpſe is carried out of town to be burned or interred, they muſt do that office; for which each receives a *fanum*, or one piece and a half of ſilver, worth three ſous and a half. Theſe are the ſame ſort of people who are called at Surat *Halalchors*; that is, in the Perſian language, "eat-alls, or eaters at large." Nothing can offend an Hindoo more than to be called an Halalchor: yet theſe poor people are not offended, cringe and bow to all they paſs, and go through their drudgery without noiſe or concern.

The Parias are very vicious, ſtupid, and ignorant, occaſioned by their wretched way of life. The Bramins and nobility ſhun them as if they had the plague, and look on their meeting with a Parias as the greateſt misfortune. To come near one of them is a ſin, to touch them a ſacrilege. If a Parias were dying, it is infamy to viſit him, or to give him the leaſt aſſiſtance, in the utmoſt danger or diſtreſs. A Bramin who unavoidably ſhould touch a Parias, immediately waſhes himſelf from the impurity. Even their ſhadow and breath being reckoned contagious, they are obliged to live on the eaſt ſide of their towns, that the weſterly winds which reign in this country may keep back their breath. And it is lawful for a Bramin to kill one of theſe unhappy creatures, if he does not avoid it by getting out of his way. In ſhort, they think them reprobated by God, and believe the ſouls of the damned enter into the Parias, to be puniſhed for their crimes.—Yet the Miſſion have found among theſe dregs of the people very active zealous catechiſts, who by their labours have very much contributed to the converſion of their countrymen, particularly one Rajanaiken a Paria ſoldier, who, of all the inferior miſſionaries, has diſtinguiſhed himſelf moſt by his labours and ſufferings.

PARIETALIA OSSA, in anatomy. See ANATOMY.

PARIETARIA, PELLITORY *of the* WALL: A genus of the monœcia order, belonging to the polygamia claſs of plants; and in the natural method ranking under the 53d order, *Scabridæ*. The calyx of the hermaphrodite is quadrifid; there is no corolla; there are four ſtamina; one ſtyle; and one ſeed, ſuperior and elongated. The female calyx is quadrifid; there is no corolla; nor are there any ſtamina. There is one ſtyle; and one ſeed ſuperior, and elongated. There are ſix ſpecies, of which one named the *officinalis* is uſed in medicine. This has a creeping root. The ſtalk grows erect, is rough to the touch, and adheſive. The leaves are alternate, elliptical, lanceolate, veined, and a little rough. The flowers grow out of the alæ of the leaves, in ſeſſile, branched, verticillate cluſters, of a greeniſh colour tinged with red. The antheræ have a great degree of ſenſibility; for, if irritated with the point of a pin, they fly from the calyx with elaſtic force, and throw out their powder. The plant has a cooling and diuretic quality. Three ounces of the juice taken internally, or a fomentation externally applied, have been found ſerviceable in the ſtrangury. The plant laid upon heaps of corn infeſted with weevils, is ſaid to drive away thoſe deſtructive inſects.

PARIETES, in anatomy, a term uſed for the incloſures or membranes that ſtop up or cloſe the hollow parts of the body; eſpecially thoſe of the heart, the thorax, &c. The parietes of the two ventricles of the heart are of unequal ſtrength and thickneſs; the left exceeding the right, becauſe of its office, which is to force the blood through all parts of the body; whereas the right only drives it through the lungs.

PARIS (MATTHEW), one of our beſt hiſtorians from William the Conqueror to the latter end of the reign of Henry III. but of his life few particulars have been tranſmitted to us. Leland, his original biographer, without determining whether he was born in France or England, informs us, that he was a monk of St. Alban's, and that he was ſent by Pope Innocent to reform the monks of the convent at Holm in Norway. Biſhop Bale, the next in point of time, adds to the above relation, that, on account of his extraordinary gifts of body and mind, he was much eſteemed, particularly by king Henry III. who commanded him to write the hiſtory of his reign. Fuller makes him a native of Cambridgeſhire, becauſe there was an ancient family of his name in that county. He alſo mentions his being ſent by the pope to viſit the monks in the dioceſe of Norwich. Biſhop Tanner, Biſhop Nicholſon, Doctor du Pin, and the *Nouveau Dictionnaire Hiſtorique*, add not a ſingle fact to thoſe above related. Matthew Paris died in the monaſtery of St. Alban's in the year 1259. He was doubtleſs a man of extraordinary knowledge for the 13th century; of an excellent moral character, and, as an hiſtorian, of ſtrict integrity. His ſtyle is unpoliſhed; but that defect is ſufficiently atoned for by the honeſt freedom with which he relates the truth, regardleſs of the dignity or ſanctity of the perſons concerned. His works

ace. 1. *Hiſtoria ab Adamo ad Conqueſtum Angliæ*, lib. i. manuſcript. col. C. C. Cantab. c. ix. Moſt of this book is tranſcribed, by Matthew of Weſtminſter, into the firſt part of his *Florilegium*. 2. *Hiſtoria major, ſeu rerum Anglicanarum hiſtoria a Gul. Conqueſtoris adventu ad annum* 43 *Henrici* III. &c. ſeveral times printed. The firſt part of this hiſtory, viz. to the year 1235, is tranſcribed almoſt verbatim from the Chronicle of Roger Wendover; and the Appendix, from the year 1260, is the work of William Raſhinger, who was alſo a monk of St. Alban's. 3. *Vitæ duorum Offarum, Merciæ regum, S. Albani fundatorum.* 4. *Geſta* 22 *abbatum S. Albani.* 5 *Additamenta chronicorum ad hiſt. majorem*; printed. 6. *Hiſtoria minor, ſive epitome majoris hiſtoriæ*; manuſcript. Beſides many other things in manuſcript.

Paris, ſon of Priam king of Troy by Hecuba, alſo named *Alexander*. He was decreed, even before his birth, to become the ruin of his country; and when his mother, in the firſt months of her pregnancy, had dreamed that ſhe ſhould bring forth a torch which would ſet fire to her palace, the foothſayers foretold the calamities which were to be expected from the imprudence of her future ſon, and which would end in the ruin of Troy. Priam, to prevent ſo great and ſo alarming an evil, ordered his ſlave Archelaus to deſtroy the child as ſoon as he was born. The ſlave, either touched with humanity, or influenced by Hecuba, did not obey, but was ſatisfied to expoſe the child on mount Ida, where the ſhepherds of the place found him, and educated him as their own. Some attribute the preſervation of his life, before he was found by the ſhepherds, to the motherly tenderneſs of a ſhe-bear who ſuckled him. Young Paris, though educated among ſhepherds and peaſants, gave very early proofs of courage and intrepidity; and from his care in protecting the flocks of mount Ida from the rapacity of the wild beaſts, he was named *Alexander*, "helper or defender." He gained the eſteem of all the ſhepherds, and his graceful countenance and manly deportment recommended him to the favours of Œnone, a nymph of Ida, whom he married, and with whom he lived with the moſt perfect tenderneſs. Their conjugal peace was, however, of no long duration. At the marriage of Peleus and Thetis, the goddeſs of Diſcord, who had not been invited to partake of the entertainment, ſhowed her diſpleaſure, by throwing into the aſſembly of the gods who were at the celebration of the nuptials, a golden apple, on which were written the words *Detur pulchriori*. All the goddeſſes claimed it as their own; the contention at firſt became general; but at laſt only three, Juno, Venus, and Minerva, wiſhed to diſpute their reſpective right to beauty. The gods, unwilling to become arbiters in an affair ſo tender and ſo delicate in its nature, appointed Paris to adjudge the prize of beauty to the faireſt of the goddeſſes; and indeed the ſhepherd ſeemed ſufficiently qualified to decide ſo great a conteſt, as his wiſdom was ſo well eſtabliſhed, and his prudence and ſagacity ſo well known. The goddeſſes appeared before their judge without any covering or ornament, and each endeavoured by promiſes and entreaties to gain the attention of Paris, and to influence his judgment. Juno promiſed him a kingdom; Minerva, military glory; and Venus, the faireſt woman in the world for his wife; as Ovid expreſſes it *Heroid.* 17. v. 118.

Unaque cum regnum; belli daret altera laudem;
Tyndaridis conjux, tertia dixit, eris.

After he had heard their ſeveral claims and promiſes, Paris adjudged the prize to Venus, and gave her the golden apple, to which perhaps ſhe ſeemed intitled as the goddeſs of beauty. This deciſion of Paris drew upon the judge and his family the reſentment of the two other goddeſſes. Soon after, Priam propoſed a conteſt amongſt his ſons and other princes, and promiſed to reward the conqueror with one of the fineſt bulls of mount Ida. His emiſſaries were ſent to procure the animal; and it was found in the poſſeſſion of Paris, who reluctantly yielded it. The ſhepherd was anxious to regain his favourite, and he went to Troy and entered the liſts of the combatants. He was received with the greateſt applauſe, and obtained the victory over his rivals, Neſtor the ſon of Neleus, Cyenus ſon of Neptune, Polites, Helenus, and Deiphobus, ſons of Priam. He likewiſe obtained a ſuperiority over Hector himſelf; which prince, enraged to ſee himſelf conquered by an unknown ſtranger, purſued him cloſely; and Paris muſt have fallen a victim to his brother's rage, had he not fled to the altar of Jupiter. This ſacred retreat preſerved his life; and Caſſandra the daughter of Priam, ſtruck with the ſimilarity of the features of Paris with thoſe of her brothers, inquired his birth and his age. From theſe circumſtances ſhe ſoon diſcovered that he was her brother, and as ſuch ſhe introduced him to her father and to her brothers. Priam acknowledged Paris as his ſon, forgetful of the alarming dreams which had cauſed him to meditate his death, and all jealouſy ceaſed among the brothers. Paris did not long ſuffer himſelf to remain inactive; he equipped a fleet, as if willing to redeem Heſione his father's ſiſter, whom Hercules had carried away and obliged to marry Telamon the ſon of Æacus. This was the pretended motive of his voyage, but the cauſes were far different. Paris remembered that he was to be the huſband of the faireſt of women; and, if he had been led to form thoſe expectations while he was an obſcure ſhepherd of Ida, he had now every plauſible reaſon to ſee them realized, ſince he was the acknowledged ſon of the king of Troy. Helen was the faireſt woman of the age, and Venus had promiſed her to him. On theſe grounds, therefore, he went to Sparta, the reſidence of Helen, who had married Menelaus. He was received with great reſpect; but he abuſed the hoſpitality of Menelaus; and while the huſband was abſent in Crete, Paris perſuaded Helen to elope with him, and to fly to Aſia. Helen conſented; and Priam received her into his palace without difficulty, as his ſiſter was then detained in a foreign country, and as he wiſhed to ſhow himſelf as hoſtile as poſſible to the Greeks. This affair was ſoon productive of ſerious conſequences. When Menelaus had married Helen, all her ſuitors had bound themſelves by a ſolemn oath to protect her perſon, and to defend her from every violence; and therefore the injured huſband reminded them of their engagements, and called upon them to recover her. Upon this all Greece took up arms in the cauſe of Menelaus; Agamemnon was choſen general of all the combined forces, and a regular war was begun. Paris, meanwhile, who had refuſed Helen to the petitions and embaſſies of the Greeks, armed himſelf, with his brothers and ſubjects, to oppoſe the enemy; but the ſucceſs of the war was neither hindered nor accelerated by his means. He fought with little courage, and at the very ſight of Menelaus, whom he had ſo recently injured, all his reſolution vaniſhed, and he retired from the front of the army, where he walked before like a conqueror. In a combat with Menelaus, which he undertook by means of his brother Hector, Paris muſt have periſhed, had not Venus interfered, and ſtolen him from the reſentment of his antagoniſt. He wounded, however, in another battle, Machaon, Euryphilus, and Diomedes; and, according to ſome opinions, he killed with one of his arrows the great Achilles.

The death of Paris is differently related: ſome ſay that he was mortally wounded by one of the arrows of Philoctetes, which had been once in the poſſeſſion of Hercules; and that, when he found himſelf languid on account of his wounds, he ordered himſelf to be carried to the feet of Œnone, whom he had baſely abandoned, and who in the years of his obſcurity had foretold him that he would ſolicit her aſſiſtance in his dying moments. He expired before he came into the preſence of

Œnone; and the nymph, ſtill mindful of their former loves, threw herſelf upon his body, and ſtabbed herſelf to the heart, after ſhe had plentifully bathed it with her tears. According to others, Paris did not immediately go to Troy when he left the Peloponneſus, but he was driven on the coaſts of Egypt, where Proteus, who was king of the country, detained him; and when he heard of the violence which had been offered to the king of Sparta, he kept Helen at his court, and permitted Paris to retire. Whatever was the mode of his death, it took place, we are told, about 1188 B. C. See TROY, &c.

PARIS, a city and capital of France. In the time of the Romans, before the birth of Chriſt, in that part called the *Iſland of the Palace*, was a town named *Lutetia*, or *Lutetia Pariſiorum*, or ſimply *Pariſij*, from the *Pariſii*, a people of Celtic Gaul, who, when the Romans invaded the country, themſelves ſet fire to it. The conquerors rebuilt it; but it attained to no great eminence, till the time of Julian the Apoſtate, who enlarged and built a palace in it. It was ſtill farther enlarged by the kings of the Franks, and Clovis made it his reſidence. It ſeems to have been afterwards neglected, till about the year 954, when Hugh Capet made it the capital of his kingdom, and the place of his reſidence, in which he was followed by all the ſucceeding kings. It was about that time divided into four quarters. Philip Auguſtus, in the beginning of the thirteenth century, built a new wall round it, paved the ſtreets, and divided it into three parts, the city, the ville, and the univerſity. It was farther enlarged in the beginning of the fifteenth century, when it was arranged into ſixteen quarters, which Louis XIV, in the year 1702, increaſed to twenty. The ſituation is in an extenſive plain, on the river Seine, and, including the ſuburbs, occupies a ſpace of 9000 toiſes in circumference; the number of ſtreets is eſtimated at 875. There are ſaid to be 105 alleys or ſtreets which have no thoroughfare, upwards of 23,000 houſes of from four to ſeven ſtories, without including the public buildings, religious houſes, ſhops, or warehouſes: the houſes are, in general, handſome, and the fronts, for the moſt part, uniform. Before the revolution, it was the ſee of an archbiſhop, and contained fifty-one pariſh-churches, twenty not parochial, ſeventeen collegiate churches, among which were thirteen chapters, forty chapels, three abbeys, twenty-two priories, and fifty convents for men, eccleſiaſtical and ſecular; ſeven abbeys, ſix priories, and fifty-three convents for women; twelve ſeminaries; ſixteen hoſpitals, ten of them appropriated to children and women, and ſix for deſerted children; an univerſity; ſix academies of ſcience; three academies for the inſtruction of young gentlemen; ſeven public libraries; 124 companies of artiſans and tradeſmen; four royal palaces; upwards of 500 palaces, or houſes inhabited by nobility and private gentlemen of fortune; ſixteen principal ſquares, and upwards of ſixty inferior; fifty public markets, ſixty fountains, twelve bridges over the Seine, twenty-ſix quays, ſixteen gates, &c. That part of the city which is called the Ville, is ſituated to the north, the city is ſituated in the centre, and the univerſity to the ſouth. The city is ſurrounded by the Seine, and is compoſed of three iſlands, called the *Iſland of the Louviers*, the *Notre Dame*, and *of the Palace*, which laſt is the ancient city of Paris. The church of Notre Dame, which gives name to the iſland, is a Gothic building, but grand and majeſtic in its appearance, and was the metropolitan. The iſland of Notre Dame is joined to the Iſland of the Palace by a wooden bridge. The Iſland of the Palace takes its name from a building which was formerly the reſidence of the kings, and afterwards was reſigned to the parliament. This iſland communicates with the reſt of the town by eleven bridges, the principal of which, called Pont-neuf, croſſes the two branches of the Seine, and is 168 toiſes in length: it was begun in the reign of Henry III, and finiſhed by Henry IV. In the centre was an equeſtrian ſtatue of Henry IV, in bronze, of a coloſſal ſize, on a pedeſtal of white marble, with a deſcription of ſome of the principal actions of his life. At the end of the bridge which conducts to the Louvre, is a beautiful building, called the Samaritan, which contains an engine for conveying the water of the Seine to the ſeveral quarters of the Ville. The Iſland of Louviers is ſmall, and principally filled with ſtore-houſes for wood, and yards for timber. The grand palace called the Louvre, was begun in the reign of Francis I, and ſtill remains unfiniſhed. It is a quadrangular edifice, the court in the centre, forming a ſquare of ſixty-five toiſes. The front was built in the reign of Louis XIV, and is one of the moſt beautiful monuments of his reign. In the large gallery, which is 227 toiſes long, and joins this palace to that of the Thuilleries, are to be ſeen upwards of 180 models of fortreſſes in France and other countries, all performed with the utmoſt accuracy, and ſo natural as to repreſent the ſeveral cities therein deſcribed, with their ſtreets, houſes, ſquares, and churches, and likewiſe all their works, moats, bridges, and rivers, together with the very country adjacent, ſuch as conſiſting of plains, mountains, corn lands, meadows, gardens, and woods. Some of theſe models may even be taken to pieces, that the curious may be the better enabled to perceive the admirable conſtruction of them. Louis XIV was the firſt who ordered theſe models to be conſtructed; and when any alterations are made in the fortreſſes, the alterations are alſo obſerved in theſe models, or new ones conſtructed with the moſt ſcrupulous conformity to the preſent ſtate of the place. In this palace is alſo the king's printing-houſe; and it contains, likewiſe, the moſt valuable collection of paintings: in it too we meet with ſeveral academies, viz. 1. The Académie Françoiſe, founded in the year 1633 by cardinal Richlieu, and confirmed in 1637 by the parliament. The object of this foundation is the improvement of the French language. 2. The Académie Royale des Inſcriptions & des Belles Lettres, inſtituted for the advancement of polite literature. In this academy ancient monuments are explained, and the tranſactions of the kingdom perpetuated by medals, inſcriptions, &c. 3. The Académie Royale des Sciences, inſtituted in 1666. 4. The Académie Royale de Peinture & de Sculpture, founded in 1648. The maſter-pieces of the painters and ſculptors admitted into it are diſpoſed in three halls, and marked with the names of the ſeveral artiſts. Here are alſo the pictures of great numbers of celebrated painters; and among the ſtatues, ſeveral of Gyps, taken from antiques. 5. The Académie Royale d'Architecture, founded in 1671. The quarter of the Palais Royal, now Palais d'Egalité, belonging alſo to the city, contains the Palais Royal, built by cardinal Richlieu, betwixt the years 1629 and 1636, and therefore originally called the Hotel de Richlieu, afterwards le Palais Cardinal. In the year 1637, he made a preſent of it to king Louis XIII; after whoſe deceaſe, his dowager, with her ſon Louis XIV, in 1643, reſided in it, on which account it was afterwards called the Palais Royal. Louis XIV firſt conferred it on his brother Philip, and, after his death, on Philip duke of Orleans. It contains pictures to the value of four millions of livres, purchaſed by the regent duke of Orleans, who placed them in the chief apartments, moſt of which too are hung with red damaſk. The foundation of this collection of paintings was begun by the cabinets of Chriſtina queen of Sweden, which, after paſſing through ſeveral hands, but always remaining entire and complete, were bought by the regent for 400,000 livres. Here are alſo great numbers of pieces by the moſt celebrated ancient maſters, namely, Raphael, Rubens, Titian, Vandyke, &c. In this palace we meet with the Académie de Muſique, founded in the year 1669. The Palais des Thuilleries (now Palais National) ſo called from a tile-kiln, formerly here, communicates, by means of a gallery, with the Louvre, but is a ſepa-

rate ſtructure. It was begun in the year 1564 by queen Catherine de Medicis, and completed in 1600 by Henry IV. Louis XIV, in 1664, cauſed the inſide to be embelliſhed. It conſiſts of five pavilions and four corps de logis, ſtanding all in a direct line, above 168 toiſes in length, and making a very grand appearance. In the pavilion adjoining to the river, is a ſpacious and magnificent theatre. Its garden is alſo very beautiful, and in fair weather reſorted to by aſtoniſhing crowds of people. Behind the garden, along the Seine, is the Cour de la Reine, conſiſting of three walks; near which, on the right hand, are the Elyſian fields, which are planted with rows of trees. In the riding-houſe of the Thuilleries, is the Académie de la Guerinière, where young gentlemen were taught all the academical exerciſes.

The palace of Orleans, or Luxembourg, is a magnificent ſtructure, and was rebuilt, in the ſpace of ſix years, by Mary de Medicis, ſecond wife to Henry IV. during her widowhood, though ſhe ended not her days here, but at Cologne, and that too in very great poverty. In its famous gallery are twenty exquiſite paintings by Rubens, of which one piece, which ſymbolically repreſents the life of this queen, is nine feet in breadth, and ten in length; yet this celebrated painter completely finiſhed them all in two years. This palace has lately been uſed as a ſtate priſon. La Place de Louis le Grand, or des Conquêtes, is of an octangular form, and ſurrounded with houſes, built in an uniform manner, on each ſide, moſt of which make a fine appearance. In the centre ſtood an equeſtrian ſtatue of braſs, of Louis le Grand, which is very juſtly accounted a maſter-piece in its kind, being all of one caſt, though twenty feet two inches in height. No place is ſaid to afford its parallel, not even in Florence or Rome. The ſquare called La Place de Louis Quinze is remarkable for the execution of the laſt king (Louis XVI) his queen, and his ſiſter the princeſs Elizabeth, the duke of Orleans, and many others. The royal library, in the rue Vivien, in the year 1741, contained above 94,000 printed books, and 30,000 manuſcripts, with a cabinet of medals, and a collection of copper-plates, the large folio volumes of which alone form a conſiderable library; theſe, accordingly, are under their peculiar librarian, and among them is an incredible number of the moſt valuable pieces. The quarter St. Denis is a part of the city, and contains the Hoſpital de la Sainte Trinité, inſtituted for 100 boys, and thirty-ſix girls, who are all to be orphans and natives of Paris, but muſt be healthy, and learn trades. The quarter of the Grève is part of the city, and lies on the Seine. It contains the open place called La Grève, where all public rejoicings are celebrated, and malefactors likewiſe executed: and the Hôtel de Ville, the tribunal of which conſiſted of the prevôt des marchands, four echevins, an attorney and counſellor, a ſubſtitute, and a clerk of the court. Over its gate is an equeſtrian ſtatue of Henry IV: and in the court, under an arcade, one of braſs, of Louis XIV, in an erect poſture; in the court alſo is a kind of public chronicle, being an account, in Latin and French, of the moſt remarkable actions of Henry IV, inſcribed in letters of gold, cut on tables of black marble. The arſenal is in the quarter of St. Paul, and conſiſts of many ſpacious buildings, with a foundry, and a houſe for making ſalt-petre; but containing no great number of arms. The Baſtille was built as a fortreſs by Charles V, to defend the city from the Engliſh. It was an old caſtle, with eight towers and a redoubt, but too ſmall to protect the city, and too low to command it, inſomuch that it ſerved only for a ſtate priſon. This place was deſtroyed by the people, in the beginning of the revolution. The univerſity was founded by Charles the Fat, and conſiſts of four faculties: viz. divinity, the civil and canon law, phyſic, and the ſciences. Its head is the rector, who is always choſen from the faculty of the ſciences. The election is renewed every three months, yet many have been known to enjoy that honour for ſeveral years. In the ſuburbs of St. Victor, is the Hoſpital-general, which alſo goes by the name of La Salpêtrière, that commodity having been formerly made here. The buildings belonging to this hoſpital are of large extent. In it is a moſt noble foundation for the female ſex, near 7000 of whom are here provided for, and live under the inſpection of ſixty ſiſters, ſubordinate to whom are eighty governeſſes, and a conſiderable number of maid-ſervants. Into this place are received, 1. The foundlings, who take up one ward. 2. Girls and young women, who ſow and knit. 3. A great number of bad women, who are compelled here to ſpin wool. 4. Some hundreds of idiots of that ſex, who live here in little houſes built in faſhion of a ſtreet. 5. Many other poor women, ſome of whom are kept here gratis, and others pay a ſmall ſum for their ſupport. 6. Delinquents who are confined, but not put to work. To this incomparable foundation alſo belongs the caſtle of Biceſtre, which is ſeated on an eminence, at a ſmall diſtance from the houſes aforementioned, being well defended on all ſides by a wall, of very conſiderable circuit, and contains within it many large buildings and ſeveral open places. In this caſtle are near 4000 perſons of the other ſex; viz. 1. Poor men, who are entertained here at free coſt. 2. Some who pay for their reception into the houſe. 3. Perſons diſordered in their ſenſes, whoſe ward looks like a village, being built with regular ſtreets. 4. Men and women afflicted with the venereal diſtemper, to the number of twenty-five of each ſex at a time. Common priſoners are kept here in a particular houſe, walled in, and every one in a cell by himſelf. The Hoſpital de la Pietié, in the rue St. Victor, where poor children are brought up, conſtitutes alſo a part of the Hoſpital-general, and is the place where the governors uſually hold their meetings. Theſe three foundations, together with the Hôtel-Dieu, have one common fund, amounting to full two millions of livres per annum. On the quarter of St. Benoit is the college of phyſicians, containing five profeſſors. The little Chatelet is a kind of antique fortreſs, and at preſent ſerves for a priſon. The abbey of St. Genevieve was founded by king Clovis, whoſe marble monument is ſtill to be ſeen in the church. In the library are about 60,000 printed books, and among them a few which are old and ſcarce. Here is alſo a pretty valuable cabinet of antiquities and natural curioſities. In this quarter is likewiſe the national obſervatory, which ſtands in the higheſt part of the city. The Sorbonne is ſituated in the quarter of St. André, takes its name from Robert de Sorbonne, its founder, who erected it in the year 1252; but it was cardinal Richlieu who ſettled its form of government, and built its preſent handſome houſe and fine church, the latter of which is a maſter-piece of architecture. In it may be ſeen the admirable marble monument of this cardinal, on which the celebrated Girardon worked twenty years. The College of the Four Nations, or Mazarin, ſo called from the cardinal of that name, its founder, ſtands on the Seine, and is under the direction of the Sorbonne. The lectures read here are all gratis, and the library has been public ever ſince the year 1688. The Hôtel des Invalides was erected by Louis XIV, for the relief of diſabled officers and ſoldiers. This foundation derives its æra from 1670, and the following year the ground was laid out for this ſpacious and ſtately ſtructure, and in eight years the whole was finiſhed. It lies on the borders of the country, not far from the Seine, and forms a regular quadrangle of 17 acres. Lon. 20. E. Ferro. Lat. 48. 42. N.

PARIS (*Department of*), one of the new diviſions of France, which includes the city of Paris, and its immediate environs.

PARIS, *Herb Paris*, or *Truelove*: A genus of the trigynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The calyx is tetraphyllous; there are four petals, narrow in proportion; the berry quadrilocular. There is but one ſpecies, growing naturally in woods and ſhady places both in Scotland

and England. It hath a ſingle naked ſtem, greeniſh bloſſoms, and blueiſh black berries. The leaves and berries are ſaid to partake of the properties of opium; and the juice of the berries is uſeful in inflammations of the eyes. Linnæus ſays, that the root will vomit as well as ipecacuanha, but muſt be taken in double the quantity. Goats and ſheep eat the plant; cows, horſes, and ſwine refuſe it. Though this plant has been reckoned of a poiſonous nature, being ranked among the aconites; yet late authors attribute quite other properties to it, eſteeming it to be a counter-poiſon, and good in malignant and peſtilential fevers.

Herb PARIS *of Canada or of America, Trillium,* in botany, a genus of the hexandria trigynia claſs: The characters are, that it has a three-leaved ſpreading empalement, and three oval petals; it has ſix awl-ſhaped ſtamina, terminated by oblong ſummits, and a roundiſh germen with three ſlender recurved ſtyles, crowned by ſingle ſtigmas; the germen afterwards becomes a roundiſh berry, with three cells filled with roundiſh ſeeds. There are three ſpecies.

Plaſter of PARIS. See PLASTER *of Paris.*

PARISH, the precinct of a parochial church, or a circuit of ground inhabited by people who belong to one church, and are under the particular charge of its miniſter. The word comes from the Latin *parochia,* the Greek παροικια *habitation*; compounded of παρα *near*, and οικος *houſe.*—Accordingly Du Cange obſerves, that the name παροικια was anciently given to the whole territory of a biſhop, and derives it from *neighbourhood*; becauſe the primitive Chriſtians, not daring to aſſemble openly in cities, were forced to meet ſecretly in neighbour-houſes.

In the ancient church there was one large edifice in each city for the people to meet in; and this they called *parochia,* "pariſh." But the ſignification of the word was afterwards enlarged, and by a pariſh was meant a dioceſe, or the extent of the juriſdiction of a biſhop, conſiſting of ſeveral churches; unleſs we will ſuppoſe, as ſome do, that thoſe biſhops were only paſtors of ſingle churches. Du Pin obſerves, that country pariſhes had not their origin before the 4th century; but thoſe of cities are more ancient. The city of Alexandria is ſaid to have been the firſt that was divided into pariſhes.

How ancient the diviſion of pariſhes is, is not indeed abſolutely certain; for in the early ages of Chriſtianity in this iſland, pariſhes were unknown, or at leaſt ſignified the ſame that a dioceſe now does. There was then no appropriation of eccleſiaſtical dues to any particular church; but every man was at liberty to contribute his tithes to any prieſt or church he pleaſed, but he was obliged to do it to ſome; or if he made no ſpecial appropriation thereof, they were paid to the biſhop, whoſe duty it was to diſtribute them among the clergy, and for other pious purpoſes, according to his own diſcretion. Camden ſays England was divided into pariſhes by archbiſhop Honorius about the year 630. Sir Henry Hobart maintains that pariſhes were firſt erected by the council of Lateran, held A. D. 1179. But Mr. Selden proves, that the clergy lived in common without any diviſion of pariſhes, long after the time mentioned by Camden; and it appears from the Saxon laws, that pariſhes were in being long before the council of Lateran in 1179. The diſtinction of pariſhes occurs in the laws of king Edgar, about the year 970. It ſeems pretty clear and certain, ſays judge Blackſtone (Com. vol. i. p. 112.), that the boundaries of pariſhes were firſt aſcertained by thoſe of a manor or manors; becauſe it very ſeldom happens that a manor extends itſelf over more than one pariſh, though there are often many manors in one pariſh. The lords, he adds, as Chriſtianity ſpread, began to build churches upon their own demeſnes or waſtes, in order to accommodate their tenants in one or two adjoining lordſhips; and that they might have divine ſervice regularly performed therein, obliged all their tenants to appropriate their tithes to the maintenance of the one officiating miniſter, inſtead of leaving them at liberty to diſtribute them among the clergy of the dioceſe in general; and this tract of land, the tithes of which were ſo appropriated, formed a diſtinct pariſh; and this accounts for the frequent intermixture of pariſhes one with another. For if a lord had a parcel of land detached from the main of his eſtate, but not ſufficient to form a pariſh of itſelf, it was natural for him to endow his newly-erected church with the tithes of ſuch lands. Extra-parochial waſtes and marſh lands, when improved and drained, are by 17 Geo. II. cap. 37. to be aſſeſſed to all parochial rates in the pariſh next adjoining. Camden reckons 9284 pariſhes in England; and Chamberlayne makes 9913. They are now generally reckoned about 10,000.

PARISH-*Clerk.* In every pariſh the parſon, vicar, &c. hath a pariſh-clerk under him, who is the loweſt officer of the church. Theſe were formerly clerks in orders, and their buſineſs at firſt was to officiate at the altar; for which they had a competent maintenance by offerings; but they are now laymen, and have certain fees with the parſon on chriſtenings, marriages, burials, &c. beſides wages for their maintenance. The law looks upon them as officers for life: and they are choſen by the miniſter of the pariſh, unleſs there is a cuſtom for the pariſhioners or church-wardens to chooſe them; in which caſe the canon cannot abrogate ſuch cuſtom; and when choſen, it is to be ſignified, and they are to be ſworn into their office by the archdeacon, for which the court of king's bench will grant a mandamus.

PARISII (anc. geog.), a people of Gallia Celtica, inhabiting the country about the Sequana and Marona. Now a great part of the iſle of France.—*Pariſii* (Ptolemy), a people of Britain, having the Brigantes to the north and weſt, the German ſea to the eaſt, and the Coritani to the ſouth, from whom they were ſeparated by the Humber. Now *Holderneſſe,* a peninſula of the Eaſt Riding of Yorkſhire.

PARISIORUM CIVITAS. See LUTETIA.

PARIUM (anc. geog.), a noble city of Myſia Minor, with a port on the Propontis; called *Adraſtia* by Homer, according to Pliny; but Strabo diſtinguiſhes them: according to others, the *Paeſtos* of Homer. *Pariani,* the people (Strabo). The birthplace of Neoptolemus ſurnamed *Gloſſographus* (Strabo). Here ſtood a Cupid equal in exquiſite workmanſhip to the Cnidian Venus.

PARK (French *parque,* i. e. *locus incluſus*), is a large quantity of ground incloſed and privileged for wild beaſts of chaſe, by the king's grant or preſcription. See CHASE and FOREST. Manwood defines a chaſe to be "a privileged place for beaſts of venery, and other wild beaſts of the foreſt and chaſe, *tam ſylveſtres, quam campeſtres*;" and differs from a chaſe or warren, in that it muſt be incloſed; for if it lies open, it is good cauſe of ſeizure into the king's hands, as a thing forfeited; as a free chaſe is, if it be incloſed: beſides, the owner cannot have an action againſt ſuch as hunt in his park, if it lies open. No man can erect a park without licence under the broad ſeal; for the common law does not encourage matter of pleaſure, which brings no profit to the commonwealth. But there may be a park in reputation erected without any lawful warrant; and the owner may bring his action againſt perſons killing his deer.

To a park three things are required. 1. A grant thereof. 2. Incloſure by pale, wall, or hedge. 3. Beaſts of a park; ſuch as the buck, doe, &c. And where all the deer are deſtroyed, it ſhall no more be accounted a park; for a park conſiſts of vert, veniſon, and incloſure; and if it is determined in any of them, it is a total diſparking. Parks as well as chaſes are ſubject to the common law, and are not to be governed by the foreſt laws.

PARK, as connected with gardening. See FARM and GARDENING. A park and a garden are more nearly allied than a farm and a garden, and can therefore be accommodated to each

other without any diſparagement to either. A farm loſes ſome of its characteriſtic properties by the connection, and the advantage is on the part of the garden; but a park thus bordered retains all its own excellencies; they are only enriched, not counteracted by the intermixture. The moſt perfect compoſition of a place that can be imagined, conſiſts of a garden opening into a park, with a ſhort walk through the latter to a farm, and ways along its glades to ridings in the country; but to the farm and the ridings the park is no more than a paſſage; and its woods and its buildings are but circumſtances in their views; its ſcenes can be communicated only to the garden.

The affinity of the two ſubjects is ſo cloſe, that it would be difficult to draw the exact line of ſeparation between them Gardens have lately encroached very much both in extent and in ſtyle on the character of a park; but ſtill there are ſcenes in the one which are out of the reach of the other. The ſmall ſequeſtered ſpots which are agreeable in a garden would be trivial in a park; and the ſpacious lawns which are among the nobleſt features of the latter, would in the former fatigue by their want of variety; even ſuch as, being of a moderate extent, may be admitted into either, will ſeem bare and naked, if not broken in the one; and loſe much of their greatneſs, if broken in the other. The proportion of a part to the whole is a meaſure of its dimenſions: it often determines the proper ſize for an object, as well as the ſpace fit to be allotted to a ſcene; and regulates the ſtyle which ought to be aſſigned to either. But whatever diſtinctions the extent may occaſion between a park and a garden, a ſtate of highly cultivated nature is conſiſtent with each of their characters; and may in both be of the ſame kind, though in different degrees.

PARK *of Artillery*. See ARTILLERY.

PARK *of Proviſions*, in military affairs, the place where the ſuttlers pitch their tents in the rear, and ſell their proviſions to the ſoldiers. Likewiſe that place where the bread-waggons are drawn up, and where the troops receive their ammunition-bread, being the ſtore of the army.

PARKER (MATTHEW), the ſecond Proteſtant archbiſhop of Canterbury, was born at Norwich in the year 1504, the 19th of Henry VII. His father, who was a man in trade, died when our author was about 12 years old; but his mother took ſpecial care of his education, and at the age of 17 ſent him to Corpus-Chriſti college in Cambridge, where, in 1523, he took his bachelor's degree. In 1527 he was ordained, created maſter of arts, and choſen fellow of the college. Having obtained a licence to preach, he frequently held forth at St. Paul's croſs in London, and in other parts of the kingdom. In 1533 or 1534 he was made chaplain to queen Anne Boleyn, who obtained for him the deanery of Stoke Clare in Suffolk, where he founded a grammar-ſchool. After the death of the queen, king Henry made him his own chaplain, and in 1541 prebendary of Ely. In 1544, he was, by the king's command, elected maſter of Corpus-Chriſti college, and the following year vice-chancellor o the univerſity. In 1547 he loſt the deanery of Stoke, by the diſſolution of that college. In the ſame year he married the daughter of Robert Harleſtone, a Norfolk gentleman.

In the year 1552 he was nominated by Edward VI. to the deanery of Lincoln, which, with his other preferments, enabled him to live in great affluence: but the papiſt Mary was hardly ſeated on the throne before he was deprived of every thing he held in the church, and obliged to live in obſcurity, frequently changing his place of abode to avoid the fate of the other reformers.

Queen Elizabeth aſcended the throne in 1558; and in the following year Dr. Parker, from indigence and obſcurity, was at once raiſed to the ſee of Canterbury (A); an honour which he neither ſolicited nor deſired. In this high ſtation he acted with ſpirit and propriety. He viſited his cathedral and dioceſe in 1560, 1565, 1570, and 1573. He repaired and beautified his palace at Lambeth at a vaſt expence. The ſum which the repairs of the palace and great hall at Canterbury coſt him was upwards of 1400l. ſterling, which is at leaſt equal to ten times the ſum now-a-days. Both the palace and great hall were in decay, partly through the injuries of time, and partly through that of fire. The hall, built by archbiſhop Huber in the 12th century, was famous in hiſtory for the great feaſts that had been made there by archbiſhops and abbots in former times; in particular, at the nuptial feaſts of king Edward I. in 1290; at the inſtallation of the abbot of St. Auſtin's in 1309; at the inthronization of George Nevill archbiſhop of York in 1464; and of Archbiſhop Warham in 1504, when Edward duke of Buckingham acted as lord high ſteward of his houſehold; and, laſtly, for the entertainment given by that archbiſhop in 1519 to the emperor Charles V. Henry VIII. Queen Catherine, &c. In 1565 archbiſhop Parker gave three entertainments in this hall at Whitſuntide (which laſted three days), on Trinity Sunday and in aſſize time. At the two firſt of theſe the archbiſhop himſelf ſat in the midſt of the uppermoſt table: on his left hand the Mayor, &c. and ſo on one ſide of the hall a continued row of men according to their rank, filled the other tables; and on his right hand ſat only ſome noble women and ladies of quality, the whole length of the hall, correſponding to the row of men on the other ſide: which order of placing the women was obſerved in honour of the queen. The firſt rank of gueſts being riſen, and the tables cleared, they were furniſhed again, and filled the ſecond time. At the laſt feaſt, which was grander than all the reſt, the archbiſhop entertained the two judges who went that circuit (B), the attorney general, the high ſheriff, with all who met at theſe aſſizes, as juſtices of the peace, advocates and common lawyers, and all the reſt of proctors and attorneys; who all (with a promiſcuous company) in troops came in. The hall was ſet forth with much plate of ſilver and gold, adorned with much tapeſtry of Flanders; and dainties of all ſorts were ſerved in excellent order by none but the archbiſhop's ſervants, the table being often the ſame day furniſhed afreſh with new gueſts: while the ladies were nobly entertained in inner parlours by Mrs. Parker, the hall being now filled only with gentlemen. Otherwiſe, at theſe feaſts, it was the archbiſhop's cuſtom, in honour of matrimony, to entertain both men and their wives. Of this noble hall and palace, now within 200 years, there is little or nothing left except a few ruins. On Whitſunday 1570, and the two following days, this archbiſhop feaſted the citizens of Canterbury and their wives in the ſame manner as he had done before: and on Trinity Sunday (after conſecrating Biſhop Curteis of Chicheſter) he made another moſt archiepiſcopal feaſt, inviting another

(A) He was conſecrated December 17th 1559, in Lambeth chapel, by Barlow biſhop of Chicheſter, Scory biſhop of Hereford, Coverdale biſhop of Exeter, and Hodgkin ſuffragan biſhop of Bedford. This deſerves to be particularly mentioned, becauſe the Romaniſts aſſerted afterwards that he had been conſecrated at the Nag's-head inn or tavern in Cheapſide. But this notorious and improbable falſehood hath been fully confuted by Maſon in his Vindication of the Church of England concerning the Conſecration and Ordination of Biſhops, 1613, folio; by Bramhall in his Conſecration of Proteſtant Biſhops vindicated; and by Courayer in his Defence of the Validity of Engliſh Ordinations, 1728, 3 vols 8vo; and even by many Catholics.

(B) This proves that the judges of aſſize then came to Canterbury, though it was then a county in itſelf, being ſo made in 1461.

archbiſhop (viz. Grindal of York, who came thither for confirmation) to be his gueſt: beſides whom were preſent Horn biſhop of Wincheſter, and Curteis aforeſaid of Chicheſter. At the lower tables ſat all the miniſters and ſervants whatſoever, even the children, who belonged to that church; and at the remoteſt tables, but in the ſame hall, in ſight, ſat the poor of both ſexes of the hoſpitals of St. John's and Harbledown. On July 11th, being aſſizes time, the judges, high ſheriff, gentlemen, and the common ſort, were all feaſted by the archbiſhop in a ſplendid manner as before. Soon after biſhop Sandys of Worceſter, elect of London, came to Canterbury to be confirmed. The archbiſhop, on his return, lodged the firſt night at Sittingbourn, and the next night (after dining at Graveſend) came to Lambeth in barges by Thames, with all his family. Sept. 7. 1573, being Q. Elizabeth's birth-day, archbiſhop Parker entertained her majeſty, and as many noblemen, &c. as were preſent at archbiſhop Warham's entertainment in the ſame hall 54 years before. The archbiſhop (to uſe his own words, in a letter to archbiſhop Grindal of York) "met her highneſs, as ſhe was coming to Dover, upon Folkſtone Down. I left her at Dover, and came home to Bekeſborn that night; and after that went to Canterbury to receive her majeſty there. Which I did, with the biſhops of Lincoln and Rocheſter, and my ſuffragan [of Dover], at the weſt door; where, after the grammarian had made his oration to her upon her horſe-back, ſhe alighted. We then kneeled down, and ſaid the pſalm *Deus miſereatur*, in Engliſh, with certain other collects briefly; and that in our chimers and rochets. The quire, with the dean and prebendaries, ſtood on either ſide of the church, and brought her majeſty up with a ſquare ſong; ſhe going under a canopy, borne by four of her temporal knights, to her traverſe, placed by the communion board, where ſhe heard evening ſong; and after departed to her lodging at St. Auſtin's, whither I waited upon her. From thence I brought certain of the council, and divers of the court, to my houſe to ſupper, and gave them 14 or 15 diſhes, furniſhed with two meſs, at my long table, whereat ſat about 20; and in the ſame chamber a third meſs, at a ſquare table, whereat ſat 10 or 12; my leſs hall having three long tables furniſhed with my officers, and with the guard, and others of the court: and ſo her majeſty came every Sunday to church to hear the ſermon. And upon one Monday it pleaſed her highneſs to dine in my great hall, thoroughly furniſhed with the council, Frenchmen, ladies, gentlemen, and the mayor of the town, with his brethren, &c.; her highneſs ſitting in the midſt, having two French ambaſſadors [Gondius and Mothe-Fenelon] at the end of the table, and four ladies of honour at the other end. And ſo three meſs were ſerved by her nobility at waſhing, her gentlemen and guard bringing her diſhes, &c." On which the archbiſhop of York, in his anſwer, made this reflection: "Your grace's large deſcription of the entertainment at Canterbury did ſo lively ſet forth the matter, that in reading thereof I almoſt thought myſelf to be one of your gueſts there, and as it were beholding the whole order of all things done there. Sir, I think it ſhall be hard for any of our coat to do the like for one hundred years, and how long after God knoweth." In this progreſs Lord Treaſurer Burghley was lodged with Mr. Pearſon, the eleventh prebendary, who, the archbiſhop ſays, "had a fine houſe."

He founded ſeveral ſcholarſhips in Bennet or Corpus-Chriſti college in Cambridge, and gave large preſents of plate to that and to other colleges in this univerſity. He gave 100 volumes to the public library. He likewiſe founded a free-ſchool at Rochdale in Lancaſhire. He took care to have the ſees filled with pious and learned men; and, conſidering the great want of bibles in many places, he, with the aſſiſtance of other learned men, improved the Engliſh tranſlation, had it printed on a large paper, and diſperſed through the kingdom. This worthy prelate died in the year 1575, aged 72, and was buried in his own chapel at Lambeth. He was pious without affectation or auſterity, cheerful and contented in the midſt of adverſity, moderate in the height of power, and beneficent beyond example. He wrote ſeveral books; and alſo publiſhed four of our beſt hiſtorians; *Matthew of Weſtminſter*, *Matthew Paris*; *Aſſer's Life of King Alfred*, and *Tho. Walſingham*. The learned archbiſhop alſo tranſlated the Pſalter. This verſion was printed, but without a name; and has been attributed to an obſcure poet of the name of Keeper. This was Wood's opinion; but it is more than probable that the learned author of the *Athenæ Oxon.* was wrong. See Gentleman's Magazine for 1781, p. 566. where Parker is proved to be the author of a verſion of the Pſalms.

PARKER (Samuel), an Engliſh clergyman, who, by a temporizing ſpirit, aided by excellent parts and conſiderable learning, raiſed himſelf to the biſhopric of Oxford. He was born September 1640, at Northampton, where his father John then practiſed the law. John had been bred to that profeſſion, in one of the Temples at London; and, being afterwards againſt the king, was made a member of the high court of juſtice in 1649, where he gave ſentence againſt the three lords, Capel, Holland, and Hamilton, who were beheaded. During Cromwell's uſurpation, he was made an aſſiſtant committee man for his county. In 1650 he publiſhed a book in defence of the new government, as a commonwealth, without a king or houſe of lords. June 1655, when Cromwell was declared protector, he was appointed a commiſſioner for removing obſtructions at Worceſter-houſe in the Strand, near London, and was ſworn ſerjeant at law next day. January 1659, he was appointed one of the barons of the exchequer by the Rump-parliament; but, upon a complaint againſt him, was quickly diſplaced. However, he was again regularly made ſerjeant at law, on the recommendation of Chancellor Hyde, at the firſt call after the Reſtoration. In the mean time, he carefully educated his ſon Samuel among the Puritans in Northampton; whence, being fit for the univerſity, he was ſent to Wadham college in Oxford, and admitted, in 1659, under a preſbyterian tutor. Here he led a ſtrict and religious life, entered into a weekly ſociety, then called the *Gruellers*, becauſe (as Wood obſerves) their chief diet was water-gruel; and it was obſerved that he put more graves in his porridge than all the reſt. They faſted and prayed, and met at a houſe at Halywell, where he was ſo zealous and conſtant at prayers, ſermons, and ſacraments, that he was eſteemed one of the moſt precious young men in the univerſity. He took the degree of A. B. February 28, 1659-60. Upon the Reſtoration, he heſitated what ſide to take; but continuing publicly to ſpeak againſt Epiſcopacy, he was much diſcountenanced by the new warden Dr. Blanford, who had been appointed to that office upon the dawn of the Reſtoration in 1659. Upon this he removed to Trinity-college, where, by the advice of Dr. Ralph Ruthwell, then a ſenior fellow of that ſociety, he was reſcued from the prejudices of an unhappy education, which in fact he publicly avowed in print. He then became a zealous Anti-puritan, and for many years acted the part of what was then called a true ſon of the church. In this temper, having taken the degree of M. A. in 1663, he entered into holy orders, reſorted frequently to London, and became chaplain to a nobleman; continuing to diſplay his wit upon his old friends the Preſbyterians, Independents, &c.

In 1665 he publiſhed ſome Philoſophical Eſſays, and was elected a member of the Royal Society: theſe Eſſays he dedicated to Sheldon archbiſhop of Canterbury, who became his patron; and in 1667 made him his chaplain. Being thus in the road to preferment, he left Oxford, and reſided at Lambeth, under the eye of his patron; who, in 1670, made him archdeacon of Canterbury, in the room of Dr. Sancroft, afterwards archbiſhop. November the ſame year, he put himſelf in the

train of William prince of Orange, who viſited Cambridge, and had the degree of D.D. conferred upon him there. November 1672, he was inſtalled a prebendary of Canterbury; and was made rector of Ickham and Chatham in Kent by the archbiſhop much about the ſame time. He was very obſequious to the court during the reign of Ch. II. and upon the acceſſion of his brother to the throne, he continued the ſame ſervile complaiſance; and he ſoon reaped the fruits of it in the biſhopric of Oxford, to which he was appointed by James II. on the death of Dr. Fell in 1686, being allowed to hold the archdeaconry of Canterbury in commendam. He was likewiſe made a privy counſellor, and conſtituted by a royal mandamus preſident of Magdalen-college in Oxford. Theſe favours, however, were the price of his religion, which he ſcrupled not to offer up a ſacrifice to his ambition. In this new change, he became one of the Romiſh mercenaries, proſtituting his pen in defending tranſubſtantiation, and the worſhip of ſaints and images. The Papiſts made ſure of him as a proſelyte; one of whom ſays that he even propoſed in council, whether it was not expedient, that at leaſt one college in Oxford ſhould be allowed Catholics, that they might not be forced to be at ſuch charges by going abroad to ſtudy. In the ſame way, having invited two Popiſh noblemen, and one of the church of England, to an entertainment, he drank the king's health, wiſhing a happy ſucceſs to all his affairs; adding, that the Proteſtant religion in England ſeemed to him to be in no better a condition than that of Buda was before it was taken, and that they were next to atheiſts who dared to defend that faith. Nay, ſo ſhameful was his conduct, that the cooler among the Romaniſts condemned it as too hot and precipitate. For example, Father Petre, a Jeſuit, and privy counſellor to King James, in a letter to Father la Chaiſe, confeſſor to Louis XIV. writes thus: "The biſhop of Oxford has not yet declared himſelf openly; the great obſtacle is his wife, whom he cannot rid himſelf of; his deſign being to continue a biſhop, and only change communion, as it is not doubted but the king will permit, and our holy father confirm; though I don't ſee how he can be farther uſeful to us in the religion he is in; becauſe he is ſuſpected, and of no eſteem among the heretics of the Engliſh church: nor do I ſee that the example of his converſion is like to draw many others after him, becauſe he declared himſelf ſo ſuddenly. If he had believed my counſel, which was to temporize for ſome longer time, he would have done better; but it is his temper, or rather zeal, that hurried him on to it." Accordingly his authority in his dioceſe was ſo very inſignificant, that when he aſſembled his clergy, and deſired them to ſubſcribe an "Addreſs of Thanks to the King for his Declaration of Liberty of Conſcience," they rejected it ſo unanimouſly, that he got but one clergyman to concur with him in it. Biſhop Burnet repreſents him to be a man of no judgment, and of as little virtue; and as to religion rather impious: that he was covetous and ambitious, and ſeemed to have no other ſenſe of religion but as a political intereſt, and a ſubject of party and faction. He ſeldom came to prayers, or to any exerciſes of devotion; and was ſo proud, that he grew inſufferable to all that came near him. (But this muſt be read with caution.) No doubt but the ill ſucceſs he met with in puſhing on the deſign to introduce Popery, ruined him, as well as his royal maſter: the latter loſt his crown by it, and the biſhop his life; for, falling into contempt with all good men, trouble of mind threw him into a diſtemper, of which he died unlamented, at Magdalen-college, March 20, 1687. He ſent, however, a diſcourſe to James, perſuading him to embrace the Proteſtant religion, with a Letter to the ſame purpoſe, which was printed at London in 1690, 4to. He wrote ſeveral pieces, in all which Burnet allows that there was an entertaining livelineſs; though at the ſame time he accompanies that favourable cenſure, as his manner is, with a "But it was neither grave nor correct." Yet Dr. Nichols's remark cannot be diſputed, and may be extended to the preſent time, "that he has but few readers at this day." And Swift obſerves, that Marvell's remarks on Parker continued to be read, when the book which occaſioned them was long ago ſunk. He left a ſon, Samuel, an excellent ſcholar, and of ſingular modeſty; who married a bookſeller's daughter at Oxford, where he reſided with a numerous family of children; to ſupport which, he publiſhed ſome books, with a modeſt Vindication of his father. One of his ſons is now, or was lately, a bookſeller at Oxford.

PARKINSONIA, ſo called in honour of the Engliſh botaniſt *Parkinſon*: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method it ranks under the 33d order, *Lomentaceæ*. The calyx is quinquefid; there are five petals, all of them oval except the loweſt, which is reniform; there is no ſtyle; the legumen moniliform, or like ſtrung beads. We know but one ſpecies of this plant, which is very common in the Spaniſh Weſt Indies, but has of late years been introduced into the Engliſh ſettlements, for the beauty and ſweetneſs of its flowers. In the countries where it grows naturally, it riſes to be a tree of 20 or more feet high, and bears long ſlender bunches of yellow flowers; which have a moſt agreeable ſweet ſcent.

PARLEY, a conference with an enemy. Hence, to beat or ſound a parley, is to give a ſignal for holding ſuch a conference by beat of drum or ſound of trumpet.

PARLIAMENT, the grand aſſembly of the three eſtates of this kingdom, ſummoned together by the king's authority, to conſider of matters relating to the public welfare, and particularly to enact and repeal laws.

The original or firſt inſtitution of parliament is one of thoſe matters which lie ſo far hidden in the dark ages of antiquity, that the tracing of it out is a thing equally difficult and uncertain. The word *parliament* itſelf (or *colloquium*, as ſome of our hiſtorians tranſlate it) is, comparatively, of moderate date; derived from the French, and ſignifying "the place where they met and conferred together." It was firſt applied to general aſſemblies of the ſtates under Louis VII. in France, about the middle of the 12th century. But it is certain, that, long before the introduction of the Norman language into England, all matters of importance were debated and ſettled in the great councils of the realm:—a practice which ſeems to have been univerſal among the northern nations, particularly the Germans; and carried by them into all the countries of Europe, which they over-ran at the diſſolution of the Roman empire. Relicks of which conſtitution, under various modifications and changes, are ſtill to be met with in the diets of Poland, Germany, and Sweden, and lately in the aſſembly of the eſtates in France: for what was there called the *parliament*, was only the ſupreme court of juſtice, conſiſting of the peers, certain dignified eccleſiaſtics, and judges; which neither was in practice, nor was ſuppoſed to be in theory, a general council of the realm.

In England, however, this general council hath been held immemorially, under the ſeveral names of *michel ſynoth*, or "great council;" *michel gemote*, or "great meeting;" and more frequently *wittena-gemote*, or "the meeting of wiſe men." It was alſo ſtyled in Latin, *commune concilium regni*, *magnum concilium regis*, *curia magna*, *conventus magnatum vel procerum*, *aſſiſa generalis*, and ſometimes *communitas regni Angliæ*. We have inſtances of its meeting to order the affairs of the kingdom, to make new laws, and to amend the old, or, as Fleta expreſſes it, *novis injuriis emerſis nova conſtituere remedia*, ſo early as the reign of Ina king of the Weſt Saxons, Offa king of the Mercians, and Ethelbert king of Kent, in the ſeveral realms of the heptarchy. And after their union, the Mirrour informs us, that King Alfred ordained for a perpetual uſage, that theſe councils ſhould meet twice in the year, or oftener if need be,

to treat of the government of God's people; how they ſhould keep themſelves from ſin, ſhonld live in quiet, and ſhould receive right. Our ſucceeding Saxon and Daniſh monarchs held frequent councils of this ſort, as appears from their reſpective codes of laws; the titles whereof uſually ſpeak them to be enacted, either by the king with the advice of his *wittena-gemote*, or wiſe men, as, *Hæc ſunt inſtituta, quæ Edgarus rex conſilio ſapientium ſuorum inſtituit*; or to be enacted by thoſe ſages with the advice of the king, as, *Hæc ſunt judicia, quæ ſapientes conſilio regis Ethelſtani inſtituerunt*; or laſtly, to be enacted by them both together, as *Hæ ſunt inſtitutiones, quas rex Edmundus et epiſcopi ſui cum ſapientibus ſuis inſtituerunt.*

There is alſo no doubt but theſe great councils were occaſionally held under the firſt princes of the Norman line. Glanvil, who wrote in the reign of Henry II. ſpeaking of the particular amount of an amercement in the ſheriff's court, ſays, it had never yet been aſcertained by the general aſſize or aſſembly, but was left to the cuſtom of particular counties. Here the general aſſize is ſpoken of as a meeting well known, and its ſtatutes or deciſions are put in a manifeſt contradiſtinction to cuſtom, or the common law. And in Edward III.'s time, an act of parliament, made in the reign of William the Conqueror, was pleaded in the caſe of the abbey of St. Edmund's-bury, and judicially allowed by the court.

Hence it indiſputably appears, that parliaments, or general councils, are coeval with the kingdom itſelf. How thoſe parliaments were conſtituted and compoſed, is another queſtion, which has been matter of great diſpute among our learned antiquarians; and particularly, whether the commons were ſummoned at all, or, if ſummoned, at what period they began to form a diſtinct aſſembly. But without entering into controverſies of this ſort, it may be ſufficient to obſerve, that it is generally agreed, that in the main the conſtitution of parliament, as it now ſtands, was marked out ſo long ago as the 17th year of King John, A. D. 1215, in the great charter granted by that prince; wherein he promiſes to ſummon all archbiſhops, biſhops, abbots, earls, and greater barons, perſonally; and all other tenants in chief under the crown, by the ſheriff and bailiffs; to meet at a certain place, with 40 days notice, to aſſeſs aids and ſcutages when neceſſary. And this conſtitution has ſubſiſted in fact at leaſt from the year 1266, 49 Henry III. there being ſtill extant writs of that date, to ſummon knights, citizens, and burgeſſes, to parliament. We proceed therefore to inquire wherein conſiſts this conſtitution of parliament, as it now ſtands, and has ſtood for the ſpace of at leaſt 500 years. And in the proſecution of this inquiry, we ſhall conſider, firſt, The manner and time of its aſſembling: Secondly, Its conſtituent parts: Thirdly, The laws and cuſtoms relating to parliament; Fourthly, The methods of proceeding, and of making ſtatutes, in both houſes; And, laſtly, The manner of the parliament's adjournment, prorogation, and diſſolution.

I. *As to the manner and time of aſſembling.* The parliament is regularly to be ſummoned by the king's writ or letter, iſſued out of chancery, by advice of the privy-council, at leaſt 40 days before it begins to ſit. It is a branch of the royal prerogative, that no parliament can be convened by its own authority, or by the authority of any except the king alone. And this prerogative is founded upon very good reaſon. For, ſuppoſing it had a right to meet ſpontaneouſly, without being called together, it is impoſſible to conceive that all the members, and each of the houſes, would agree unanimouſly upon the proper time and place of meeting; and if half of the members met, and half abſented themſelves, who ſhall determine which is really the legiſlative body, the part aſſembled, or that which ſtays away? It is therefore neceſſary, that the parliament ſhould be called together at a determinate time and place; and highly becoming its dignity and independence, that it ſhould be called together by none but one of its own conſtituent parts: and, of the three conſtituent parts, this office can only appertain to the king; as he is a ſingle perſon, whoſe will may be uniform and ſteady; the firſt perſon in the nation, being ſuperior to both houſes in dignity; and the only branch of the legiſlature that has a ſeparate exiſtence, and is capable of performing any act at a time when no parliament is in being. Nor is it an exception to this rule, that by ſome modern ſtatutes, on the demiſe of a king or queen, if there be then no parliament in being, the laſt parliament revives, and is to ſit again for ſix months, unleſs diſſolved by the ſucceſſor; for this revived parliament muſt have been originally ſummoned by the crown.

It is true, that the convention-parliament, which reſtored King Charles II. met above a month before his return; the lords by their own authority, and the commons in purſuance of writs iſſued in the name of the keepers of the liberty of England by authority of parliament; and that the ſaid parliament ſat till the 29th of December, full ſeven months after the Reſtoration; and enacted many laws, ſeveral of which are ſtill in force. But this was for the neceſſity of the thing, which ſuperſedes all law; for if they had not ſo met, it was morally impoſſible that the kingdom ſhould have been ſettled in peace. And the firſt thing done after the king's return was, to paſs an act declaring this to be a good parliament, notwithſtanding the defect of the king's writ. So that as the royal prerogative was chiefly wounded by their ſo meeting, and as the king himſelf, who alone had a right to object, conſented to wave the objection, this cannot be drawn into an example in prejudice of the rights of the crown. Beſides, we ſhould alſo remember, that it was at that time a great doubt among the lawyers, whether even this healing act made it a good parliament, and held by very many in the negative; though it ſeems to have been too nice a ſcruple. And yet, out of abundant caution, it was thought neceſſary to confirm its acts in the next parliament, by ſtatute 13 Car. II. c. 7. & c. 14.

It is likewiſe true, at the time of the Revolution, A. D. 1688, the lords and commons by their own authority, and upon the ſummons of the prince of Orange (afterwards King William), met in a convention, and therein diſpoſed of the crown and kingdom. But it muſt be remembered, that this aſſembling was upon a like principle of neceſſity as at the Reſtoration; that is, upon a full conviction that King James II. had abdicated the government, and that the throne was thereby vacant: which ſuppoſition of the individual members was confirmed by their concurrent reſolution, when they actually came together. And, in ſuch a caſe as the palpable vacancy of a throne, it follows, *ex neceſſitate rei*, that the form of the royal writs muſt be laid aſide, otherwiſe no parliament can ever meet again. For let us put another poſſible caſe, and ſuppoſe, for the ſake of argument, that the whole royal line ſhould at any time fail, and become extinct, which would indiſputably vacate the throne: in this ſituation it ſeems reaſonable to preſume, that the body of the nation, conſiſting of lords and commons, would have a right to meet and ſettle the government; otherwiſe there muſt be no government at all. And upon this and no other principle did the convention in 1688 aſſemble. The vacancy of the throne was precedent to their meeting without any royal ſummons, not a conſequence of it. They did not aſſemble without writ, and then make the throne vacant; but, the throne being previouſly vacant by the king's abdication, they aſſembled without writ, as they muſt do if they aſſembled at all. Had the throne been full, their meeting would not have been regular; but, as it was really empty, ſuch meeting became abſolutely neceſſary. And accordingly it is declared by ſtatute 1 W. & M. ſt. 1. c. 1. that this convention was really the two houſes of parliament, notwithſtanding the want of writs or other defects of form. So that, not-

withſtanding theſe two capital exceptions, which were juſtifiable only on a principle of neceſſity (and each of which, by the way, induced a revolution in the government), the rule laid down is in general certain, that the king only can convoke a parliament.

And this, by the ancient ſtatutes of the realm, he is bound to do every year, or oftener if need be. Not that he is, or ever was, obliged by theſe ſtatutes to call a new parliament every year; but only to permit a parliament to ſit annually for the redreſs of grievances, and diſpatch of buſineſs, if need be. Theſe laſt words are ſo looſe and vague, that ſuch of our monarchs as were inclined to govern without parliaments, neglected the convoking them, ſometimes for a very conſiderable period, under pretence that there was no need of them. But, to remedy this, by the ſtatute 16 Car. II. c. 1. it is enacted, that the ſitting and holding of parliaments ſhall not be intermitted above three years at the moſt. And by the ſtatute 1 W. & M. ſt. 2. c 2. it is declared to be one of the rights of the people, that for redreſs of all grievances, and for the amending, ſtrengthening, and preſerving the laws, parliaments ought to be held frequently. And this indefinite frequency is again reduced to a certainty by ſtatute 6 W. & M. c. 2. which enacts, as the ſtatute of Charles II. has done before, that a new parliament ſhall be called within three years after the determination of the former.

II. *The conſtituent parts of a parliament are*, the king's majeſty, ſitting there in his royal political capacity, and the three eſtates of the realm; the lords ſpiritual, the lords temporal (who ſit together with the king in one houſe), and the commons, who ſit by themſelves in another. And the king and theſe three eſtates together form the great corporation or body politic of the kingdom, of which the king is ſaid to be *caput, principium, et finis*. For, upon their coming together, the king meets them either in perſon or by repreſentation; without which there can be no beginning of a parliament; and he alſo has alone the power of diſſolving them.

It is highly neceſſary for preſerving the balance of the conſtitution, that the executive power ſhould be a branch, though not the whole, of the legiſlature. The total union of them, we have ſeen, would be productive of tyranny; the total diſjunction of them, for the preſent, would in the end produce the ſame effects, by cauſing that union againſt which it ſeems to provide. The legiſlature would ſoon become tyrannical, by making continual encroachments, and gradually aſſuming to itſelf the rights of the executive power. Thus the long parliament of Charles I. while it acted in a conſtitutional manner, with the royal concurrence, redreſſed many heavy grievances, and eſtabliſhed many ſalutary laws. But when the two houſes aſſumed the power of legiſlation, in excluſion of the royal authority, they ſoon after aſſumed likewiſe the reins of adminiſtration; and, in conſequence of theſe united powers, overturned both church and ſtate, and eſtabliſhed a worſe oppreſſion than any they pretended to remedy. To hinder therefore any ſuch encroachments, the king is himſelf a part of the parliament; and as this is the reaſon of his being ſo, very properly therefore the ſhare of legiſlation which the conſtitution has placed in the crown, conſiſts in the power of rejecting, rather than reſolving; this being ſufficient to anſwer the end propoſed. For we may apply to the royal negative, in this inſtance, what Cicero obſerves of the negative of the Roman tribunes, that the crown has not any power of doing wrong, but merely of preventing wrong from being done. The crown cannot begin of itſelf any alterations in the preſent eſtabliſhed law; but it may approve or diſapprove of the alterations ſuggeſted and conſented to by the two houſes. The legiſlature therefore cannot abridge the executive power of any rights which it now has by law, without its own conſent; ſince the law muſt perpetually ſtand as it now does, unleſs all the powers will agree to alter it. And herein indeed conſiſts the true excellence of the Britiſh government, that all the parts of it form a mutual check upon each other. In the legiſlature, the people are a check upon the nobility, and the nobility a check upon the people, by the mutual privilege of rejecting what the other has reſolved; while the king is a check upon both, which preſerves the executive power from encroachments. And this very executive power is again checked and kept within due bounds by the two houſes, through the privilege they have of inquiring into, impeaching, and puniſhing the conduct (not indeed of the king, which would deſtroy his conſtitutional independence, but, which is more beneficial to the public,) of his evil and pernicious counſellors. Thus every branch of our civil polity ſupports and is ſupported, regulates and is regulated, by the reſt: for the two houſes naturally drawing in two directions of oppoſite intereſt, and the prerogative in another ſtill different from them both, they mutually keep each other from exceeding their proper limits; while the whole is prevented from ſeparation, and artificially connected together by the mixed nature of the crown, which is a part of the legiſlative, and the ſole executive magiſtrate. Like three diſtinct powers in mechanics, they jointly impel the machine of government in a direction different from what either, acting by itſelf, would have done; but at the ſame time in a direction partaking of each, and formed out of all; a direction which conſtitutes the true line of the liberty and happineſs of the community.

Having already conſidered theſe conſtituent parts of the ſovereign power, or parliament, each in a ſeparate view, under the articles KING, LORDS, and COMMONS, to which the reader is referred, we proceed,

III. To examine the laws and cuſtoms relating to parliament, united together and conſidered as one aggregate body. The power and juriſdiction of parliament, ſays Sir Edward Coke, is ſo tranſcendent and abſolute, that it cannot be confined either for cauſes or perſons within any bounds. And of this high court, he adds, it may be truly ſaid, *Si antiquitatem ſpectes, eſt vetuſtiſſima; ſi dignitatem, eſt honoratiſſima; ſi juriſdictionem, eſt capaciſſima.* It hath ſovereign and uncontrolable authority in making, confirming, enlarging, reſtraining, abrogating, repealing, reviving, and expounding of laws, concerning matters of all poſſible denominations, eccleſiaſtical or temporal, civil, military, maritime, or criminal: this being the place where that abſolute deſpotic power, which muſt in all governments reſide ſomewhere, is entruſted by the conſtitution of theſe kingdoms. All miſchiefs and grievances, operations and remedies, that tranſcend the ordinary courſe of the laws, are within the reach of this extraordinary tribunal. It can regulate or new-model the ſucceſſion to the crown; as was done in the reign of Henry VIII. and William III. It can alter the eſtabliſhed religion of the land; as was done in a variety of inſtances in the reigns of king Henry VIII. and his three children. It can change and create afreſh even the conſtitution of the kingdom and of parliaments themſelves; as was done by the act of union, and the ſeveral ſtatutes for triennial and ſeptennial elections. It can, in ſhort, do every thing that is not naturally impoſſible; and therefore ſome have not ſcrupled to call its power, by a figure rather too bold, the *omnipotence of parliament*. True it is, that what the parliament doth, no authority upon earth can undo. So that it is a matter moſt eſſential to the liberties of this kingdom, that ſuch members be delegated to this important truſt as are moſt eminent for their probity, their fortitude, and their knowledge; for it was a known apophthegm of the great lord treaſurer Burleigh, "That England could never be ruined but by a parliament;" and, as Sir Matthew Hale obſerves, this being the higheſt and greateſt

court, over which none other can have jurisdiction in the kingdom, if by any means a misgovernment should anyway fall upon it, the subjects of this kingdom are left without all manner of remedy. To the same purpose the president Montesquieu, though we trust too hastily, presages, that, as Rome, Sparta, and Carthage, have lost their liberty and perished; so the constitution of England will in time lose its liberty, will perish: it will perish whenever the legislative power shall become more corrupt than the executive.

It must be owned, that Mr. Locke, and other theoretical writers, have held, that "there remains still inherent in the people a supreme power to remove or alter the legislature, when they find the legislature act contrary to the trust reposed in them; for when such trust is abused, it is thereby forfeited, and devolves to those who gave it." But however just this conclusion may be in theory, we cannot adopt it, nor argue from it, under any dispensation of government at present actually existing. For this devolution of power, to the people at large, includes in it a dissolution of the whole form of government established by that people; reduces all the members to their original state of equality; and, by annihilating the sovereign power, repeals all positive laws whatsoever before enacted. No human laws will therefore suppose a case, which at once must destroy all law, and compel men to build afresh upon a new foundation; nor will they make provision for so desperate an event as must render all legal provisions ineffectual. So long therefore as the English constitution lasts, we may venture to affirm, that the power of parliament is absolute and without controul.

In order to prevent the mischiefs that might arise by placing this extensive authority in hands that are either incapable or else improper to manage it, it is provided by the custom and law of parliament, that no one shall sit or vote in either house unless he be 21 years of age. This is also expressly declared by statute 7 & 8 W. III. c. 25: with regard to the house of commons, doubts have arisen, from some contradictory adjudications, whether or not a minor was incapacitated from sitting in that house. It is also enacted by statute 7 Jac. I. c. 6. that no member be permitted to enter the house of commons till he hath taken the oath of allegiance before the lord steward or his deputy: and by 30 Car. II. st. 2. and 1 Geo. I. c. 13. that no member shall vote or sit in either house, till he hath, in the presence of the house, taken the oaths of allegiance, supremacy, and abjuration, and subscribed and repeated the declaration against transubstantiation, and invocation of saints, and the sacrifice of the mass. Aliens, unless naturalized, were likewise by the law of parliament incapable to serve therein: and now it is enacted, by statute 12 & 13 W. III. c. 2. that no alien, even though he be naturalized, shall be capable of being a member of either house of parliament. And there are not only these standing incapacities; but if any person is made a peer by the king, or elected to serve in the house of commons by the people, yet may the respective houses, upon complaint of any crime in such person, and proof thereof, adjudge him disabled and incapable to sit as a member: and this by the law and custom of parliament.

For as every court of justice hath laws and customs for its direction, some the civil and canon, some the common law, others their own peculiar laws and customs; so the high court of parliament hath also its own peculiar law, called the *lex et consuetudo parliamenti*; a law which, Sir Edward Coke observes, is *ab omnibus quærenda, a multis ignorata, a paucis cognita*. It will not therefore be expected that we should enter into the examination of this law with any degree of minuteness; since, as the same learned author assures us, it is much better to be learned out of the rolls of parliament and other records, and by precedents and continual experience, than can be expressed by any one man. It will be sufficient to observe, that the whole of the law and custom of parliament has its original from this one maxim, "That whatever matter arises concerning either house of parliament, ought to be examined, discussed, and adjudged in that house to which it relates, and not elsewhere." Hence, for instance, the lords will not suffer the commons to interfere in settling the election of a peer of Scotland; the commons will not allow the lords to judge of the election of a burgess; nor will either house permit the subordinate courts of law to examine the merits of either case. But the maxims upon which they proceed, together with the method of proceeding, rest entirely in the breast of the parliament itself; and are not defined and ascertained by any particular stated laws.

The privileges of parliament are likewise very large and indefinite; and therefore, when, in 31st Hen. VI. the house of lords propounded a question to the judges concerning them, the chief justice, Sir John Fortescue, in the name of his brethren, declared, "That they ought not to make answer to that question; for it hath not been used aforetime, that the justices should in anywise determine the privileges of the high court of parliament; for it is so high and mighty in its nature, that it may make law; and that which is law, it may make no law: and the determination and knowledge of that privilege belongs to the lords of parliament, and not to the justices." Privilege of parliament was principally established in order to protect its members not only from being molested by their fellow-subjects, but also more especially from being oppressed by the power of the crown. If therefore all the privileges of parliament were once to be set down and ascertained, and no privilege to be allowed but what was so defined and determined, it were easy for the executive power to devise some new case, not within the line of privilege, and under pretence thereof to harass any refractory member and violate the freedom of parliament. The dignity and independence of the two houses are therefore in great measure preserved by keeping their privileges indefinite. Some, however, of the more notorious privileges of the members of either house are, privilege of speech, of person, of their domestics, and of their lands and goods. As to the first, privilege of speech, it is declared by the statute 1 W & M. st. 2. c. 2. as one of the liberties of the people, "That the freedom of speech, and debates, and proceedings in parliament, ought not to be impeached or questioned in any court or place out of parliament." And this freedom of speech is particularly demanded of the king in person, by the speaker of the house of commons, at the opening of every new parliament. So likewise are the other privileges, of person, servants, lands, and goods; which are immunities as ancient as Edward the Confessor: in whose laws we find this precept, *Ad synodos venientibus, sive summoniti sint, sive per se quid agendum habuerint, sit summa pax*; and so too in the old Gothic constitutions, *Extenditur hæc pax et securitas ad quatuordecim dies, convocato regni senatu.* This included formerly not only privilege from illegal violence, but also from legal arrests and seizures by process from the courts of law. And still to assault by violence a member of either house, or his menial servants, is a high contempt of parliament, and there punished with the utmost severity. It has likewise peculiar penalties annexed to it in the courts of law by the statutes 5 Hen. IV. c. 6. and 11 Hen. VI. c. 11. Neither can any member of either house be arrested and taken into custody without a breach of the privilege of parliament.

But all other privileges which derogate from the common law are now at an end, save only as to the freedom of the member's person; which in a peer (by the privilege of peerage) is for ever sacred and inviolable; and in a commoner (by the privilege of parliament) for forty days after every prorogation, and forty days before the next appointed meeting; which is now in effect as long as the parliament subsists, it seldom being prorogued for more than eighty days at a time. As to all other

privileges which obſtruct the ordinary courſe of juſtice, they were reſtrained by the ſtatutes 12 W. III. c. 3. 2 and 3 Ann. c. 18. and 11 Geo. II. c. 24. and are now totally aboliſhed by ſtatute 10 G. III. c. 50.: which enacts, that any ſuit may at any time be brought againſt any peer or member of parliament, their ſervants, or any other perſon intitled to privilege of parliament; which ſhall not be impeached or delayed by pretence of any ſuch privilege, except that the perſon of a member of the houſe of commons ſhall not thereby be ſubjected to any arreſt or impriſonment. Likewiſe, for the benefit of commerce, it is provided by ſtatute 4 Geo. III. c. 33. that any trader, having privilege of parliament, may be ſerved with legal proceſs for any juſt debt (to the amount of 100l.): and unleſs he makes ſatisfaction within two months, it ſhall be deemed an act of bankruptcy; and that commiſſions of bankruptcy may be iſſued againſt ſuch privileged traders in like manner as againſt any other.

The only way by which courts of juſtice could anciently take cognizance of privilege of parliament, was by a writ of privilege, in the nature of a *ſuperſedeas*, to deliver the party out of cuſtody when arreſted in a civil ſuit. For when a letter was written by the ſpeaker to the judges, to ſtay proceedings againſt a privileged perſon, they rejected it as contrary to their oath of office. But ſince the ſtatute 12 Will. III. c. 3. which enacts, that no privileged perſon ſhall be ſubject to arreſt or impriſonment, it hath been held, that ſuch arreſt is irregular *ab initio*, and that the party may be diſcharged upon motion. It is to be obſerved, that there is no precedent of any ſuch writ of privilege, but only in civil ſuits; and that the ſtatute of 1 Jac. I. c. 13. and that of King William (which remedy ſome inconveniences ariſing from privilege of parliament), ſpeak only of civil actions. And therefore the claim of privilege hath been uſually guarded with an exception as to the caſe of indictable crimes; or, as it hath been frequently expreſſed, of treaſon, felony, and breach (or ſurety) of the peace. Whereby it ſeems to have been underſtood, that no privilege was allowable to the members, their families, or ſervants, in any *crime* whatſoever; for all crimes are treated by the law as being *contra pacem domini regis*. And inſtances have not been wanting, wherein privileged perſons have been convicted of miſdemeanors, and committed, or proſecuted to outlawry, even in the middle of a ſeſſion; which proceeding has afterwards received the ſanction and approbation of parliament. To which may be added, that a few years ago, the caſe of writing and publiſhing ſeditious libels was reſolved by both houſes not to be intitled to privilege; and that the reaſons upon which that caſe proceeded, extended equally to every indictable offence. So that the chief, if not the only, privilege of parliament, in ſuch caſes, ſeems to be the right of receiving immediate information of the impriſonment or detention of any member, with the reaſon for which he is detained; a practice that is daily uſed upon the ſlighteſt military accuſations, preparatory to a trial by a court-martial; and which is recognized by the ſeveral temporary ſtatutes for ſuſpending the *habeas corpus* act: whereby it is provided, that no member of either houſe ſhall be detained, till the matter of which he ſtands ſuſpected be firſt communicated to the houſe of which he is a member, and the conſent of the ſaid houſe obtained for his commitment or detaining. But yet the uſage has uniformly been, ever ſince the Revolution, that the communication has been ſubſequent to the arreſt.

Theſe are the general heads of the laws and cuſtoms relating to parliament, conſidered as one aggregate body. The laws and cuſtoms relating to each branch in particular being explained under the articles already referred to, viz. KING, LORDS, and COMMONS, we ſhall proceed, IV. To the method of making laws; which is much the ſame in both houſes. But for this, too, we have to refer the reader to the article BILL; and ſhall only obſerve in this place, that, for diſpatch of buſineſs, each houſe of parliament has its ſpeaker. The ſpeaker of the houſe of lords, whoſe office it is to preſide there, and manage the formality of buſineſs, is the lord chancellor, or keeper of the king's great ſeal, or any other appointed by the king's commiſſion: and if none be ſo appointed, the houſe of lords (it is ſaid) may elect. The ſpeaker of the houſe of commons is choſen by the houſe; but muſt be approved by the king. And herein the uſage of the two houſes differs, that the ſpeaker of the houſe of commons cannot give his opinion or argue any queſtion in the houſe; but the ſpeaker of the houſe of lords, if a lord of parliament, may. In each houſe the act of the majority binds the whole; and this majority is declared by votes openly and publicly given; not, as at Venice, and many other ſenatorial aſſemblies, privately, or by ballot. This latter method may be ſerviceable, to prevent intrigues and unconſtitutional combinations; but is impoſſible to be practiſed with us, at leaſt in the houſe of commons, where every member's conduct is ſubject to the future cenſure of his conſtituents, and therefore ſhould be openly ſubmitted to their inſpection.

V. There remains only, in the laſt place, to add a word or two concerning the manner in which parliaments may be *adjourned*, *prorogued*, or *diſſolved*.

An *adjournment* is no more than a continuance of the ſeſſion from one day to another; as the word itſelf ſignifies; and this is done by the authority of each houſe ſeparately every day; and ſometimes for a fortnight or a month together, as at Chriſtmas or Eaſter, or upon other particular occaſions. But the adjournment of one houſe is no adjournment of the other. It hath alſo been uſual, when his Majeſty hath ſignified his pleaſure that both or either of the houſes ſhould adjourn themſelves to a certain day, to obey the king's pleaſure ſo ſignified, and to adjourn accordingly. Otherwiſe, beſides the indecorum of a refuſal, a prorogation would aſſuredly follow: which would often be very inconvenient to both public and private buſineſs. For prorogation puts an end to the ſeſſion; and then ſuch bills as are only begun, and not perfected, muſt be reſumed *de novo* (if at all) in a ſubſequent ſeſſion; whereas, after an adjournment, all things continue in the ſame ſtate as at the time of the adjournment made, and may be proceeded on without any freſh commencement.

A *prorogation* is the continuance of the parliament from one ſeſſion to another; as an adjournment is a continuation of the ſeſſion from day to day. This is done by the royal authority, expreſſed either by the lord chancellor in his Majeſty's preſence, or by commiſſion from the crown, or frequently by proclamation. Both houſes are neceſſarily prorogued at the ſame time; it not being a prorogation of the houſe of lords or commons, but of the parliament. The ſeſſion is never underſtood to be at an end until a prorogation; though, unleſs ſome act be paſſed, or ſome judgment given in parliament, it is in truth no ſeſſion at all. And formerly the uſage was, for the king to give the royal aſſent to all ſuch bills as he approved at the end of every ſeſſion, and then to prorogue the parliament, though ſometimes only for a day or two; after which all buſineſs then depending in the houſes was to be begun again. Which cuſtom obtained ſo ſtrongly, that it once became a queſtion, Whether giving the royal aſſent to a ſingle bill did not of courſe put an end to the ſeſſion? And though it was then reſolved in the negative, yet the notion was ſo deeply rooted, that the ſtatute 1 Car. I. c. 1. was paſſed to declare, that the king's aſſent to that and ſome other acts ſhould not put an end to the ſeſſion; and even ſo late as the reign of Charles II. we find a proviſo frequently tacked to a bill, that his Majeſty's aſſent thereto ſhould not determine the ſeſſion of parliament. But it now ſeems to be allowed, that a prorogation muſt be expreſsly made, in order to determine the ſeſſion. And if at the time of an actual rebellion

or imminent danger of invaſion, the parliament ſhall be ſeparated by adjournment or prorogation, the king is empowered to call them together by proclamation, with 14 days notice of the time appointed for their reaſſembling.

A *diſſolution* is the civil death of the parliament; and this may be effected three ways: 1. By the king's will, expreſſed either in perſon or by repreſentation. For as the king has the ſole right of convening the parliament, ſo alſo it is a branch of the royal prerogative, that he may (whenever he pleaſes) prorogue the parliament for a time, or put a final period to its exiſtence. If nothing had a right to prorogue or diſſolve a parliament but itſelf, it might happen to become perpetual. And this would be extremely dangerous, if at any time it ſhould attempt to encroach upon the executive power; as was fatally experienced by the unfortunate king Charles I; who, having unadviſedly paſſed an act to continue the parliament then in being till ſuch time as it ſhould pleaſe to diſſolve itſelf, at laſt fell a ſacrifice to that inordinate power which he himſelf had conſented to give them. It is therefore extremely neceſſary that the crown ſhould be empowered to regulate the duration of theſe aſſemblies, under the limitations which the Engliſh conſtitution has preſcribed: ſo that on the one hand, they may frequently and regularly come together for the diſpatch of buſineſs and redreſs of grievances; and may not, on the other, even with the conſent of the crown, be continued to an inconvenient or unconſtitutional length.

2. A parliament may be diſſolved by the demiſe of the crown. This diſſolution formerly happened immediately upon the death of the reigning ſovereign: for he being conſidered in law as the head of the parliament, (*caput, principium, et finis*), that failing, the whole body was held to be extinct. But the calling a new parliament immediately on the inauguration of the ſucceſſor being found inconvenient, and dangers being apprehended from having no parliament in being in caſe of a diſputed ſucceſſion, it was enacted by the ſtatutes 7 & 8 W. III. c. 15. and 6 Ann. c. 7. that the parliament in being ſhall continue for ſix months after the death of any king or queen, unleſs ſooner prorogued or diſſolved by the ſucceſſor; that if the parliament be, at the time of the king's death, ſeparated by adjournment or prorogation, it ſhall notwithſtanding aſſemble immediately: and that if no parliament is then in being, the members of the laſt parliament ſhall aſſemble, and be again a parliament.

3. Laſtly, a parliament may be diſſolved or expire by length of time. For if either the legiſlative body were perpetual, or might laſt for the life of the prince who convened them as formerly, and were ſo to be ſupplied, by occaſionally filling the vacancies with new repreſentatives; in theſe caſes, if it were once corrupted, the evil would be paſt all remedy; but when different bodies ſucceed each other, if the people ſee cauſe to diſapprove of the preſent, they may rectify its faults in the next. A legiſlative aſſembly alſo, which is ſure to be ſeparated again (whereby its members will themſelves become private men, and ſubject to the full extent of the laws which they have enacted for others), will think themſelves bound, in intereſt as well as duty, to make only ſuch laws as are good. The utmoſt extent of time that the ſame parliament was allowed to ſit, by the ſtatute 6 W. & M. c. 3. was *three* years: after the expiration of which, reckoning from the return of the firſt ſummons, the parliament was to have no longer continuance. But by the ſtatute 1 Geo. I. ſt. 2, c. 38. (in order, profeſſedly, to prevent the great and continued expences of frequent elections, and the violent heats and animoſities conſequent thereupon, and for the peace and ſecurity of the government then juſt recovering from the late rebellion), this term was prolonged to *ſeven* years; and, what alone is an inſtance of the vaſt authority of parliament, the very ſame houſe that was choſen for three years, enacted its own continuance for ſeven. So that, as our conſtitution now ſtands, the parliament muſt expire, or die a natural death, at the end of every ſeventh year, if not ſooner diſſolved by the royal prerogative.

We ſhall conclude this article with an account of ſome general forms not taken notice of under any of the above heads.

In the houſe of lords, the princes of the blood ſit by themſelves on the ſides of the throne; at the wall, on the king's right hand, the two archbiſhops ſit by themſelves on a form. Below them, the biſhops of London, Durham, and Wincheſter, and all the other biſhops, ſit according to the priority of their conſecration. On the king's left hand the lord treaſurer, lord preſident and lord privy-ſeal, ſit upon forms above all dukes except the royal blood; then the dukes, marquiſſes, and earls, according to their creation. Acroſs the room are wool-ſacks, continued from an ancient cuſtom; and the chancellor, or keeper, being of courſe the ſpeaker of the houſe of lords, ſits on the firſt wool-ſack before the throne, with the great ſeal or mace lying by him; below theſe are forms for the viſcounts and barons. On the other wool-ſacks are ſeated the judges, maſters in chancery, and king's council, who are only to give their advice in points of law: but they all ſtand up till the king gives them leave to ſit.

The commons ſit promiſcuouſly; only the ſpeaker has a chair at the upper end of the houſe, and the clerk and his aſſiſtant ſit at a table near him.

When a member of the houſe of commons ſpeaks, he ſtands up uncovered, and directs his ſpeech to the ſpeaker only. If what he ſays be anſwered by another, he is not allowed to reply the ſame day, unleſs perſonal reflections have been caſt upon him: but when the commons, in order to have a greater freedom of debate, have reſolved themſelves into a committee of the whole houſe, every member may ſpeak to a queſtion as often as he thinks neceſſary. In the houſe of lords they vote, beginning at the puiſne or loweſt baron, and ſo up orderly to the higheſt, every one anſwering, *Content* or *Not content*. In the houſe of commons they vote by *yeas* and *nays*; and if it be dubious, which are the greater number, the houſe divides. If the queſtion be about bringing any thing into the houſe, the *yeas* go out; but if it be about any thing the houſe already has, the *nays* go out. In all diviſions the ſpeaker appoints four tellers, two of each opinion. In a committee of the whole houſe, they divide by changing ſides, the *yeas* taking the right and the *nays* the left of the chair; and then there are but two tellers. If a bill paſs one houſe, and the other demur to it, a conference is demanded in the painted chamber, where certain members are deputed from each houſe; and here the lords ſit covered, and the commons ſtand bare, and debate the caſe. If they diſagree, the affair is null; but if they agree, this, with the other bills that have paſſed both houſes, is brought down to the king in the houſe of lords, who comes thither clothed in his royal robes; before him the clerk of the parliament reads the title of each bill, and as he reads, the clerk of the crown pronounces the royal aſſent or diſſent. If it be a public bill, the royal aſſent is given in theſe words: *Le roy le veut*, "The king will have it ſo;" if private, *Soit fait comme il eſt deſiré*, "Let the requeſt be complied with;" if the king refuſes the bill, the anſwer is, *Le roy s'aviſera*, "The king will think of it;" and if it be a money-bill, the anſwer is, *Le roy remercie ſes loyaux ſujets, accepte leur benevolence, & auſſi le veut*; "The king thanks his loyal ſubjects, accepts their benevolence, and therefore grants his conſent."

High Court of PARLIAMENT, is the ſupreme court in the kingdom, not only for the making, but alſo for the execution of laws; by the trial of great and enormous offenders, whether lords or commoners, in the method of parliamentary impeachment. As for acts of parliament to attaint particular perſons of treaſon or felony, or to inflict pains and penalties,

beyond or contrary to the common law, to ſerve a ſpecial purpoſe, we ſpeak not of them; being to all intents and purpoſes new laws, made *pro re nata*, and by no means an execution of ſuch as are already in being. But an impeachment before the lords by the commons of Great Britain, in parliament, is a proſecution of the already known and eſtabliſhed law, and has been frequently put in practice; being a preſentment to the moſt high and ſupreme court of criminal juriſdiction by the moſt folemn grand inqueſt of the whole kingdom. A commoner cannot, however, be impeached before the lords for any capital offence, but only for high miſdemeanors; a peer may be impeached for any crime. And they uſually (in caſe of an impeachment of a peer for treaſon) addreſs the crown to appoint a lord high ſteward, for the greater dignity and regularity of their proceedings; which high ſteward was formerly elected by the peers themſelves, though he was generally commiſſioned by the king; but it hath of late years been ſtrenuouſly maintained, that the appointment of an high ſteward in ſuch caſes is not indiſpenſably neceſſary, but that the houſe may proceed without one. The articles of impeachment are a kind of bills of indictment, found by the houſe of commons. and afterwards tried by the lords; who are in caſes of miſdemeanors conſidered not only as their own peers, but as the peers of the whole nation. This is a cuſtom derived to us from the conſtitution of the ancient Germans, who in their great councils ſometimes tried capital accuſations relating to the public: *Licet apud concilium accuſare quoque, et diſcrimen capitis intendere.* And it has a peculiar propriety in the Engliſh conſtitution; which has much improved upon the ancient model imported hither from the continent. For though in general the union of the legiſlative and judicial powers ought to be moſt carefully avoided, yet it may happen that a ſubject, intruſted with the adminiſtration of public affairs, may infringe the rights of the people, and be guilty of ſuch crimes as the ordinary magiſtrate either dares not or cannot puniſh. Of theſe the repreſentatives of the people, or houſe of commons, cannot properly judge; becauſe their conſtituents are the parties injured, and can therefore only impeach. But before what court ſhall this impeachment be tried? Not before the ordinary tribunals, which would naturally be ſwayed by the authority of ſo powerful an accuſer. Reaſon therefore will ſuggeſt, that this branch of the legiſlature, which repreſents the people, muſt bring its charge before the other branch, which conſiſts of the nobility, who have neither the ſame intereſts, nor the ſame paſſions, as popular aſſemblies. This is a vaſt ſuperiority which the conſtitution of this iſland enjoys over thoſe of the Grecian or Roman republics: where the people were at the ſame time both judges and accuſers. It is proper that the nobility ſhould judge, to inſure juſtice to the accuſed; as it is proper that the people ſhould accuſe, to inſure juſtice to the commonwealth. And therefore, among other extraordinary circumſtances attending the authority of this court, there is one of a very ſingular nature, which was inſiſted on by the houſe of commons in the caſe of the earl of Danby in the reign of Charles II. and is now enacted by ſtatute 12 & 13 W. III. c. 2 that no pardon under the great ſeal ſhall be pleadable to an impeachment by the commons of Great Britain in parliament.

Such is the nature of a Britiſh parliament and in theory at leaſt we ſhould preſume it were nearly perfect: but ſome of our fellow-countrymen, more zealous perhaps than wiſe, ſee prodigious faults in it, ſuch indeed as they think muſt inevitably prove fatal. The conſequence of this perſuaſion has been a loud and inceſſant call for parliamentary reform. That abuſes ought to be reformed, is certain; and that few inſtitutions are ſo perfect as not to need amendment, is a fact equally indiſputable. We ſhall even ſuppoſe that there are many abuſes in our parliament which would require to be amended; but, granting all this, and ſomething more if it were neceſſary, we ſhould recommend in the mean time to the ſerious conſideration of thoſe who call themſelves the *Friends of the People*, whoſe ſincerity in their profeſſions it would be unpolite to queſtion, the example of France, and that they would allow it to be a warning to Britain. France wanted reform indeed, and that which was firſt propoſed had the countenance of the cooleſt and the beſt of men; but the conſequences have been dreadful; and if ever a free and ſtable government take place in it, which we ſincerely wiſh may be ſoon, it will have been purchaſed at an immenſe price, by enormities which will diſgrace it whilſt the remembrance of them laſts.

The former PARLIAMENTS *of France* were ſovereign courts eſtabliſhed by the king, finally to determine all diſputes between particular perſons, and to pronounce on appeals from ſentences given by inferior judges.—There were ten of theſe parliaments in France, of which that of Paris was the chief, its privileges and juriſdiction being of the greateſt extent. It conſiſted of eight chambers: the grand chamber, where cauſes of audience were pleaded: the chamber of written law; the chamber of counſel; the Tournelle criminelle, for judging criminal affairs; the Tournelle civile, in aid of the grand chamber; and three chambers of inqueſts, where proceſſes were adjudged in writing: beſide theſe, there was alſo the chamber of vacations, and thoſe of requeſts. In 1771 the king thought fit to branch the parliament of Paris into ſix different parliaments, under the denomination of ſuperior courts, each parliament having ſimilar juriſdiction. Under their ſecond race of kings, this parliament, like that of England, was the king's council; it gave audience to ambaſſadors, and conſulted of the affairs of war and government. The king, like ours, at that time preſided in them, without being at all maſter of their reſolutions. But in after times their authority was abridged; as the kings reſerved the deciſion of the grand affairs of the public to their own councils; leaving none but private ones to the parliaments. The parliament of Paris alſo were ſuppoſed to enjoy the privilege of verifying and regiſtering the king's arrets or edicts, without which thoſe edicts were void; the aſſent, however, of this parliament, to any public meaſure propoſed by the king, was generally a matter of courſe.

PARLIAMENT *of Sweden*, conſiſts of four eſtates, with the king at their head. Theſe eſtates are, 1. The nobility and repreſentatives of the gentry; with whom the colonels, lieutenant colonels, majors, and captains of every regiment, ſit and vote. 2. The clergy; one of which body is elected from every rural deanery of ten pariſhes; who, with the biſhops and ſuperintendants, amount to about 200. 3. The burghers, elected by the magiſtrates and council of every corporation as their repreſentatives, of whom there are four for Stockholm, and two for every other town, amounting in the whole to about 150. 4. The peaſants, choſen by the peaſants out of every diſtrict; who chooſe one of their own rank, and not a gentleman, to repreſent them: theſe amount to about 250. All theſe generally meet at Stockholm: and after the ſtate-affairs have been repreſented to them from the throne, they ſeparate, and ſit in four ſeveral chambers or houſes, in each of which affairs are carried on by majority of votes; and every chamber has a negative in the paſſing any law.

PARMA, an ancient, rich, populous, and handſome town of Italy, capital of the duchy of the ſame name, with a citadel, a biſhop's ſee, and an univerſity. It has a magnificent cathedral, and the largeſt opera-houſe in Europe, which has ſeats for 8000 people; but as it required a vaſt number of candles, which occaſioned great expence, they have contrived another which has room for 2000 ſpectators. The dome and the church of St. John are painted by the famous Coreggio, who was a

native of this place. Don Carlos, king of the Two Sicilies, carried away the library to Naples, which contained 18,000 volumes, and a very valuable cabinet of curioſities, as alſo the rich collection of medals. The citadel, which is very near the city, is built in the ſame taſte as that at Antwerp. In 1734 there was a bloody battle fought here; and in 1741, by the treaty of Aix-la Chapelle, the duchies of Parma, Placentia, and Guaſtalla, were given to Don Philip, brother to Don Carlos abovementioned. It is 40 miles north-weſt of Modena, and 60 ſouth eaſt of Milan. E. lon. 10. 30. N. lat. 44. 50.

PARMA, the duchy of a province of Italy, bounded on the north by the Po; on the north-eaſt by the Mantuan; on the eaſt by the duchy of Modena; on the ſouth by Tuſcany; and on the weſt by the duchy of Placentia. The air is very wholeſome, on which account the inhabitants live to a great age. The ſoil is very fertile, in corn, wine, oil, and hemp; the paſtures feed a great number of cattle, and the cheeſe is in very high eſteem. Here are conſiderable mines of copper and ſilver, and plenty of truffles, which many are very fond of.

PARMESAN CHEESE, a ſort of cheeſe much eſteemed among the Italians; ſo named from the duchy of Parma, where it is made, and whence it is conveyed to various parts of Europe. The excellent paſture-grounds of this country are watered by the Po; and the cows from whoſe milk this cheeſe is made yield a great quantity of it. Of this cheeſe there are three ſorts; the *fromaggio di forma*, about two palms in diameter, and ſeven or eight inches thick; and the *fromaggio di ribiole* and *di ribolini*, which are not ſo large. This cheeſe is of a ſaffron-colour; and the beſt is kept three or four years. See CHEESE.

PARMIGIANO, a celebrated painter, whoſe true name was Franceſco Mazzuoli; but he received the former from the city of Parma, where he was born, in 1504. He was brought up under his two uncles, and was an eminent painter when but 16 years of age. He was famous all over Italy at 19; and at 23 performed ſuch wonders, that when the general of the emperor Charles V. took Rome by ſtorm, ſome of the common ſoldiers having, in ſacking the town, broke into his apartments, found him intent upon his work, and were inſtantly ſo ſtruck with the beauty of his pieces, that inſtead of involving him in the plunder and deſtruction in which they were then employed, they reſolved to protect him from all manner of violence; which they actually performed. His works are diſtinguiſhed by the beauty of the colouring, the invention, and drawing. His figures are ſpirited and graceful, particularly with reſpect to the choice of attitude, and in their dreſſes. He alſo excelled in muſic, in which he much delighted.

In large compoſitions Parmigiano did not always reach an high degree of excellence; but in his holy families, and other ſimilar ſubjects, the gracefulneſs of his heads, and the elegance of his attitudes, are peculiarly delightful. For the celebrity of his name he ſeems to be chiefly indebted to his numerous drawings and etchings; for his life being ſhort, and a great part of it conſumed in the idle ſtudy of alchemy, in purſuit of the philoſopher's ſtone, and in the ſeducing avocations of muſic and gambling, there was but little time left for application to the laborious part of his buſineſs. His paintings in oil are few in number, and held in high eſteem, as are alſo his drawings and etchings; good impreſſions of theſe laſt being very rarely to be found He was the firſt that practiſed the art of etching in Italy; and probably he did not at firſt know that it had been for ſome years practiſed in Germany. When he ſet out for Rome, he was adviſed to take ſome of his pictures with him, as a means of getting himſelf introduced into the acquaintance of the nobility and artiſts in that celebrated city. One of them is mentioned by his biographers as a maſterpiece. It was his own portrait painted upon a piece of wood of a convex form, in imitation of a convex mirror. The ſurface is ſaid to have been ſo wonderfully executed, that it had the appearance of real glaſs; and the head, as well as every part of the furniture of the chamber in which he was ſuppoſed to ſit, was ſo artfully managed, that the whole formed a very complete piece of deception. At Rome he was employed by Pope Clement VII. who was highly pleaſed with his performances, and rewarded him liberally. A Circumciſion which he painted for him was particularly eſteemed as a capital work. In it Parmigiano was ſucceſsful in introducing a variety of lights, without deſtroying the general harmony. When Charles V. came to Bologna to be crowned emperor of the Romans, Parmigiano failed not to be preſent at that ſingular ceremony; and ſo accurately marked the countenance of the emperor, that at his return home he was enabled from memory to make out a ſurpriſing likeneſs. In the ſame piece he introduced the figure of Fame placing a crown of laurel on the head of the emperor, whilſt a young Hercules preſented him with a globe of the world. Before it was quite finiſhed, the painter and his piece were introduced to Charles by the Pope, but to little purpoſe; for the emperor left Bologna a few days after, without ordering him any recompence for his labour. In the church of Madona della Stercato at Parma are ſtill to be ſeen ſeveral of the works of this artiſt; among which one of Sybils, and two others of Moſes, and of Adam and Eve, are much admired. So alſo is a Dead Chriſt, with the Virgin in ſorrow, in the church of the Dominicans at Cremona. In the Houghton collection of pictures, now in poſſeſſion of the emperor of Ruſſia, is one of his beſt pictures, repreſenting Chriſt laid in the ſepulchre, for which he is ſaid to have been knighted by the duke of Parma. His principal works are at Parma, where he died poor in 1540.

PARNASSIA, graſs of Parnaſſus, in botany; a genus of the tetragynia order, belonging to the pentandria claſs of plants. The calyx is quinquepartite; there are five petals, and as many nectaria, heart-ſhaped, and ciliated with globular tops; the capſule quadrivalved. There is but one ſpecies, having a ſtalk about a foot high, angular, and often a little twiſted, bearing a ſingle white flower at top. The flowers are very beautifully ſtreaked with yellow; ſo that though it is a common plant, growing naturally in moiſt paſtures, it is frequently admitted into gardens.

PARNASSUS (Strabo, Pindar, Virgil), a mountain of Phocis, near Delphi, and the mounts Cithæron and Helicon, with two tops (Ovid, Lucan); the one called *Cirrha*, ſacred to Apollo; and the other *Niſa*, ſacred to Bacchus, (Juvenal.) It was covered with bay trees, (Virgil;) and originally called *Larnaſſus*, from Deucalion's larnax or ark, thither conveyed by the flood, (Stephanus, Scholiaſt on Apollonius:) after the flood, *Parnaſſus*; from Har Nahas, changing the *b* into *p*, the hill of divination or augury (Peucerus); the oracle of Delphi ſtanding at its foot. Chandler, who viſited it, thus deſcribes it:—"Parnaſſus was the weſtern boundary of Phocis, and, ſtretching northward from about Delphi toward the Œtæan mountains, ſeparated the weſtern Locri from thoſe who poſſeſſed the ſea-coaſt before Eubœa. It was a place of refuge to the Delphians in times of danger. In the deluge which happened under Deucalion, the natives were ſaved on it by following the cry of wolves. On the invaſion by Xerxes, ſome tranſported their families over to Achaia, but many concealed them in the mountain, and in Corycium, a grotto of the Nymphs. All Parnaſſus was renowned for ſanctity, but Corycium was the moſt noted among the hallowed caves and places. 'On the way to the ſummits of Parnaſſus, ſays Pauſanias, as much as 60 ſtadia beyond Delphi, is a brazen image; and from thence the aſcent to Corycium is eaſier for a man on foot, than for mules and horſes. Of all the caves in which I have been, this appeared to me the beſt worth ſeeing, On the coaſts, and by

the ſea-ſide, are more than can be numbered; but ſome are very famous both in Greece and in other countries. The Corycian cave exceeds in magnitude thoſe I have mentioned, and for the moſt part may be paſſed through without a light. It is ſufficiently high; and has water, ſome ſpringing up, and yet more from the roof, which petrifies; ſo that the bottom of the whole cave is covered with ſparry icicles. The inhabitants of Parnaſſus eſteem it ſacred to the Corycian Nymphs, and particularly to Pan. From the cave to reach the ſummits of the mountain is difficult even to a man on foot. The ſummits are above the clouds, and the women called *Thyades* madden on them in the rites of Bacchus and Apollo.' Their frantic orgies were performed yearly. Wheler and his company aſcended Parnaſſus from Delphi, ſome on horſes, by a track between the Stadium and the clefts of the mountain. Stairs were cut in the rock, with a ſtrait channel, perhaps a water-duct.—In a long hour, after many traverſes, they gained the top, and entering a plain turned to the right, towards the ſummits of Caſtalia, which are divided by deep precipices. From this eminence they had a fine proſpect of the Gulph of Corinth, and of the coaſt; mount Cirphis appearing beneath them as a plain, bounded on the eaſt by the bay of Aſproſpitia, and on the weſt by that of Salona. A few ſhepherds had huts there. They returned to the way which they had quitted, and croſſed a hill covered with pines and ſnow. On their left was a lake, and beyond it a peak, exceedingly high, white with ſnow. They travelled to the foot of it through a valley, four or five miles in compaſs; and reſted by a plentiful fountain called *Droſonigo*, the ſtream boiling up a foot in diameter, and nearly as much above the ſurface of the ground. It runs into the lake, which is about a quarter of a mile diſtant to the ſouth-eaſt. They did not diſcover Corycium, or proceed farther on, but, keeping the lake on their right, came again to the brink of the mountain, and deſcended by a deep and dangerous track to Racovi, a village four or five miles eaſtward from Delphi. It was the opinion of Wheler, that no mountain in Greece was higher than Parnaſſus; that it was not inferior to mount Cenis among the Alps; and that, if detached, it would be ſeen at a greater diſtance than even mount Athos. The ſummits are perpetually increaſing, every new fall of ſnow adding to the perennial heap, while the ſun has power only to thaw the ſuperficies. Caſtalis Pleiſtus and innumerable ſprings are fed, ſome inviſibly, from the lakes and reſervoirs, which, without theſe drains and ſubterraneous vents, would ſwell, eſpecially after heavy rain and the melting of ſnow, ſo as to fill the vallèys, and run over the tops of the rocks down upon Delphi, ſpreading wide an inundation, ſimilar, as has been ſurmiſed, to the Deucalionean deluge."

PARNELL (Dr. Thomas), a very ingenious divine and poet in the early part of this century. He was archdeacon of Clogher, and the intimate friend of Mr. Pope; who publiſhed his works, with an elegant copy of recommendatory verſes prefixed. He died in 1718, aged 39. Johnſon ſays, "The Life of Dr. Parnell is a taſk which I ſhould very willingly decline, ſince it has been lately written by Goldſmith, a man of ſuch variety of powers, and ſuch felicity of performance, that he always ſeemed to do beſt that which he was doing; a man who had the art of being minute without tediouſneſs, and general without confuſion; whoſe language was copious without exuberance, exact without conſtraint, and eaſy without weakneſs.

"What ſuch an author has told, who would tell again? I have made an extract from his larger narrative; and ſhall have this gratification from my attempt, that it gives me an opportunity of paying due tribute to the memory of a departed genius. 'Το γὰρ γερας εϛι θανονλων.'

"The general character of Parnell is not great extent of comprehenſion, or fertility of mind. Of the little that appears ſtill leſs is his own. His praiſe muſt be derived from the eaſy ſweetneſs of his diction: in his verſes there is more happineſs than pains; he is ſprightly without effort, and always delights though he never raviſhes; every thing is proper, yet every thing ſeems caſual. If there is ſome appearance of elaboration in the Hermit, the narrative, as it is leſs airy, is leſs pleaſing. Of his other compoſitions, it is impoſſible to ſay whether they are the productions of Nature, ſo excellent as not to want the help of Art, or of Art ſo refined as to reſemble Nature."

PARODY, a popular maxim, adage, or proverb.

Parody is alſo a poetical pleaſantry, conſiſting in applying the verſes written on one ſubject, by way of ridicule, to another; or in turning a ſerious work into a burleſque, by affecting to obſerve as near as poſſible the ſame rhymes, words, and cadences. The parody was firſt ſet on foot by the Greeks; from whom we borrow the name. It comes near to what ſome of our late writers call *traveſty*. Others have more accurately diſtinguiſhed between a parody and burleſque; and they obſerve, that the change of a ſingle word may parody a verſe; or of a ſingle letter a word. Thus, in the laſt caſe, Cato expoſed the inconſtant diſpoſition of Marcus Fulvius Nobilior, by changing Nobilior into Mobilior. Another kind of parody conſiſts in the mere application of ſome known verſe or part of a verſe of a writer, without making any change in it, with a view to expoſe it. A fourth inſtance is that of writing verſes in the taſte and ſtyle of authors little approved. The rules of parody regard the choice of a ſubject, and the manner of treating it. The ſubject ſhould be a known and celebrated work: as to the manner, it ſhould be by an exact imitation, and an intermixture of good natural pleaſantry.

PAROLE, in a military ſenſe, the promiſe made by a priſoner of war, when he has leave to go any where, of returning at a time appointed, if not exchanged.

Parole means alſo a word given out every day in orders by the commanding officer, both in camp and garriſon, in order to know friends from enemies.

PARONOMASIA, in rhetoric, a pun; or a figure, whereby words nearly alike in ſound, but of very different meanings, are affectedly or deſignedly uſed. See Oratory.

PARONYCHIA, the Whitlow, in ſurgery, is an abſceſs at the end of the fingers. It begins with a ſlow heavy pain, attended with a ſlight pulſation, without ſwelling, redneſs, or heat: but ſoon the pain, heat, and throbbing, are intolerable; the part grows large and red, the adjoining fingers and the whole hand ſwell up; in ſome caſes, a kind of red and inflated ſtreak may be obſerved, which beginning at the affected part, is continued almoſt to the elbow; nor is it unuſual for the patient to complain of a very ſharp pain under the ſhoulder, and ſometimes the whole arm is exceſſively inflamed and ſwelled; the patient cannot ſleep, the fever, &c. increaſing; and ſometimes delirium or convulſions follow. According as it is ſituated more or leſs deep, it is differently denominated, and divided into ſpecies. 1. When it is ſeated in the ſkin or fat, in the back or the fore part of the finger, or under or near the nail, the pain is ſevere, but ends well. 2. When the perioſteum is inflamed or corroded, the pain is tormenting. 3. When the nervous coats of the flexor tendons of the fingers or nerves near them are ſeized, the worſt ſymptoms attend. If the firſt kind ſuppurates, it muſt be opened, and treated as abſceſſes in general; but the beſt method of treating the other two ſpecies is, on the firſt, or at furtheſt the ſecond day, to cut the part where the pain is ſeated quite to the bone: if this operation is longer deferred, a ſuppuration will come on; in which caſe ſuppuration ſhould be ſpeedily promoted, and as early a diſcharge given to the matter as poſſible. As the pain is ſo conſiderable as to occaſion a fever, and ſometimes convulſions, opium may be added to the ſuppu-

rating applications, and alſo given in a draught at bed-time. The ſecond ſpecies proves very troubleſome, and ſometimes ends in a caries of the ſubjacent bone. The third ſpecies is very tedious in the cure, and uſually the phalanx on which it is ſeated is deſtroyed.

The late Mr. Juſtamond, in the "Surgical Tracts" publiſhed by Mr. Houlſton, gives a very full account of the varieties of this diſeaſe. He recommends camphorated ſpirits, applied to the finger on linen rag, as a means of checking the diſeaſe in its incipient ſtate.

PAROS (anc. geog.), an iſland of the Ægean ſea, one of the Cyclades, with a ſtrong cognominal town, 38 miles diſtant from Delos (Pliny, Nepos). Anciently called *Pactye* and *Minoa* (Pliny); alſo *Demetrias*, *Zacynthus*, *Hyria*, *Hyleeſſa*, and *Cabarnis* (Nicanor). The country of Archilochus the Iambic poet (Strabo). An iſland famous for its white marble (Virgil, Horace, Ovid), called *lychnites*, becauſe dug with lamps (Pliny). The name of Cabarnis is borrowed, according to Stephanus, from one Cabarnus, who firſt informed Ceres of the rape of her daughter Proſerpine; or, according to Heſychius, from the Cabarni, the prieſts of Ceres being ſo called by the inhabitants of this iſland. The name of Minoa is borrowed from Minos king of Crete, who ſubdued this as he did moſt of the other iſlands of the Ægean ſea. It was called Paros, which name it retains to this day, from Paros the ſon of Parrhaſius, or, as Stephanus will have it, of Jaſon the Argonaut. Paros, according to Pliny's computation, is diſtant from Naxos ſeven miles and a half, and 28 from Delos. Some of the modern travellers will have it to be 80, others only 50 miles in compaſs. Pliny ſays it is half as large as Naxos, that is, between 36 and 37 miles in compaſs. It was a rich and powerful iſland, being termed the moſt wealthy and happy of the Cyclades, and by Cornelius Nepos an iſland elated with its riches. The city of Paros, the metropolis, is ſtyled by Stephanus a potent city, and one of the largeſt in the Archipelago: the preſent city of Paros, now Parichia, is ſuppoſed to have been built upon its ruins, the country abounding with valuable monuments of antiquity. The very walls of the preſent city are built with columns, architraves, pedeſtals, mingled with pieces of ancient marble of a ſurpriſing magnitude, which were once employed in more noble edifices. Paros was indeed formerly famous for its marble, which was of an extraordinary whiteneſs, and in ſuch requeſt among the ancients that the beſt ſtatuaries uſed no other. The iſland is provided with ſeveral capacious and ſafe harbours, and was anciently much reſorted to by traders. It was, according to Thucydides, originally peopled by the Phœnicians, who were the firſt maſters of the ſea. Afterwards the Carians ſettled here, as we are told by Thucydides and Diodorus. But theſe two authors differ as to the time when the Carians came firſt into the iſland; for Thucydides tells us, that the Carians were driven out by the Cretans under the conduct of Minos; and Diodorus writes, that the Carians did not ſettle here till after the Trojan war, when they found the Cretans in poſſeſſion of the iſland. Stephanus thinks that the Cretans, mixed with ſome Arcadians, were the only people that ever poſſeſſed this iſland. Minos himſelf, if we believe Pliny, reſided ſome time in the iſland of Paros, and received here the melancholy news of the death of his ſon Androgeus, who was killed in Attica after he had diſtinguiſhed himſelf at the public games. We find the inhabitants of this iſland choſen from among all the Greeks by the Mileſians to compoſe the differences which had for two generations rent that unhappy ſtate into parties and factions. They acquitted themſelves with great prudence, and reformed the government. They aſſiſted Darius in his expedition againſt Greece with a conſiderable ſquadron; but after the victory obtained by Miltiades at Marathon, they were reduced to great ſtraits by that general. However, after blocking up the city for 26 days, he was obliged to quit the enterprize, and return to Athens with diſgrace. Upon his departure, the Parians were informed that Timo, a prieſteſs of the national gods, and then his priſoner, had adviſed him to perform ſome ſecret ceremony in the temple of Ceres, near the city; aſſuring him that he would thereby gain the place. Upon this information they ſent deputies to conſult the oracle of Delphi, whether they ſhould puniſh her with death, for endeavouring to betray the city to the enemy, and diſcovering the ſacred myſteries to Miltiades. The Pythian anſwered, that Timo was not the adviſer; but that the gods, having reſolved to deſtroy Miltiades, had only made her the inſtrument of his death. After the battle of Salamis, Themiſtocles ſubjected Paros and moſt of the other neighbouring iſlands to Athens, exacting large ſums from them by way of puniſhment for having favoured the Perſians. It appears from the famous monument of Adulas, which Coſmos of Egypt has deſcribed with great exactneſs, that Paros and the other Cyclades were once ſubject to the Ptolemies of Egypt. However, Paros fell again under the power of the Athenians, who continued maſters of it till they were driven out by Mithridates the great. But that prince being obliged to yield to Sylla, to Lucullus, and to Pompey, this and the other iſlands of the Archipelago ſubmitted to the Romans, who reduced them to a province with Lydia, Phrygia, and Caria.

Mr. Sutherland, who lately viſited Paros, ſays, that "the water in it is excellent; and as that which we got at Meſſina has been complained of, as being too hard to make proper peaſe-ſoup for the people, all the caſks are ordered to be emptied and refilled. The Ruſſians made this place their grand arſenal; their powder-magazines, and ſeveral other buildings, are ſtill ſtanding; and the iſland is conſiderably indebted to them for improving the convenience for water, and for the trade which the caſh they expended introduced among the inhabitants."

PAROTIDES, in anatomy. See ANATOMY.

PAROXYSM, in medicine, the ſevere fit of a diſeaſe, under which it grows higher or exaſperated; as of the gout, &c.

PARR (THOMAS), or *Old Parr*, a remakable Engliſhman, who lived in the reigns of ten kings and queens; married a ſecond wife when he was 120, and had a child by her. He was the ſon of John Parr, a huſbandman of Winnington, in the pariſh of Alderbury, in the county of Salop, where he was born in the year 1483. Though he lived to the vaſt age of upwards of 152 years, yet the tenor of his life admitted but of little variety; nor can the detail of it be conſidered of importance, further than what will ariſe from the gratification of that curioſity which naturally inquires after the mode of living which could lengthen life to ſuch extreme old age. Following the profeſſion of his father, he laboured hard, and lived on coarſe fare.

The manner of his being conducted to London is noticed in the following terms: "The Right Hon. Thomas Earl of Arundel and Surrey, earl-marſhal of England, on being lately in Shropſhire to viſit ſome lands and manors which his lordſhip holds in that county, or for ſome other occaſions of importance which cauſed his lordſhip to be there, the report of this aged man was ſignified to his honour, who hearing of ſo remarkable a piece of antiquity, his lordſhip was pleaſed to ſee him; and in his innate, noble, and Chriſtian piety, he took him into his charitable tuition and protection, commanding that a litter and two horſes (for the more eaſy carriage of a man ſo feeble and worn with age) ſhould be provided for him; alſo, that a daughter of his, named Lucy, ſhould likewiſe attend him, and have a horſe for her own riding with him: and to cheer up the old man, and make him merry, there was an antique-faced fellow, with a high and mighty no-beard, that had alſo a horſe for his carriage. Theſe were all to be brought out of the country to London by eaſy journeys, the charge being allowed by his

lordſhip; likewiſe one of his lordſhip's own ſervants, named Bryan Kelly, to ride on horſeback with them, and to attend and defray all manner of reckonings and expences. All which was done accordingly as follows.

"Winnington is a pariſh of Alderbury, near a place called the Welch Pool, eight miles from Shrewſbury; from whence he was carried to Wem, a town of the earl's aforeſaid; and the next day to Shiffnall, a manor-houſe of his lordſhip's, where they likewiſe ſtayed one night: from Shiffnall they came to Wolverhampton, and the next day to Birmingham, and from thence to Coventry. Although Maſter Kelly had much to do to keep the people off, that preſſed upon him in all places where he came, yet at Coventry he was moſt oppreſſed; for they came in ſuch multitudes to ſee the old man, that thoſe that defended him were almoſt quite tired and ſpent, and the aged man in danger of being ſtifled; and, in a word, the rabble were ſo unruly, that Bryan was in doubt he ſhould bring his charge no farther; ſo greedy are the vulgar to hearken to or gaze after novelties. The trouble being over, the next day they paſſed to Daintree, to Stony Stratford, to Radburne, and ſo to London; where he was well entertained and accommodated with all things, having all the aforeſaid attendance at the ſole charge and coſt of his lordſhip." When brought before the king, his majeſty, with more acuteneſs than good manners, ſaid to him, "You have lived longer than other men, what have you done more than other men?" He anſwered, "I did penance when I was an hundred years old." This journey, however, proved fatal to him: owing to the alteration in his diet, to the change of the air, and his general mode of life, he lived but a very ſhort time, dying the 5th of November 1635 *; and was buried in Weſtminſter Abbey. After his death, his body was opened; and an account was drawn up by the celebrated Dr. Harvey.

The following ſummary of his life is copied from Oldys's MS. notes on Fuller's Worthies: Old Parr was born 1483; lived at home until 1500, æt. 17, when he went out to ſervice. 1518, æt. 35, returned home from his maſter. 1522, æt. 39, ſpent four years on the remainder of his father's leaſe. 1543, æt. 60, ended the firſt leaſe he renewed of Mr. Lewis Porter. 1563, æt. 80, married Jane, daughter of John Taylor, a maiden; by whom he had a ſon and a daughter, who both died very young. 1564, æt. 81, ended the ſecond leaſe which he renewed of Mr. John Porter. 1585, æt. 102, ended the third leaſe he had renewed of Mr. Hugh Porter. 1588, æt. 105, did penance in Alderbury church, for lying with Katharine Milton, and getting her with-child. 1595, æt. 112, he buried his wife Jane, after they had lived 32 years together. 1605, æt. 122, having lived 10 years a widower, he married Jane, widow of Anthony Adda, daughter of John Lloyd of Gilfells, in Montgomeryſhire, who ſurvived him. 1635, æt. 152, he died; after they had lived together 30 years, and after 50 years poſſeſſion of his laſt leaſe. See LONGEVITY.

PARRA, in ornithology, a genus of birds belonging to the order of grallæ; the characters of which are: The bill is tapering and a little obtuſe; the noſtrils are oval, and ſituated in the middle of the bill; the forehead is covered with fleſhy caruncles, which are lobated; the wings are ſmall and ſpinous. There are five ſpecies; of which the moſt remarkable is the chavaria, which is about the ſize of the domeſtic cock. The Indians in the neighbourhood of Carthagena, who breed large flocks of poultry that ſtray in the woods, train up the chavaria to defend them againſt the numerous birds of prey, no one of which will dare to encounter it. It is never known to deſert the flock, and it returns every evening to rooſt.

The parra Dominica is about the ſize of the lapwing. The bill is yellow, as are alſo the head and upper parts; the under are of a yellowiſh white bordering on roſe colour. The legs are alſo yellow. This ſpecies inhabits ſeveral of the warmer parts of America and St. Domingo. The parra ſenegalla is about the ſame ſize with the former. Its bill is alſo yellow tipped with black: the forehead is covered with a yellow ſkin; the chin and throat are black; the head and upper parts of the body and leſſer wing-coverts are grey-brown. The lower part of the belly, and the upper and under tail-coverts, are dirty white. At the bend of the wing is a black ſpur. It inhabits Senegal, and thence derives its name. The negroes call them *Uett Uett*, the French the *ſquallers*, becauſe, as we are told, as ſoon as they ſee a man they ſcream and fly off. They always fly in pairs. The parra jacana, or ſpur-winged water-hen, is about the ſize of the water-rail. The bill is in length about an inch and a quarter, of an orange colour; and on the forehead is a membranous flap half an inch long and nearly as broad. On each ſide of the head alſo is another of the ſame, about a quarter of an inch broad, and both together they ſurround the baſe of the bill. The head, throat, neck, breaſt, and under-parts, are black; and ſometimes the belly is mixed with white, &c. The birds of this ſpecies inhabit Braſil, Guiana, and Surinam; but are equally common at St. Domingo, where they frequent the marſhy places, ſides of ponds, and ſtreams, and wade quite up to the thighs in the water. They are alſo generally ſeen in pairs, and when ſeparated call each other continually till they join again. They are very ſhy, and moſt common in the rainy ſeaſons in May and November. They are at all times very noiſy; their cry ſharp and ſhrill, and may be heard a great way off. This, as well as the other ſpecies, is called by the French *chirurgien*. The fleſh is accounted pretty good. The parra variabilis, or ſpur-winged water-hen, is about nine inches long. The bill is about 14 inches in length, and in colour is orange-yellow. On the forehead is a flap of red ſkin; the crown of the head is brown, marked with ſpots of a darker colour; the hind part of the neck is much the ſame, but of a deeper dye. The ſides of the head, throat, forepart of the neck, breaſt, belly, thighs, and under tail-coverts are white, with a few red ſpots on the ſides of the belly and baſe of the thighs. On the forepart of the wing is a yellow ſpur, &c. The legs are furniſhed with long toes, as in all the others, the colour of which is blueiſh aſh. Mr. Latham ſays, that one which came under his inſpection from Cayenne was rather ſmaller. It had the upper parts much paler; over the eye was a ſtreak of white paſſing no further, and unaccompanied by a black one. The hind part of the neck was duſky black. It had only the rudiment of a ſpur; and the red caruncle on the forehead was leſs, and laid back on the forehead. From theſe differences this learned ornithologiſt conceives it to have differed either in ſex or age from the other. This ſpecies inhabits Braſil, and is ſaid to be pretty common about Carthagena and in South America. The parra chavaria is, as we have already obſerved, about the ſize of a dunghill cock, and ſtands a foot and a half from the ground. The bill is of a dirty white colour; the upper mandible ſimilar to that in a dunghill cock; the noſtrils are oblong, pervious: on both ſides, at the baſe of the bill, is a red membrane, which extends to the temples. The irides are brown. On the hind head are about 12 blackiſh feathers, three inches in length, forming a

* The author of a book entitled *Long Livers*, 8vo, 1722, which Oldys in his MS. notes on Fuller aſcribes to one Robert Samber, againſt all evidence ſays, p. 89, that Parr died ſixteen years after he had been preſented to the king, 24th of November, 1651.

creſt and hanging downwards. The reſt of the neck is covered with a thick black down. The body is brown, and the wings and tail inclined to black. On the bend of the wing are two or three ſpurs half an inch long. The belly is a light black. The thighs are half bare of feathers. The legs are very long, and of a yellow red colour. The toes are ſo long as to entangle one another in walking. "This ſpecies (ſays Mr. Latham in his Synopſis) inhabits the lakes, &c. near the river Cinu, about 30 leagues from Carthagena, in South America, and is ſaid to feed on vegetables. Its gait is ſolemn and ſlow; but it flies eaſily and ſwiftly. It cannot run, unleſs aſſiſted by the wings at the ſame time. When any part of the ſkin is touched by the hand, a crackling is felt, though it is very downy beneath the feathers; and indeed this down adheres ſo cloſely as to enable the bird at times to ſwim. The voice is clear and loud, but far from agreeable. The natives, who keep poultry in great numbers, have one of theſe tame, which goes along with the flock about the neighbourhood to feed during the day, when this faithful ſhepherd defends them againſt birds of prey; being able, by means of the ſpurs on the wings, to drive off birds as big as the carrion-vulture, and even that bird itſelf. It is ſo far of the greateſt uſe, as it never deſerts the charge committed to its care, bringing them all home ſafe at night. It is ſo tame as to ſuffer itſelf to be handled by a grown perſon; but will not permit children to attempt the ſame." Linnæus is ſaid to be the only one who has given any account of this wonderful bird.

PARRELS, in a ſhip, are frames made of trucks, ribs, and ropes, which having both their ends faſtened to the yards, are ſo contrived as to go round about the maſts, that the yards by their means may go up and down upon the maſt. Theſe alſo, with the breaſt-ropes, faſten the yards to the maſts.

PARRET or PEDRED river, has its riſe in the ſouthern part of Somerſetſhire in England. Near Langport it is joined by the Ordred, augmented by the Ivel; and, about four miles from this junction, it is joined by the Tone or Thone, a pretty large river, riſing among the hills in the weſtern parts of this county. About two miles below the junction of the Tone, the Parret receives another conſiderable ſtream; and, thus augmented, it paſſes by the town of Bridgewater, and falls into the Briſtol channel in Bridgewater-bay.

PARRHASIUS, a famous ancient painter of Epheſus, or, as ſome ſay, of Athens: he flouriſhed about the time of Socrates, according to Xenophon, who hath introduced him into a dialogue diſcourſing with that philoſopher. He was one of the beſt painters in his time. Pliny ſays, that it was he who firſt gave ſymmetry and juſt proportions in that art; that he likewiſe was the firſt who knew how to expreſs the truth and life of characters, and the different airs of the face; that he diſcovered a beautiful diſpoſition of the hair, and heightened the grace of the viſage. It was allowed even by the maſters in the art, that he far outſhone them in the glory of ſucceeding in the outlines, in which conſiſts the grand ſecret of painting. But it is alſo remarked by Pliny, that Parrhaſius became inſupportable with pride; and was ſo very vain as to give himſelf the moſt flattering epithets; ſuch as, the tendereſt, the ſofteſt, the grandeſt, the moſt delicate, and the perfecter of his art. He boaſted that he was ſprung from Apollo, and that he was born to paint the gods; that he had actually drawn Hercules touch by touch; that hero having often appeared to him in dreams. When the plurality of voices was againſt him at Samos in favour of Timanthes, in the opinion of a picture of Ajax provoked againſt the Greeks for adjudging to Ulyſſes the arms of Achilles, he anſwered a perſon who condoled him on this check, "For my part, I do not trouble myſelf at the ſentence; but I am ſorry that the ſon of Telamon hath received a greater outrage than that which was formerly put upon him ſo unjuſtly." Ælian relates this ſtory, and tells us that Parrhaſius affected to wear a crown of gold upon his head, and to carry in his hand a batoon ſtudded with nails of the ſame metal. He worked at his art with pleaſantry, often indeed ſinging. He was very licentious and looſe in his pictures; and he is ſaid, by way of amuſement, to have repreſented the moſt infamous objects. His Atalantis, with her ſpouſe Meleager, was of this kind. This piece was afterwards deviſed as a legacy to the emperor Tiberius, upon condition that, if he was diſpleaſed with the ſubject, he ſhould receive a million ſeſterces inſtead of it. The emperor, covetous as he was, not only preferred the picture to that ſum, but even placed it in his moſt favourite apartment. It is alſo ſaid, that, though Parrhaſius was excelled by Timanthes, yet he excelled Zeuxis. Among his pictures is a celebrated one of Theſeus; and another repreſenting Meleager, Hercules, and Perſeus in a group together; as alſo Æneas, with Caſtor and Pollux, in a third.

PARRHASIUS (Janus), a famous grammarian in Italy, who was born at Coſenza in the kingdom of Naples, 1470. He was intended for the law, the profeſſion of his anceſtors; but he refuſed it, and cultivated claſſical learning. His real name was Johannes Paulus Pariſius; but according to the humour of the grammarians of the age, he took inſtead of it Parrhaſius. He taught at Milan with much reputation, being admired for a graceful delivery, in which he chiefly excelled other profeſſors. It was this charm in his voice, which brought a vaſt concourſe of people to his lectures; and among others he had the pleaſure to ſee general Trimoles, who was then threeſcore years old. He went to Rome when Alexander VI. was pope; and was like to be involved in the misfortunes of Bernardini Cajetan and Silius Savello, with whom he had ſome correſpondence; but he eſcaped the danger, by the information of Thomas Phœdrus, profeſſor of rhetoric, and canon of St. John Lateran, whoſe advice he followed in retiring from Rome. Soon after, he was appointed public profeſſor of rhetoric at Milan; but the liberty he took to cenſure the teachers there as arrant blockheads, provoked them in return to aſperſe his morals. They ſaid he had a criminal converſe with his ſcholars; which being a crime extremely abhorred by the Milaneſe, our profeſſor was obliged to leave Milan. He went to Vicenza, where he obtained a larger ſalary; and he held this profeſſorſhip till the ſtates of the Venetians were laid waſte by the troops of the League: upon which he went to his native country, having made his eſcape through the army of the enemies. He was at Coſenza, when his old friend Phœdrus perſuaded Julius to ſend for him to Rome; and though that deſign proved abortive by the death of the pope, yet, by the recommendation of John Laſcaris, he was called thither under the ſucceſſor Leo X. Leo was before favourably inclined to him; and, on his arrival at Rome, appointed him profeſſor of polite literature. He had been now ſome time married to a daughter of Demetrius Chalcondylas; and he took with him to Rome Baſil Chalcondylas, his wife's brother, and brother of Demetrius Chalcondylas, profeſſor of the Greek tongue at Milan. He did not long enjoy this employ conferred upon him by the pope: for, worn out by his ſtudies and labours, he became ſo afflicted with the gout, that for ſome years he had no part of his body free, except his tongue; having almoſt loſt the uſe of both his legs and both his arms. He laboured beſides under ſo great a degree of poverty, as put him out of all hopes of being ever in a better ſituation; ſo that he left Rome, and returned into Calabria, his native country, where he was tormented a long while with a fever, and at laſt died in the greateſt miſery. He left his library to his friend Seripandus, brother to Cardinal Jerome Seripandus, who built him a tomb in the convent of the Auſtin friars at Naples. There are ſeveral books aſcribed to him; and

in the dedication of one of them, his character is drawn to great advantage by Henry Stephens.

PARRHESIA. See ORATORY.

PARRICIDE, the murder of one's parents or children. By the Roman law, it was punished in a much severer manner than any other kind of homicide. After being scourged, the delinquents were sewed up in a leathern sack, with a live dog, a cock, a viper, and an ape, and so cast into the sea. Solon, it is true, in his laws, made none against parricide; apprehending it impossible that one should be guilty of so unnatural a barbarity. And the Persians, according to Herodotus, entertained the same notion, when they adjudged all persons who killed their reputed parents to be bastards. And upon some such reason as this must we account for the omission of an exemplary punishment for this crime in our English laws; which treat it no otherwise than as simple murder, unless the child was also the servant of the parent. For though the breach of natural relation is unobserved, yet the breach of civil or ecclesiastic connections, when coupled with murder, denominates it a new offence; no less than a species of treason, called *parva proditio*, or *petit treason*: which, however, is nothing else but an aggravated degree of murder; although, on account of the violation of private allegiance, it is stigmatized as an inferior species of treason. And thus, in the ancient Gothic constitution, we find the breach both of natural and civil relations ranked in the same class with crimes against the state and sovereign.

PARROT, in ornithology. See PSITTACUS.

PARSHORE, a town of England in Worcestershire, seven miles from Worcester, and 102 from London, is a neat old town on the north side of the Avon, near its junction with the river Bow, being a considerable thoroughfare in the lower road from Worcester to London. A religious house was founded here in 604, a small part of which now remains, and is used as the parish church of Holy Cross, the whole of which contained above 10 acres. The abbey church was 250 feet long, and 120 broad. The parish of Parshore is of great extent, and hath within its limits many manors and chapelries. At present it has two parishes, Holy Cross and St. Andrew. In Holy Cross church are several very antique monuments. Its chief manufacture is stockings. It contains about 300 houses, and has markets on Tuesday and Saturday; fairs Easter-Tuesday, June 26th, and Tuesday before November 1st.

PARSLEY, in botany. See APIUM.

PARSNEP, in botany. See PASTINACA.

PARSON, *and* VICAR. A parson, *persona ecclesiæ*, is one that hath full possession of all the rights of a parochial church. He is called parson, *persona*, because by his person the church, which is an invisible body, is represented; and he is in himself a body corporate, in order to protect and defend the rights of the church (which he personates) by a perpetual succession. He is sometimes called the *rector* or *governor* of the church: but the appellation of *parson* (however it may be depreciated by familiar, clownish, and indiscriminate use) is the most legal, most beneficial, and most honourable title that a parish priest can enjoy; because such a one (Sir Edward Coke observes), and he only, is said *vicem seu personam ecclesiæ gerere*. A parson has, during his life, the freehold in himself of the parsonage house, the glebe, the tithes, and other dues. But these are sometimes *appropriated*; that is to say, the benefice is perpetually annexed to some spiritual corporation, either sole or aggregate, being the patron of the living; whom the law esteems equally capable of providing for the service of the church as any single private clergyman. See APPROPRIATION.

The appropriating corporations, or religious houses, were wont to depute one of their own body to perform divine service, and administer the sacraments, in those parishes of which the society was thus the parson. This officiating minister was in reality no more than a curate, deputy, or vicegerent of the appropriator, and therefore called *vicarius*, or "vicar." His stipend was at the discretion of the appropriator, who was, however, bound of common right to find somebody, *qui illi de temporalibus, episcopo de spiritualibus, debeat respondere*. But this was done in so scandalous a manner, and the parishes suffered so much by the neglect of the appropriators, that the legislature was forced to interpose: and accordingly it is enacted, by statute 15 Ric. II. c. 6. that in all appropriations of churches, the diocesan bishop shall ordain (in proportion to the value of the church) a competent sum to be distributed among the poor parishioners annually; and that the vicarage shall be sufficiently endowed. It seems the parish were frequently sufferers, not only by the want of divine service, but also by with-holding those alms for which, among other purposes, the payment of tithes was originally imposed: and therefore in this act a pension is directed to be distributed among the poor parochians, as well as a sufficient stipend to the vicar. But he, being liable to be removed at the pleasure of the appropriator, was not likely to insist too rigidly on the legal sufficiency of the stipend; and therefore, by statute 4 Hen. IV. c. 12. it is ordained, that the vicar shall be a secular person, not a member of any religious house; that he shall be vicar perpetual, not removable at the caprice of the monastery; and that he should be canonically instituted and inducted, and be sufficiently endowed, at the discretion of the ordinary, for these three express purposes: to do divine service, to inform the people, and to keep hospitality. The endowments, in consequence of these statutes, have usually been by a portion of the glebe or land belonging to the parsonage, and a particular share of the tithes, which the appropriators found it most troublesome to collect, and which are therefore generally called *petty* or *small tithes*; the greater, or perdial tithes, being still reserved to their own use. But one and the same rule was not observed in the endowment of all vicarages. Hence some are more liberally, and some more scantily, endowed: and hence the tithes of many things, as wood in particular, are in some parishes rectorial, and in some vicarial tithes.

The distinction therefore of a parson and vicar is this: The parson has for the most part the whole right to all the ecclesiastical dues in his parish; but a vicar has generally an appropriator over him, entitled to the best part of the profits, to whom he is in effect perpetual curate, with a standing salary. Though in some places the vicarage has been considerably augmented by a large share of the great tithes; which augmentations were greatly assisted by the statute 27 Car. II. c. 8. enacted in favour of poor vicars and curates, which rendered such temporary augmentations (when made by the appropriators) perpetual.

The method of becoming a parson or vicar is much the same. To both there are four requisites necessary; holy orders, presentation, institution, and induction. The method of conferring the holy orders of deacon and priest, according to the liturgy and canons, is foreign to the present purpose; any further than as they are necessary requisites to make a complete parson or vicar. By common law, a deacon, of any age, might be instituted and inducted to a parsonage or vicarage: but it was ordained, by statute 13 Eliz. c. 12. that no person under twenty-three years of age, and in deacon's orders, should be presented to any benefice with cure; and if he were not ordained priest within one year after his induction, he should be *ipso facto* deprived: and now, by statute 13 and 14 Car. II. c. 4. no person is capable to be admitted to any benefice, unless he hath been first ordained a priest; and then he is, in the language of the law, a clerk in orders. But if he obtains orders, or a licence to preach, by money or corrupt practices, (which seems to be the true, though not the common, notion of simony,) the

perſon giving ſuch orders forfeits 40l. and the perſon receiving, 10l. and is incapable of any eccleſiaſtical preferment for ſeven years after.

Any clerk may be preſented to a parſonage or vicarage; that is, the patron, to whom the advowſon of the church belongs, may offer his clerk to the biſhop of the dioceſe to be inſtituted. But when he is préſented, the biſhop may refuſe him upon many accounts. As, 1. If the patron is excommunicated, and remains in contempt 40 days; or, 2. If the clerk be unfit: which unfitneſs is of ſeveral kinds. Firſt, with regard to his perſon; as if he be a baſtard, an outlaw, an excommunicate, an alien, under age, or the like. Next, with regard to his faith or morals; as for any particular hereſy, or vice that is *malum in ſe*; but if the biſhop alleges only in generals, as that he is *ſchiſmaticus inveteratus*, or objects a fault that is *malum prohibitum* merely, as haunting taverns, playing at unlawful games or the like, it is not good cauſe of refuſal. Or, laſtly, the clerk may be unfit to diſcharge the paſtoral office for want of learning. In any of which caſes, the biſhop may refuſe the clerk. In caſe the refuſal is for hereſy, ſchiſm, inability of learning, or other matter of eccleſiaſtical cognizance, there the biſhop muſt give notice to the patron of ſuch his cauſe of refuſal, who being uſually a layman, is not ſuppoſed to have knowledge of it; elſe he cannot preſent by lapſe; but if the cauſe be temporal, there he is not bound to give notice.

If an action at law be brought by the patron againſt the biſhop for refuſing his clerk, the biſhop muſt aſſign the cauſe. If the cauſe be of a temporal nature, and the fact admitted, (as, for inſtance, outlawry,) the judges of the king's courts muſt determine its validity, or whether it be ſufficient cauſe of refuſal; but if the fact be denied, it muſt be determined by a jury. If the cauſe be of a ſpiritual nature, (as hereſy, particularly alleged,) the fact, if denied, ſhall alſo be determined by a jury: and if the fact be admitted or found, the court, upon conſultation and advice of learned divines, ſhall decide its ſufficiency. If the cauſe be want of learning, the biſhop need not ſpecify in what points the clerk is deficient, but only allege that he is deficient; for the ſtatute 9 Edw. II. ſt. 1. c. 13. is expreſs, that the examination of the fitneſs of a perſon preſented to a benefice belongs to the eccleſiaſtical judge. But becauſe it would be nugatory in this caſe to demand the reaſon of refuſal from the ordinary, if the patron were bound to abide by his determination, who has already pronounced his clerk unfit; therefore, if the biſhop returns the clerk to be *minus ſufficiens in literatura*, the court ſhall write to the metropolitan to re-examine him, and certify his qualifications; which certificate of the archbiſhop is final.

If the biſhop hath no objections, but admits the patron's preſentation, the clerk ſo admitted is next to be inſtituted by him; which is a kind of inveſtiture of the ſpiritual part of the benefice; for by inſtitution the care of the ſouls of the pariſh is committed to the charge of the clerk. When a vicar is inſtituted, he (beſides the uſual forms) takes, if required by the biſhop, an oath of perpetual reſidence; for the maxim of law is, that *vicarius non habet vicarium*: and as the non-reſidence of the appropriators was the cauſe of the perpetual eſtabliſhment of vicarages, the law judges it very improper for them to defeat the end of their conſtitution, and by abſence to create the very miſchief which they were appointed to remedy; eſpecially as, if any profits are to ariſe from putting in a curate and living at a diſtance from the pariſh, the appropriator, who is the real parſon, has undoubtedly the elder title to them. When the ordinary is alſo the patron, and confers the living, the preſentation and inſtitution are one and the ſame act, and are called a *collation to a benefice*. By inſtitution or collation the church is full, ſo that there can be no freſh preſentation till another vacancy, at leaſt in the caſe of a common patron; but the church is not full againſt the king till induction: nay, even if a clerk is inſtituted upon the king's preſentation, the crown may revoke it before induction, and preſent another clerk. Upon inſtitution alſo the clerk may enter on the parſonage houſe and glebe, and take the tithes; but he cannot grant or let them, or bring an action for them till induction. See INDUCTION.

For the rights of a parſon or vicar, in his tithes and eccleſiaſtical dues, ſee TITHES. As to his duties, they are ſo numerous, that it is impracticable to recite them here with any tolerable conciſeneſs or accuracy; but the reader who has occaſion may conſult *Biſhop Gibſon's Codex*, *Johnſon's Clergyman's Vade Mecum*, and *Burn's Eccleſiaſtical Law*. We ſhall therefore only juſt mention the article of reſidence, upon the ſuppoſition of which the law doth ſtyle every parochial miniſter an incumbent. By ſtatute 21 Henry VIII. c. 13. perſons willingly abſenting themſelves from their benefices, for one month together, or two months in the year, incur a penalty of 5l. to the king, and 5l. to any perſon that will ſue for the ſame; except chaplains to the king, or others therein mentioned, during their attendance in the houſehold of ſuch as retain them; and alſo except all heads of houſes, magiſtrates, and profeſſors in the univerſities, and all ſtudents under forty years of age reſiding there, *bona fide*, for ſtudy. Legal reſidence is not only in the pariſh, but alſo in the parſonage houſe; for it hath been reſolved, that the ſtatute intended reſidence, not only for ſerving the cure and for hoſpitality, but alſo for maintaining the houſe, that the ſucceſſor alſo may keep hoſpitality there.

We have ſeen that there is but one way whereby one may become a parſon or vicar: there are many ways by which one may ceaſe to be ſo. 1. By death. 2. By ceſſion, in taking another benefice; for by ſtatute 21 Hen. VIII. c. 13. if any one having a benefice of 8l. *per annum*, or upwards, in the king's books, (according to the preſent valuation,) accepts any other, the firſt ſhall be adjudged void, unleſs he obtains a diſpenſation, which no one is entitled to have but the chaplains of the king and others therein mentioned, the brethren and ſons of lords and knights, and doctors and bachelors of divinity and law, admitted by the univerſities of this realm. And a vacancy thus made for want of a diſpenſation, is called *ceſſion*. 3. By conſecration; for, as was mentioned before, when a clerk is promoted to a biſhopric, all his other preferments are void the inſtant that he is conſecrated. But there is a method, by the favour of the crown, of holding ſuch livings *in commendam*. *Commenda*, or *eccleſia commendata*, is a living commended by the crown to the care of a clerk, to hold till a proper paſtor is provided for it. This may be temporary for one, two, or three years, or perpetual, being a kind of diſpenſation to avoid the vacancy of the living, and is called a *commenda retinere*. There is alſo a *commenda recipere*, which is to take a benefice *de novo* in the biſhop's own gift, or the gift of ſome other patron conſenting to the ſame; and this is the ſame to him as inſtitution and induction are to another clerk. 4. By reſignation. But this is of no avail till accepted by the ordinary, into whoſe hands the reſignation muſt be made. 5. By deprivation, either by canonical cenſures, or in purſuance of divers penal ſtatutes, which declare the benefice void, for ſome nonfeaſance or neglect, or elſe ſome malfeaſance or crime; as for ſimony; for maintaining any doctrine in derogation of the king's ſupremacy, or of the thirty-nine articles, or of the book of common prayer; for neglecting after inſtitution to read the liturgy and articles in the church, or make the declarations againſt Popery, or to take the abjuration-oath; for uſing any other form of prayer than the liturgy of the church of England; or for abſenting himſelf 60 days in one year from a benefice belonging to a Popiſh patron, to which the clerk was preſented by either of the univerſities: in all which, and ſimilar caſes, the benefice is *ipſo facto* void, without any formal ſentence of deprivation.

PARSONAGE, a rectory, or parish-church, endowed with a glebe, house, lands, tithes, &c. for the maintenance of a minister, with cure of souls within such parish. See PARSON.

PARSONS, or PERSONS (Robert), an eminent writer of the church of Rome, was born at Nether-Stowey, near Bridgewater, in Somersetshire, in 1546, and educated at Baliol college, Oxford, where he distinguished himself as a zealous Protestant and an acute disputant; but being charged by the society with incontinency and embezzling the college money, he went to Flanders, and declared himself a Catholic. After travelling to several other places, he effected the establishment of the English seminary at Rome, and procured father Allen to be chosen rector of it. He himself was appointed the head of the mission to England, in order to dethrone Queen Elizabeth, and if possible to extirpate the Protestant religion. He accordingly came over to this kingdom in 1580, and took some bold steps towards accomplishing his purpose, in which he concealed himself with great art, travelling about the country to gentlemen's houses, disguised in the habit sometimes of a soldier, sometimes of a gentleman, and at other times like a minister or an apparitor; but father Campian being seized and committed to prison, our author escaped out of England for fear of the same fate, and went to Rome, where he was made rector of the English seminary. He had long entertained the most sanguine hopes of converting to the Popish faith the young king of Scots, which he considered as the best and most effectual means of bringing over his subjects to the same religious principles; but finding it impossible to succeed in his design, he published in 1594 his celebrated book, under the feigned name of *Doleman*, in order to overthrow, as far as lay in his power, the title of that prince to the crown of England. He died at Rome in 1610, and was buried in the chapel of the English college. Besides the book already mentioned, he wrote, 1. A Defence of the Catholic Hierarchy. 2. The Liturgy of the Sacrament of the Mass. 3. A Memorial for the Reformation; and several other tracts.

PART, a portion of some whole, considered as divided or divisible.

Logical PART, is a division for which we are indebted to the schoolmen. It refers to some universal as its whole; in which sense the species are parts of a genus, and individuals or singulars are parts of the species.

Physical PART, is that which, though it enter the composition of a whole, may yet be considered a part, and under its own distinct idea; in which sense, a continuum is said to consist of parts. Physical parts, again, are of two kinds, homogeneous and heterogeneous; the first are those of the same denomination with some other; the second of a different one: (See HOMOGENEOUS, &c.) Parts, again, are distinguished into subjective, essential, and integrant. The schoolmen were also the authors of this division.

Aliquot PART, is a quantity which, being repeated any number of times, becomes equal to an integer. Thus 6 is an aliquot part of 24, and 5 an aliquot part of 30, &c.

Aliquant PART, is a quantity which, being repeated any number of times, becomes always either greater or less than the whole, Thus 5 is an aliquant part of 17, and 9 an aliquant part of 10, &c. The *aliquant* part is resolvable into aliquot parts. Thus 15, an aliquant part of 20, is resolvable into $10\frac{1}{2}$, and 5 a fourth part of the same.

PARTS *of Speech*, in grammar, are all the sorts of words which can enter the composition of a discourse. See GRAMMAR.

PARTERRE, in gardening, a level division of ground, which for the most part faces the south, or best front of a house, and is generally furnished with evergreens, flowers, &c. There are two kinds of these, the plain ones and the parterres of embroidery. Plain parterres are most valuable in England, because of the firmness of the English grass turf, which is superior to that of any other part of the world; and the parterres of embroidery are cut into shell and scroll work, with alleys between them. An oblong, or long square, is accounted the most proper figure for a parterre; and a parterre should indeed be always twice as long as it is broad, because, according to the known laws of perspective, a long square always sinks to a square; and an exact square always appears less than it really is. As to the breadth of a parterre, it is to be proportionable to the front of a house; but less than 100 feet in breadth is too little. There should be on each side the parterre a terras-walk raised for a view, and the flat of the parterre between the terraces should never be more than 300 feet, at the utmost, in breadth, and about 140 feet in width, with twice and a half that in length, is esteemed a very good size and proportion.

PARTHENIUM, in botany: A genus of the pentandria order, belonging to the monœcia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The male calyx is common and pentaphyllous; the florets of the disk monopetalous: the female has five florets of the radius, each with two male florets behind it; the intermediate female superior; the seed is naked.

It has been much neglected in Europe, having on account of its smell been banished from our parterres. It is therefore indebted for its culture to the distinguished rank it holds among the Chinese flowers. The skill of the florists, and their continual care, have brought this plant to so great perfection, that Europeans scarcely know it. The elegance and lightness of its branches, the beautiful indentation of its leaves, the splendour and duration of its flowers, seem indeed to justify the *florimania* of the Chinese for this plant. They have, by their attention to its culture, procured more than 300 species of it: every year produces a new one. A list of the names of all these kinds would be equally tedious and disgusting; we shall only say in general, that in its flowers are united all the possible combinations of shapes and colours. Its leaves are no less various: some of them are thin, others thick; some are very small, and some large and broad; some are indented like those of the oak, while others resemble those of the cherry treee; some may be seen cut in the form of fins, and others are found serrated on the margin, and tapering towards the points.

Parthenium is propagated in China by seed, and by suckers, grafts and slips. When the florists have a fine plant, they suffer the seeds to ripen, and about the end of autumn sow them in well prepared earth. Some keep them in this manner during winter, others sow them in spring. Provided they are watered after the winter, they shoot forth, and grow rapidly. After the parthenium has flowered, all its branches are cut three inches from the root, the earth is hoed around, and a little dung is mixed with it; and when the cold becomes severe, the plant is covered with straw, or an inverted pot. Those that are in vases are transported to the green-house, where they are not watered. In spring they are uncovered and watered, and they shoot forth a number of stems: of these some florists leave only two or three, others pull up the stalk, together with the whole root, and divide it into several portions, which they transplant elsewhere. There are some who join two slips of different colours, in each of which, towards the bottom, they make a long notch, almost to the pith, and afterwards tie them together with packthread, that they may remain closely united: by these means they obtain beautiful flowers, variegated with whatever colours they choose.

Parthenium requires a good exposure, and fresh moist air that circulates freely: when shut up closely by four walls, it soon languishes. The earth in which it is planted ought to be rich, moist, and loamy, and prepared with great care. For refreshing it, the Chinese use only rain or river-water; and in

ſpring-time, they mix with this water the excrements of ſilk-worms or the dung of their poultry; in ſummer they leave the feathers of ducks or fowls to infuſe in it for ſeveral days, after having thrown into it a little ſaltpetre; but in autumn they mix with the water a greater or ſmaller quantity of dried excrement reduced to powder, according as the plant appears more or leſs vigorous. During the great heats of ſummer, they water it morning and evening; but they moiſten the leaves only in the morning: they alſo place ſmall fragments of brick round its root, to prevent the water from preſſing down the earth too much. All this attention may appear trifling; but it is certain that it is founded upon experience and obſervation, and it is only by the aſſiſtance of ſuch minute care, that the patient and provident Chineſe has been able to procure, from a wild and almoſt ſtinking plant, ſo beautiful and odoriferous flowers. The more common ſpecies are, 1. Hyſterophorus. 2. Integrifolium.

PARTHIA, a celebrated empire of antiquity, bounded on the weſt by Media, on the north by Hyrcania, on the eaſt by Aria, on the ſouth by Carmania the deſert; ſurrounded on every ſide by mountains, which ſtill ſerve as a boundary, though its name is now changed, having obtained that of *Eyrac* or *Arac*; and to diſtinguiſh it from Chaldæa, that of *Eyrac Agami*. By Ptolemy it is divided into five diſtricts, *viz.* Caminſine, or Gamiſene, Parthyene, Choroane, Atticene, and Tabiene. The ancient geographers enumerate a great many cities in this country. Ptolemy in particular reckons 25 large cities; and it certainly muſt have been very populous, ſince we have accounts of 2000 villages, beſides a number of cities, in this diſtrict being deſtroyed by earthquakes. Its capital was named *Hecatompolis*, from the circumſtance of its having 100 gates. It was a noble and magnificent place; and, according to ſome, it ſtill remains under the name of *Iſpahan*, the capital of the preſent Perſian empire.

Some have ſuppoſed Parthia to have been firſt peopled by the Phetri or Pathri, often mentioned in Scripture, and will have the Parthians to be deſcended from Pathruſim the ſon of Miſraim. But however true this may be with regard to the ancient inhabitants, yet it is certain, that thoſe Parthians who were ſo famous in hiſtory, deſcended from the Scythians, though from what tribe we are not certainly informed.

The hiſtory of the ancient Parthians is totally loſt. All that we know about them is, that they were firſt ſubject to the Medes, afterwards to the Perſians, and laſtly to Alexander the Great. After his death the province fell to Seleucus Nicanor, and was held by him and his ſucceſſors till the reign of Antiochus Theus, about the year 250 before Chriſt. A detailed account of this ancient empire may be found in the Univerſal Hiſtory.

PARTI, Partie, *Party*, or *Parted*, in heraldry, is applied to a ſhield or eſcutcheon, denoting it divided or marked out into partitions. Parti *per pale*, is when the ſhield is divided perpendicularly into two halves, by a cut in the middle from top to bottom. Parti *per feſs*, is when the cut is acroſs the middle from ſide to ſide. Parti *per bend dexter*, is when the cut comes from the upper corner of the ſhield on the right hand, and deſcends athwart to the oppoſite lower corner. Parti *per bend ſiniſter*, is when the cut, coming from the upper left corner, deſcends acroſs to the oppoſite lower one. All theſe partitions, according to M. de la Colombiere, have their origin from the cuts and bruiſes that have appeared on ſhields after engagements; and, being proofs of the dangers to which the bearers had been expoſed, they gained them eſteem: for which reaſon they were tranſmitted to poſterity, and became arms and marks of honour to their future families.

PARTIALITY. See Self-*partiality* and Prejudice.

PARTICIPLE, in grammar, an adjective formed of a verb; ſo called, becauſe it participates partly of the properties of noun, and partly of thoſe of a verb. See Grammar.

PARTICLE, in phyſiology, the minute part of a body, an aſſemblage of which conſtitutes all natural bodies. In the new philoſophy, particle is often uſed in the ſame ſenſe with atom in the ancient Epicurean philoſophy, and corpuſcle in the latter. Some writers, however, diſtinguiſh them; making particle an aſſemblage or compoſition of two or more primitive and phyſically indiviſible corpuſcles or atoms; and corpuſcle, or little body, an aſſemblage or maſs of ſeveral particles or ſecondary corpuſcles. The diſtinction, however, is of little moment; and, as to moſt purpoſes of phyſics, particle may be underſtood as ſynonymous with corpuſcle. Particles are then the elements of bodies: it is the various arrangement and texture of theſe, with the difference of the coheſion, &c. that conſtitute the various kinds of bodies, hard, ſoft, liquid, dry, heavy, light, &c. The ſmalleſt particles or corpuſcles cohere with the ſtrongeſt attractions, and always compoſe bigger particles of weaker coheſion; and many of theſe cohering compoſe bigger particles, whoſe vigour is ſtill weaker; and thus on for divers ſucceſſions, till the progreſſion end in the biggeſt particles, whereon the operations in chemiſtry, and the colours of natural bodies depend, and which, by cohering, compoſe bodies of ſenſible bulks.

The coheſion of the particles of matter, according to the Epicureans, was effected by hooked atoms; the Ariſtotelians thought it managed by reſt, that is, by nothing at all. But Sir Iſaac Newton ſhows it is done by means of a certain power, whereby the particles mutually attract or tend towards each other, which is ſtill perhaps giving a fact without the cauſe. By this attraction of the particles he ſhows that moſt of the phenomena of the leſſer bodies are affected, as thoſe of the heavenly bodies are by the attraction of gravity. See Attraction and Cohesion.

Particle, a term in theology, uſed in the Latin church for the crumbs or little pieces of conſecrated bread called in the Greek church μερίδες. The Greeks have a particular ceremony, called των μερίδων, *of the particles*, wherein certain crumbs of bread, not conſecrated, are offered up in honour of the Virgin, St. John Baptiſt, and ſeveral other ſaints. They alſo give them the name of προσφορα, *oblation*. Gabriel archbiſhop of Philadelphia wrote a little treatiſe expreſs περι των μερίδων, wherein he endeavours to ſhow the antiquity of this ceremony, in that it is mentioned in the liturgies of St. Chryſoſtom and Baſil. There has been much controverſy on this head between the reformed and catholic divines. Aubertin and Blondel explain a paſſage in the theory of Germanus patriarch of Conſtantinople, where he mentions the ceremony of the particles as in uſe in his time, in favour of the former; Meſſieurs de Port Royal conteſt the explanation; but M. Simon, in his notes on Gabriel of Philadelphia, endeavours to ſhow that the paſſage itſelf is an interpolation, not being found in the ancient copies of Germanus, and conſequently that the diſpute is very ill grounded.

Organic Particles, are thoſe ſmall moving bodies which are imperceptible without the help of glaſſes; for, beſides thoſe animals which are perceptible to the ſight, ſome naturaliſts reckon this exceedingly ſmall ſpecies as a ſeparate claſs, if not of animals properly ſo called, at leaſt of moving bodies, which are found in the ſemen of animals, and which cannot be ſeen without the help of the microſcope. In conſequence of theſe obſervations, different ſyſtems of generation have been propoſed concerning the ſpermatic worms of the male and the eggs of the female. In the ſecond volume of Buffon's Natural Hiſtory, ſeveral experiments are related, tending to ſhow that thoſe moving bodies which we diſcover by the help of glaſſes in the male ſemen are not real animals, but organic, lively, active, and indeſtructible molecules, which poſſeſs the property of becoming a new organized body ſimilar to that from which they were ex-

tracted. Buffon found ſuch bodies in the female as well as in the male ſemen; and he ſuppoſes that the moving bodies which he obſerved with the microſcope in infuſions of the germs of plants are likewiſe vegetable organic molecules. Needham, Wriſberg, Spallanzani, and ſeveral other writers on the animal economy, have purſued the ſame track with M. de Buffon.

Some ſuppoſe that theſe organic molecules in the ſemen anſwer no purpoſe but to excite the venereal deſire: but ſuch an opinion cannot be well founded; for eunuchs, who have no ſeminal liquor, are nevertheleſs ſubject to venereal deſire. With reſpect to the beautiful experiments which have been made with the microſcope on organic molecules, M. Bonnet, that learned and excellent obſerver of nature, remarks, that they ſeem to carry us to the fartheſt verge of the ſenſible creation, did not reaſon teach us that the ſmalleſt viſible globule of ſeminal liquor is the commencement of another univerſe, which, from its infinite ſmallneſs, is beyond the reach of our beſt microſcopes. —*Animalcules*, properly ſo called, muſt not be confounded with the wonderful organic particles of Buffon. See ANIMALCULE.

PARTICLE, in grammar, a denomination for all thoſe ſmall words that tie or untie others, or that expreſs the modes or manners of words. See GRAMMAR.

PARTING, in metallurgy. See METALLURGY.

PARTING, in chemiſtry, an operation by which gold and ſilver are ſeparated from each other. As theſe two metals reſiſt equally well the action of fire and of lead, they muſt therefore be ſeparated by other methods. This ſeparation could not be effected if they were not ſoluble by different menſtruums. Nitrous acid, marine acid, and ſulphur, which cannot diſſolve gold, attack ſilver very eaſily; and therefore theſe three agents furniſh methods of ſeparating ſilver from gold, or of the operation called *parting*. Parting by nitrous acid is the moſt convenient, and therefore moſt uſed, and even almoſt the only one employed by goldſmiths and coiners. Wherefore it is called ſimply *parting*. That made with the marine acid is only made by cementation, and is known by the name of *concentrated parting*. Laſtly, parting by ſulphur is made by fuſion, which the chemiſts call the *dry way*, and is therefore called *dry parting*.

PARTING *by Aquafortis*. Although parting by aquafortis be eaſy, as we have ſaid, it cannot however ſucceed, or be very exact, unleſs we attend to ſome eſſential circumſtances.

1. The gold and ſilver muſt be in a proper proportion: for, if the gold was in too great quantity, the ſilver would be covered and guarded by it from the action of the acid. Therefore, when aſſayers do not know the proportion of theſe two metals in the maſs to be operated upon, they diſcover it by the following method. They have a certain number of needles compoſed of gold and ſilver allayed together in graduated proportions, and the allay of each needle is known by a mark upon it. Theſe are called *proof needles*.

When aſſayers want to know nearly the proportion of gold and ſilver in a maſs, they rub this maſs upon a touchſtone, ſo as to leave a mark upon it. They then make marks upon the touchſtone with ſome of the needles the colour of which they think comes neareſt to that of the maſs. By comparing the marks of theſe needles with the mark of the maſs, they diſcover nearly the proportion of the gold and ſilver in the maſs. If this trial ſhows, that in any given maſs the ſilver is not to the gold as three to one, this maſs is improper for the operation of parting by aquafortis. In this caſe, the quantity of ſilver neceſſary to make an allay of that proportion muſt be added. This operation is called *quartation*, probably becauſe it reduces the gold to a fourth part of the whole maſs.

2. That the parting may be exact, the nitrous acid or aquafortis employed muſt be very pure, and eſpecially free from mixture of vitriolic and marine acids. For, if this was not attended to, a quantity of ſilver proportionable to theſe two foreign acids would be ſeparated during the ſolution; and this portion of ſilver reduced by theſe acids to vitriol of ſilver and to luna cornea would remain mingled with the gold, which conſequently would not be entirely purified by the operation.

When the metallic maſs is properly allayed, it is to be reduced to plates, rolled up ſpirally, called cornets; or to grains. Theſe are to be put into a matraſs, and upon them a quantity of aquafortis is to be poured, the weight of which is to that of the ſilver as three to two: and as the nitrous acid employed for this operation is rather weak, the ſolution is aſſiſted, eſpecially at firſt, by the heat of a ſand bath, in which the matraſs is to be placed. When, notwithſtanding the heat, no further mark of ſolution appears, the aquafortis charged with ſilver is to be decanted. Freſh nitrous acid is to be poured into the matraſs, ſtronger than the former, and in leſs quantity, which muſt be boiled on the reſiduous maſs, and decanted as the former. Aquafortis muſt even be boiled a third time on the remaining gold, that all the ſilver may be certainly diſſolved. The gold is then to be waſhed with boiling water. This gold is very pure if the operation has been performed with due attention. It is called *gold of parting*.

No addition of ſilver is required, if the quantity of ſilver of the maſs is evidently much more conſiderable than that of the gold: perſons who have not proof needles and other apparatus to determine the proportion of the allay, may add to the gold an indeterminate quantity of ſilver, obſerving that this quantity be rather too great than too ſmall, and ſo conſiderable as to render the maſs nearly as white as ſilver; for a large quantity of ſilver is rather favourable than hurtful to the operation: it has no other inconvenience than an uſeleſs expence, as the larger the quantity is of ſilver the more aquafortis muſt be employed. We ought to attend to this fact, that the colour of gold is ſcarcely perceptible in a maſs two-thirds of which is ſilver and one-third is gold; this colour then muſt be much leſs perceptible when the gold is only one-fourth part, or leſs, of the whole maſs.

If the quantity of gold exceeds that of the ſilver, the maſs may be expoſed to the action of aqua-regia, which would be a kind of inverſe parting, becauſe the gold is diſſolved in that menſtruum, and the ſilver is not, but rather reduced to a luna cornea, which remains in form of a precipitate after the operation. But this method is not much practiſed, for the following reaſons. *Firſt*, the gold cannot be eaſily ſeparated from the aqua-regia; for, if the parting has been made with an aqua-regia prepared with ſal ammoniac, or if the gold be precipitated by a volatile alkali, this gold has a fulminating quality, and its reduction requires particular operations. If the aqua-regia has been made with ſpirit of ſalt, and the precipitation effected by a fixed alkali, the gold will not then be fulminating, but the precipitation will be very ſlow, and probably incomplete. *Secondly*, in the parting by aqua-regia, the ſilver is indeed precipitated into a luna cornea, and thus ſeparated; but this ſeparation is not perfect, as a ſmall quantity of luna cornea will always remain diſſolved by the acids, if this ſolution even could be only effected by the ſuperabundant water of theſe acids. Accordingly the ſilver is not ſo accurately ſeparated from the gold by aqua-regia, as the gold is from the ſilver by aquafortis.

The gold, after the parting by aquafortis, is much more eaſily collected when it remains in ſmall maſſes than when it is reduced to a powder.

When the maſs has been regularly quarted, that is, when it contains three parts of ſilver and one part of gold, we muſt employ, particularly for the firſt ſolution, an aquafortis ſo weakened that heat is required to aſſiſt the ſolution of the ſilver; by which means the ſolution is made gently; and the gold which remains preſerves the form of the ſmall maſſes before the ſolution. If the aquafortis employed were ſtronger, the parts of

the gold would be diſunited, and reduced to the form of a powder, from the activity with which the ſolution would be made.

We may indeed part by aquafortis a maſs containing two parts of ſilver to one part of gold; but then the aquafortis muſt be ſtronger; and if the ſolution be not too much haſtened, the gold will more eaſily remain in maſſes after the operation. In both caſes, the gold will be found to be tarniſhed and blackened, probably from what was lately called the *phlogiſton* of the nitrous acid. Its parts have no adheſion together, becauſe the ſilver diſſolved from it has left many interſtices; and the cornets or grains of this gold will be eaſily broken, unleſs they be handled very carefully. To give them more ſolidity, they are generally put into a teſt under a muffle, and made red-hot; during which operation they contract conſiderably, and their parts are approximated. Theſe pieces of gold are then found to be rendered much more ſolid, ſo that they may be handled without being broken. By this operation alſo the gold reſumes its colour and luſtre; and as it generally has the figure of cornets, it is called *gold in cornets*, or *grain gold*. Aſſayers avoid melting it, as they chooſe to preſerve this form, which ſhows that it has been parted.

The gold and ſilver thus operated upon ought to have been previouſly refined by lead, and freed from all allay of other metallic matters, ſo that the gold which remains ſhould be as pure as is poſſible. However, as this is the only metal which reſiſts the action of aquafortis, it might be purified by parting from all other metallic ſubſtances; but this is not generally done, for ſeveral reaſons. Firſt, becauſe the refining by lead is more expeditious and convenient for the ſeparation of the gold from the imperfect metals; ſecondly, becauſe the ſilver, when afterwards ſeparated from the aquafortis, is pure; laſtly, becauſe moſt imperfect metals do not remain completely and entirely diſſolved in nitrous acid, from the portion of phlogiſton which this acid deprives them of, the gold would be found after the parting mixed with the part of theſe metals which is precipitated.

The gold remaining after the parting ought to be well waſhed, to cleanſe it from any of the ſolution of ſilver which might adhere to it; and for this purpoſe diſtilled water ought to be uſed, or at leaſt water the purity of which has been aſcertained by its not forming a precipitate with a ſolution of ſilver, becauſe ſuch a precipitate would alter the purity of the gold.

The ſilver diſſolved in the aquafortis may be ſeparated either by diſtillation, in which caſe all the aquafortis is recovered very pure, and fit for another parting; or it may be precipitated by ſome ſubſtance which has a greater affinity than this metal with nitrous acid. Copper is generally employed for this purpoſe at the mint.

The ſolution of ſilver is put into copper veſſels. The aquafortis diſſolves the copper, and the ſilver precipitates. When the ſilver is all precipitated, the new ſolution is decanted, which is then a ſolution of copper. The precipitate is to be well waſhed, and may be melted into an ingot. It is called *parted ſilver*. When this ſilver has been obtained from a maſs which had been refined by lead, and when it has been well waſhed from the ſolution of copper, it is very pure.

Mr. Cramer obſerves juſtly in his Treatiſe on Eſſaying, that however accurately the operation of parting has been performed, a ſmall portion of ſilver always remains united with the gold, if the parting has been made by aquafortis; or a ſmall portion of the gold remains united with the ſilver, if the parting has been made by aqua-regia: and he eſtimates this ſmall allay to be from a two hundredth to a hundred and fiftieth part; which quantity may be conſidered as nothing for ordinary purpoſes, but may become ſenſible in accurate chemical experiments. *Chem. Dict.*

The maſs of gold and ſilver to be parted ought previouſly to be granulated; which may be done by melting it in a crucible, and pouring it into a large veſſel full of cold water, while at the ſame time a rapid circular motion is given to the water by quickly ſtirring it round with a ſtick or broom.

The veſſels generally uſed for this operation, called *parting-glaſſes*, have the form of truncated cones, the bottom being commonly about ſeven inches wide, the aperture about one or two inches wide, and the height about 12 inches. Theſe glaſs veſſels ought to have been well annealed, and choſen free from flaws; as one of the chief inconveniences attending the operation is, that the glaſſes are apt to crack by expoſure to cold, and even when touched by the hand. Some operators ſecure their glaſſes by a coating. For this purpoſe, they ſpread a mixture of quicklime ſlaked with beer and whites of eggs upon linen cloth, which they wrap round the lower part of the veſſel, leaving the upper part uncovered, that they may ſee the progreſs of the operation: and over this cloth they apply a compoſition of clay and hair. Schlutter adviſes to put the parting-glaſſes containing ſome water, and ſupported by trevets, with fire under them. When the heat communicated by the water is too great, it may be diminiſhed by adding cold water, which muſt be done very carefully by pouring againſt the ſides of the pan, to prevent too ſudden an application of cold to the parting-glaſs. The intention of this contrivance is, that the contents of the glaſſes, if theſe ſhould break, may be received by the copper veſſel. Into a glaſs 15 inches high, and 10 or 12 inches wide at bottom, placed in a copper-pan 12 inches wide at bottom, 15 inches wide at top, and 10 inches high, he uſually put about 80 ounces of metal, with twice as much aquafortis.

The aquafortis ought to be ſo ſtrong as to be capable of acting ſenſibly on ſilver when cold, but not ſo ſtrong as to act violently. If the aquafortis be very ſtrong, however pure, and if the veſſels be well cloſed, a ſmall quantity of the gold will be diſſolved along with the ſilver; which is to be guarded againſt. Little heat ought to be applied at the beginning, the liquor being apt to ſwell and riſe over the veſſel; but when the acid is nearly ſaturated, the heat may be ſafely increaſed. When the ſolution ceaſes, which may be known by the diſcontinuance of the effervеſcence, or emiſſion of air-bubbles, the liquor is to be poured off. If any grains appear entire, more aquafortis muſt be added, that all the ſilver may be diſſolved. If the operation has been performed ſlowly, the remaining gold will have ſtill the form of diſtinct maſſes, which are to receive ſolidity and colour by fire, in the manner directed by the author of the Dictionary. If the operation has been performed haſtily, the gold will have the appearance of a black mud or powder, which after five or ſix waſhings with pure water muſt be melted.

The ſilver is uſually recovered by precipitating it from the aquafortis by means of copper veſſels into which the liquor is poured, or of plates of copper which are thrown along with the liquor into glaſs veſſels. A conſiderable heat is required to accelerate this precipitation. Dr. Lewis ſays, he has obſerved that when the aquafortis was perfectly ſaturated with ſilver, no precipitation was occaſioned by plates of copper, till a drop or two of aquafortis was added to the liquor, and then the precipitation began and continued as uſual. The precipitated ſilver muſt be well waſhed in boiling water, and fuſed with ſome nitre; the uſe of which is to ſcorify any cupreous particles which may adhere to the ſilver.

From the ſolution of copper in aquafortis, a blue pigment, called *verditer*, is obtained by precipitation with whiting. *Notes to Chem. Dict.*

Concentrated. PARTING, alſo called *Parting by Cementation*, becauſe it is actually performed by cementation, is uſed when the quantity of it is ſo great in proportion to the ſilver, that it cannot be ſeparated by aquafortis. This operation is done in the following manner. A cement is firſt prepared, compoſed of

four parts of bricks powdered and ſifted, of one part of green vitriol calcined till it becomes red, and of one part of common ſalt. The whole is very accurately mixed together, and a firm paſte is made of it by moiſtening it with a little water or urine. This cement is called *cement royal*, becauſe it is employed to purify gold, which is conſidered by chemiſts as the king of metals.

The gold to be cemented is to be reduced to plates as thin as ſmall pieces of money. At the bottom of the crucible or cementing pot, a ſtratum of cement, of the thickneſs of a finger, is to be put, which is to be covered with plates of gold; upon theſe another ſtratum of cement is to be laid, and then more plates of gold, till the crucible or pot is filled with theſe alternate ſtrata of cement and of gold. The whole is then to be covered with a lid, which is to be luted with a mixture of clay and ſand. This pot is to be placed in a furnace, or oven, and heated by degrees till it is moderately red, which heat is to be continued during 24 hours. The heat muſt not be ſo great as to melt the gold. The pot or crucible is then left to cool, and the gold is to be carefully ſeparated from the cement, and boiled at different times in a large quantity of pure water. This gold is to be eſſayed upon a touchſtone or otherwiſe; and if it be found not ſufficiently purified, it is to be cemented a ſecond time in the ſame manner. The vitriolic acid of the bricks and of the calcined vitriol diſengages the acid of the common ſalt during this cementation: and this latter acid diſſolves the ſilver allayed with the gold, and ſeparates it by that means.

This experiment proves, that although marine acid, while it is liquid, cannot attack ſilver, it is nevertheleſs a powerful ſolvent of that metal. But for this purpoſe it muſt be applied to the ſilver in the ſtate of vapours, extremely concentrated, and aſſiſted with a conſiderable heat. All theſe circumſtances are united in the concentrated parting. This experiment proves alſo, that notwithſtanding all theſe circumſtances, which favour the action of the marine acid, it is incapable of diſſolving gold.

Laſtly, the marine acid in this ſtate more effectually diſſolves the ſilver than the nitrous acid does in the parting by aquafortis, ſince this operation ſucceeds well when the ſilver is in ſo ſmall a proportion as that it would be protected from the action of the nitrous acid in the ordinary parting. Inſtead of ſea-ſalt, nitre may be uſed with equal ſucceſs; becauſe the nitrous acid is then put in a ſtate to attack the ſilver, notwithſtanding the quantity of gold which covers it.

Dry-PARTING. Dry-parting, or parting by fuſion, is performed by ſulphur, which has the property of uniting eaſily with ſilver, while it does not attack gold. This method of ſeparating theſe two metals would be the cheapeſt, the moſt expeditious and convenient of any, if the ſulphur could diſſolve the ſilver, and ſeparate it from the gold as well and as eaſily as nitrous acid does: but, on the contrary, we are obliged to employ a particular treatment, and a kind of concentration, to begin the union of the ſulphur allayed with gold. Then repeated and troubleſome fuſions muſt be made, in each of which we are obliged to add different intermediate ſubſtances, and particularly the metals which have the ſtrongeſt affinity with ſulphur, to aſſiſt the precipitation, which in that caſe does not give a regulus of pure gold, but a gold ſtill allayed with much ſilver, and even with a part of the precipitating metals; ſo that, to complete the operation, cupellation is neceſſary, and alſo parting by aquafortis.

From what we have ſaid concerning this operation, we may perceive, that it ought not to be made but when the quantity of ſilver with which the gold is allayed is ſo great, that the quantity of gold which might be obtained by the ordinary parting is not ſufficient to pay the expences; and that it is only proper for concentrating a larger quantity of gold in a ſmaller quantity of ſilver. As this dry parting is troubleſome, and even expenſive, it ought not to be undertaken but on a conſiderable quantity of ſilver allayed with gold. Accordingly Cramer, Schlutter, Schlinder, and all good chemiſts and artiſts who have given proceſſes for the dry-parting, recommend its uſe only in the above-mentioned caſes. We wiſh that this operation could be improved: it would be much more advantageous if it could be done by two or three fuſions; and if by theſe an exact ſeparation could be obtained of a ſmall quantity of gold mixed with a large quantity of ſilver. *Chem. Dict.*

As this operation for extracting a ſmall quantity of gold from a large quantity of ſilver is, notwithſtanding its inconveniences, approved by Schlutter, Scheffer, and other authors, and practiſed in Hartz, we ſhall add what Dr. Lewis, in his excellent Hiſtory of Gold, has ſaid upon the ſubject.

The moſt advantageous method of ſeparating a ſmall portion of gold from a large one of ſilver, appears to be by means of ſulphur, which unites with and ſcorifies the ſilver without affecting the gold; but as ſulphurated ſilver does not flow thin enough to ſuffer the ſmall particles of gold diffuſed through it to reunite and ſettle at the bottom, ſome addition is neceſſary for collecting and carrying them down.

In order to the commixture with the ſulphur, 50 or 60 pounds of the mixed metal, or as much as a large crucible will receive, are melted at once, and reduced into grains, by taking out the fluid matter, with a ſmall crucible made red hot, and pouring it into cold water ſtirred with a rapid circular motion. From an eighth to a fifth of the granulated metal, according as it is richer or poorer in gold, is reſerved, and the reſt well mingled with an eighth of powdered ſulphur. The grains enveloped with the ſulphur are again put into the crucible, and the fire kept gentle for ſome time, that the ſilver, before it melts, may be thoroughly penetrated by the ſulphur; if the fire was haſtily urged, great part of the ſulphur would be diſſipated, without acting upon the metal.

If to ſulphurated ſilver in fuſion pure ſilver be added, the latter falls to the bottom, and forms there a diſtinct fluid not miſcible with the other. The particles of gold, having no affinity with the ſulphurated ſilver, join themſelves to the pure ſilver, wherever they come in contact with it, and are thus transferred from the former into the latter, more or leſs perfectly according as the pure ſilver was more or leſs thoroughly diffuſed through the mixed. It is for this uſe that a part of the granulated metal was reſerved. The ſulphurated maſs being brought into perfect fuſion, and kept melted for near an hour in a cloſe covered crucible, one-third of the reſerved grains is thrown in; and as ſoon as this is melted, the whole is well ſtirred, that the freſh ſilver may be diſtributed through the mixed, to collect the gold from it. The ſtirring is performed with a wooden rod; an iron one would be corroded by the ſulphur, ſo as to deprive the mixed of its due quantity of ſulphur, and likewiſe render the ſubſequent purification of the ſilver more troubleſome. The fuſion being continued an hour longer, another third of the unſulphurated grains is added, and an hour after this the remainder; after which the fuſion is further continued for ſome time, the matter being ſtirred at leaſt every half hour from the beginning to the end, and the crucible kept cloſely covered in the intervals.

The ſulphurated ſilver appears in fuſion of a dark-brown colour; after it has been kept melted for a certain time, a part of the ſulphur having eſcaped from the top, the ſurface becomes white, and ſome bright drops of ſilver, about the ſize of peas, are perceived on it. When this happens, which is commonly in about three hours after the laſt addition of the reſerved grains, ſooner or later according as the crucible has been more or leſs cloſely covered, and the matter more or leſs ſtirred, the fire muſt be immediately diſcontinued; for otherwiſe more and more of the ſilver, thus loſing its ſulphur,

would ſubſide, and mingle with the part at the bottom in which the gold is collected. The whole is poured out into an iron mortar greaſed and duly heated; or, if the quantity is too large to be ſafely lifted at once, a part is firſt taken out from the top with a ſmall crucible, and the reſt poured into the mortar. The gold, diffuſed at firſt through the whole maſs, is now found collected into a part of it at the bottom, amounting only to about as much as was reſerved unſulphurated. This part may be ſeparated from the ſulphurated ſilver above it by a chiſſel and hammer; or more perfectly, the ſurface of the lower maſs being generally rugged and unequal, by placing the whole maſs with its bottom upwards in a crucible: the ſulphurated part quickly melts, leaving unmelted that which contains the gold, which may thus be completely ſeparated from the other. The ſulphurated ſilver is eſſayed by keeping a portion of it in fuſion in an open crucible till the ſulphur is diſſipated, and then diſſolving it in aquafortis. If it ſhould ſtill be found to contain any gold, it is to be melted again; as much more unſulphurated ſilver is to be added as was employed in each of the former injections, and the fuſion continued about an hour and a half.

The gold thus collected into a part of the ſilver may be farther concentrated into a ſmaller part, by granulating the maſs and repeating the whole proceſs. The operation may be again and again repeated, till ſo much of the ſilver is ſeparated, that the remainder may be parted by aquafortis without too much expence.

The foregoing proceſs, according to Mr. Schlutter, is practiſed at Rammelſberg in the Lower Hartz. The prevailing metal in the ore of Rammelſberg is lead: the quantity of lead is at moſt 40 pounds on a quintal or 100 pounds of the ore. The lead worked off on a teſt or concave hearth yields about 110 grains of ſilver, and the ſilver contains only a 384th part of gold; yet this little quantity of gold, amounting ſcarcely to a third of a grain in a hundred weight of this ore, is thus collected with profit. The author above mentioned confines this method of ſeparation to ſuch ſilver as is poor in gold, and reckons parting with aquafortis more advantageous where the gold amounts to above a 64th of the ſilver: he adviſes alſo not to attempt concentrating the gold too far, as a portion of it will always be taken up again by the ſilver. Mr. Scheffer, however, relates (in the Swediſh Memoirs for the year 1752), that he has by this method brought the gold to perfect fineneſs; and that he has likewiſe collected all the gold which the ſilver contained; the ſilver of the laſt operations, which had taken up a portion of the gold, being reſerved to be worked over again with a freſh quantity of gold-holding ſilver. The ſulphurated ſilver is purified by continuing it in fuſion for ſome time with a large ſurface expoſed to the air; the ſulphur gradually exhales, and leaves the ſilver entire.

PARTISAN, in the art of war, a perſon dexterous in commanding a party; who, knowing the country well, is employed in getting intelligence, or ſurpriſing the enemy's convoy, &c. The word alſo means an officer ſent out upon a party, with the command of a body of light troops, generally under the appellation of the partiſan's corps. It is alſo neceſſary that this corps ſhould be compoſed of infantry, light-horſe, and huſſars.

PARTNERSHIP, is a contract among two or more perſons, to carry on a certain buſineſs, at their joint expence, and ſhare the gain or loſs which ariſes from it. Of this there are four kinds.

I. Occaſional joint trade, where two or more merchants agree to employ a certain ſum in trade, and divide the gain or loſs ſo ſoon as the adventure is brought to an iſſue. This kind of contract being generally private, the parties concerned are not liable for each other. If one of them purchaſe goods on truſt, the furniſher, who grants the credit through confidence in him alone, has no recourſe, in caſe of his inſolvency, againſt the other partners. They are only anſwerable for the ſhare of the adventure that belongs to the inſolvent partner. If it be propoſed to carry the adventure farther than originally agreed on, any partner may withdraw his intereſt; and, if it cannot be ſeparated from the others, may inſiſt that the whole ſhall be brought to an iſſue.

II. Standing companies, which are generally eſtabliſhed by written contract between the parties, where the ſtock, the firm, duration, the diviſion of the gain or loſs, and other circumſtances, are inſerted.

All the partners are generally authoriſed to ſign by the firm of the company, though this privilege may be confined to ſome of them by particular agreement. The firm ought only to be ſubſcribed at the place where the copartnery is eſtabliſhed. If a partner has occaſion, when abſent, to write a letter relating to their affairs, he ſubſcribes his own name on account of the company. When the ſame partners carry on buſineſs at different places, they generally chooſe different firms for each. The ſignature of each partner is generally ſent to new correſpondents; and when a partner is admitted, although there be no alteration in the firm, his ſignature is tranſmitted, with an intimation of the change in the copartnery, to all their correſpondents. Houſes that have been long eſtabliſhed, often retain the old firm, though all the original partners be dead or withdrawn.

The powers of each partner are, in general, diſcretionary; but they ought not to act, in matters of importance, without conſulting together, when there is an opportunity. No partner is liable to make good the loſs ariſing from his judging wrong in a caſe where he had authority to act. If he exceeds his power, and the event prove unſucceſsful, he muſt bear the loſs; but if it prove ſucceſsful, the gain belongs to the company: yet if he acquaints the company immediately of what he has done, they muſt either acquieſce therein, or leave him the chance of gain, as well as the riſk of loſs.

All debts contracted under the firm of the company are binding on the whole partners, though the money was borrowed by one of them for his private uſe, without the conſent of the reſt. And if a partner exceeds his power, the others are nevertheleſs obliged to implement his engagements; though they may render him reſponſible for his miſbehaviour.

Although the ſums to be advanced by the partners be limited by the contract, if there be a neceſſity for raiſing more money to anſwer emergencies or pay the debts of the company, the partners muſt ſuruiſh what is neceſſary, in proportion to their ſhares.

A debt to a company is not cancelled by the private debts of the partner; and when a partner becomes inſolvent, the company is not bound for his debts beyond the extent of his ſhare. The debts of the company are preferable, on the company's effects, to the private debts of the partners.

Partnerſhip is generally diſſolved by the death of a partner; yet when there are more partners than two, it may, by agreement, ſubſiſt among the ſurvivors. Sometimes it is ſtipulated, that, in caſe of the death of a partner, his place ſhall be ſupplied by his ſon, or ſome other perſon condeſcended on. The contract ought to ſpecify the time and manner in which the ſurviving partners ſhall reckon with the executors of the deceaſed for his ſhare of the ſtock, and a reaſonable time allowed for that purpoſe.

When partnerſhip is diſſolved, there are often outſtanding debts that cannot be recovered for a long time, and effects that cannot eaſily be diſpoſed of. The partnerſhip, though diſſolved in other reſpects, ſtill ſubſiſts for the management of their outſtanding affairs; and the money ariſing from them is di-

vided among the partners, or their repreſentatives, when it is recovered. But as this may protract the final ſettlement of the company's affairs to a very inconvenient length, other methods are ſometimes uſed to bring them to a concluſion, either in conſequence of the original contract, or by agreement at the time of diſſolution. Sometimes the debts and effects are ſold by auction; ſometimes they are divided among the partners; and when there are two partners, one divides them into ſhares as equal as poſſible, and the other chooſes either ſhare he thinks beſt.

If a partner withdraws, he continues reſponſible for his former partners till it be publicly known that he hath done ſo. A deed of ſeparation, regiſtered at a public office, is ſufficient preſumption of ſuch notoriety.

III. Companies, where the buſineſs is conducted by officers. There are many companies of this kind in Britain, chiefly eſtabliſhed for purpoſes which require a larger capital than private merchants can command. The laws with reſpect to theſe companies, when not confirmed by public authority, are the ſame as the former, but the articles of their agreement uſually very different. The capital is condeſcended on; and divided into a certain number of ſhares, whereof each partner may hold one or more, but is generally reſtricted to a certain number. Any partner may transfer his ſhare: and the company muſt admit his aſſignee as a partner. The death of the partners has no effect on the company. No partner can act perſonally in the affairs of the company; but the execution of their buſineſs is intruſted to officers, for whom they are reſponſible; and, when the partners are numerous, the ſuperintendency of the officers is committed to directors choſen annually, or at other appointed times, by the partners.

IV. Companies incorporated by authority. A royal charter is neceſſary to enable a company to hold lands, to have a common ſeal, and enjoy the other privileges of a corporation. A charter is ſometimes procured, in order to limit the riſk of the partners: for, in every private company, the partners are liable for the debts, without limitation; in corporated ſocieties, they are only liable for their ſhares in the ſtock of the ſociety. The incorporation of ſocieties is ſometimes authoriſed by act of parliament; but this high authority is not neceſſary, unleſs for conferring excluſive privileges.

Mr. Paley ſays, "I know of nothing upon the ſubject of partnerſhip that requires explanation, but how the profits are to be divided where one partner contributes money and the other labour, which is a common caſe.

"*Rule.* From the ſtock of the partnerſhip deduct the ſum advanced, and divide the remainder between the moneyed partner and the labouring partner, in the proportion of the intereſt of the money to the wages of the labour, allowing ſuch a rate of intereſt as money might be borrowed for upon the ſame ſecurity, and ſuch wages as a journeyman would require for the ſame labour and truſt.

"*Example.* A. advances 1000l. but knows nothing of the buſineſs; B. produces no money, but has been brought up to the buſineſs, and undertakes to conduct it. At the end of the year the ſtock and effects of the partnerſhip amount to 1200l. conſequently there are 200l. to be divided. Now nobody would lend money upon the event of the buſineſs ſucceeding, which is A's ſecurity, under 6 *per cent.* therefore A. muſt be allowed 60l. for the intereſt of his money. B. before he engaged in the partnerſhip, earned 30l. a-year in the ſame employment: his labour, therefore, ought to be valued at 30l. and the 200l. muſt be divided between the partners in the proportion of 60 to 30; that is, A. muſt receive 133l. 6s. 8d. and B. 66l. 13s. 4d. If there be nothing gained, A. loſes his intereſt, and B. his labour; which is right. If the original ſtock be diminiſhed, by this rule B. loſes only his labour as before; whereas A. loſes his intereſt and part of the principal: for which eventual diſadvantage A. is compenſated, by having the intereſt of his money computed at 6 *per cent.* in the diviſion of the profit when there is any. It is true, that the diviſion of the profit is ſeldom forgotten in the conſtitution of the partnerſhip; and is therefore commonly ſettled by expreſs agreement; but theſe agreements, to be equitable, ſhould purſue the principle of the rule here laid down. All the partners are bound by what any one of them does in the courſe of the buſineſs; for, *quoad hoc*, each partner is conſidered as an authoriſed agent for the reſt."

PARTRIDGE, in ornithology. See TETRAO. The partridge is ſo valuable at the table, that a great many ways of taking it have been invented by ſportſmen, all of which ſucceed, from the natural folly and timidity of the animal.

The places partridges delight in moſt are corn fields, eſpecially while the corn grows, for under that cover they ſhelter and breed: neither are thoſe places unfrequented by them when the corn is cut down, by reaſon of the grain they find there, eſpecially in wheat-ſtubble, the height of which they delight in, being to them as a covert or ſhelter. When the wheat-ſtubble is much trodden by men or beaſts, they then betake themſelves to the barley-ſtubble, provided it be freſh and untrodden; and they will, in the furrows amongſt the clots, bunches, and long graſs, hide both themſelves and coveys, which are ſometimes 20 in number, nay 30, in a covey.

When the winter-ſeaſon is arrived, and the ſtubble-fields are ploughed up, or over-ſoiled with cattle, partridges reſort into the upland meadows, and lodge in the dead-graſs, or fog under hedges, amongſt mole-hills, or under the roots of trees; ſometimes they reſort to coppices and under-woods, eſpecially if any corn-fields are adjacent, or where there is grown broom, brakes, fern, &c.

In the harveſt-time, when every field is full of men and cattle, in the day-time they are found in the fallow-fields which are next adjoining to the corn-fields, where they lie lurking till evening or morning, and then they feed among the ſheaves of corn.

When their haunts are known, according to the ſituation of the country and ſeaſon of the year, the next care muſt be to find them out in their haunts, which is done ſeveral ways. Some do it by the eye only; and this art can never be taught, but learned by frequent experience, the colour of the birds being ſo like that of the earth at a diſtance; that no eye but a very converſant one could diſtinguiſh them. When they are once ſeen, the buſineſs is to keep the eye upon them, and then to keep in continual motion. They are a very lazy bird, and by this means will let a perſon almoſt tread upon them; though, if the perſon ſtands ſtill to eye them, they will riſe immediately, though they be at a conſiderable diſtance.

Another method of diſcovering them is; by going to their haunts very early in the morning, or at the cloſe of the evening, which is called the *jucking*-time. The noiſe of the cock partridge is to be attended to at this time, and is very loud and earneſt. The hen will ſoon come up to the cock after her making the noiſe, which ſhe does by way of anſwer; and when they are got together, their chattering will diſcover them. Thus they may always be found at theſe times. But there is yet a better method of finding this bird, which is by the *call*. The buſineſs, in order to have ſucceſs in this way, is carefully to learn the notes of the partridge, and be able to imitate all the ſeveral ſounds. When perfect in this, the perſon is to go to the haunts morning and evening, and, placing himſelf in ſome place where he can ſee the birds without being ſeen by them, he is to liſten to their calling: and when they are heard, he is to anſwer in the ſame notes, doubling again as they do by continuing this, they may be brought ſo near, that the perſon lying down on his back may count their whole number.

Having in this manner found where the birds are, the next care is to catch them.

They are ſo fooliſh, that it is extremely eaſy to take them in *nets*. In order to this, there needs no more than the going out, provided with two or three nets, with meſhes ſomewhat ſmaller than thoſe of the pheaſant nets; and walking round about the covey, a net is to be fixed ſo as to draw over them, on pulling a line at a diſtance. All this may be eaſily done; for, ſo long as the ſportſman continues moving about, and does not fix his eye too intenſely upon them, they will let him come near enough to fix the net without moving. If they lie ſo ſtraggling, that one net will not cover them, then two or three muſt be fixed in the ſame manner. The ſportſman may then draw the nets over them, and they will often lie ſtill with the nets upon them till he comes up to fright them; then they will riſe, and be entangled in the net.

A ſecond method of taking them is with *bird-lime:* this is done by means of wheat-ſtraws. Theſe muſt be large, and cut off between knot and knot; they muſt be well limed with the beſt and ſtrongeſt bird-lime, and the ſportſman muſt carry a great number out with him. Having found a field where there are partridges, he is to call; and if they anſwer, he is then to ſtick up the limed ſtraws in rows acroſs two or three lands, and, going backward, call again to them, leading them on in the road where the ſtraws are: they will follow one another like a flock of chickens, and come out to the call; and will in their way run upon the ſtraws, and liming themſelves they will daub one another by crowding together, ſo that very few of them will be able to eſcape.

But there is yet a pleaſanter way of taking them than this, that is, by *driving* them. In order to this, an engine is to be made of canvas ſtuffed with ſtraw, to repreſent a horſe; this horſe and nets are to be taken to the haunts of the partridges; and the nets being placed ſlanting or ſlopewiſe in the lower part of the field, the ſportſman is to take the wind in his back and get above them, driving them downwards; his face is to be covered with ſomething green or blue, and, placing the horſe before him, he is to go towards them ſlowly and gently; and by this means they will be raiſed on their legs, but not on their wings, and will run before the horſe into the nets. If in the way they go into a wrong path, the horſe is to be moved to face them; and they will be thus driven back again, and driven every way the ſportſman pleaſes.

The partridges of Abyſſinia, we are told, are very large, being as big as *capons*.

In Jeremiah xvii. 11. we have the following curious paſſage: "As the partridge ſitteth on *eggs*, and hatcheth *them* not; ſo he that getteth riches, and not by right, ſhall leave them in the midſt of his days, and at his end ſhall be a fool;" which is explained by Mr. Pool as follows: It is no wonder if we cannot be certain as to the ſenſe of theſe words, ſo far as they concern natural hiſtory, when we are not certain what bird it is to which this doth relate. We tranſlate it *partridge:* others will have it to be a *cuckow:* but certain it is, that it is the ſame word which we tranſlate *partridge* 1 Sam. xxvi. 20.; and cuckows uſe not to be much hunted after. How the partridge is ſaid to ſit on eggs and hatch them not, is yet a greater queſtion. It may be occaſioned ſo many ways, viz. either ſitting upon wind-eggs; or being killed before the eggs are hatched; or having its eggs deſtroyed by the male partridge, or by ſome dog or vermin; or, its neſt being found, having her eggs taken from her, that it is hard to determine which the prophet means. Of all others, I leaſt approve of that which Jerom makes the ſenſe, though the thing be true (if we may believe Caſſiodorus and ſeveral natural hiſtorians, Aldrovandus, &c.), that partridges have ſuch a love and deſire to hatch young ones, that, having loſt their own eggs, they will ſteal the eggs of other partridges, and hatch them; which being hatched, the young ones knowing the cry of their proper dams, hearing them call, leave the partridge that hatched them (which is one thing quoted by Aldrovandus, to ſhew the ſagacity of that bird); but if this were the ſenſe, the words would be, 'as the partridge ſitteth on eggs, and hatcheth them, but enjoyeth them not;' whereas they are, 'hatcheth them not;' that is, having loſt them, either by ſome man that hath taken them from her, or by ſome vermin or wild beaſt." *Pool's Annot. in loc.*

The words in the original are, דבר זלא ילד קרא, which the Septuagint tranſlate εφωνησε περδιξ, &c. "The partridge cried; it gathered together what it had not produced;" and ſome tranſlate the Hebrew, "The partridge lays many eggs, but does not hatch them all." Le Clerc, upon the authority of Bochart, underſtands the Hebrew word *kore* here to ſignify a *woodcock*. Le Clerc's tranſlation is as follows: *Ruſticula ova colligit, ſed non parit; facit ſibi divitias, ſed ſine jure, mediis ſuis diebus eas relinquit, atque ad extremum ſtulta eſt.*

PARTURITION, the act of bringing forth or being delivered of young. See MIDWIFERY.

PARTY, in a military ſenſe, a ſmall number of men, horſe or foot, ſent upon any kind of duty; as into an enemy's country to pillage, to take priſoners, and to oblige the country to come under contribution. Parties are often ſent out to view the roads and ways, get intelligence, ſeek forage; to reconnoitre, or amuſe the enemy upon a march: they are alſo frequently ſent upon the flanks of an army or regiment, to diſcover the enemy if near, and prevent ſurpriſe or ambuſcade.

PARU, in natural hiſtory, the name of a very ſingular American fiſh. It is broad, flat, and rounded; not very thick, and uſually of about five or ſix inches long, and more than four broad. It has ſix fins, one large and long, one on the back, and another on the belly behind the anus; each of theſe reaches to the tail, and has toward the end a long ſtring or cord, made of a ſingle filament, that on the back fin being longer than that on the belly; behind the gills it has alſo two fins of two fingers breadth long and one broad; and two others on the belly, which are very narrow; its head is ſmall, and its mouth elevated and ſmall, and furniſhed with ſmall teeth; its ſcales are of a moderate ſize, and are half black and half yellow, ſo that the fiſh appears of a black colour, variegated with yellow half moons; its gills, and the beginning of its fins, are alſo yellow; and it has, on each ſide near the head, a yellow ſpot; it is eatable.

PARVICH, an iſland near Dalmatia, and one of the beſt peopled and moſt conſiderable of thoſe which are under the juriſdiction of Sibenico. It contains a great number of fiſhermen, and a conſiderable number of perſons who give themſelves up to agriculture. It contains many Roman antiquities, which evidently ſhow that it was a Roman ſtation. It ſeems to be among the number of thoſe iſlands which Pliny calls *Celaduſſæ*, which is ſuppoſed to be an inverſion of δοσκελαδος, which means *ill-ſounding* or *noiſy*. Parvich is not of large extent, but it is extremely fertile. Every product ſucceeds in perfection there: we mean thoſe products of which a very ſhallow ground is ſuſceptible; ſuch as wine, oil, mulberry-trees, and fruit. The aſpect of this iſland is alſo very pleaſant at a diſtance, whereas that of the others adjacent diſguſts the eye, by their too high, rocky, and bare hills. The name of *Parvich* ſeems to have been given it becauſe it is the firſt one meets with on going out of the harbour of Sibenico; for the Illyric word *parvi* ſignifies *firſt*.

PARULIDES, in ſurgery, tumours and inflammations of the gums, commonly called *gum-boils*. They are to be treated, when in a ſtate of maturity, by inciſion.

PARUS, or TITMOUSE, in ornithology, a genus belonging to the order of paſſeres. The bill is very entire, covered at the

baſis with hairs; the tongue is truncated and hairy. There are 14 ſpecies; of which the moſt remarkable are,

1. The *criſtatus*, or creſted titmouſe, weighs 13 pennyweight; the bill is black, with a ſpot of the ſame colour above it; all the upper part of the body grey; the neck and under parts are white, with a faint tincture of red, which is deepeſt juſt below the wings. The legs are of a lead colour. It erects its crown feathers into a creſt. It inhabits the warm parts of North America; and frequents foreſt-trees, feeding upon inſects.

2. The *major*, or great titmouſe, has the head and throat black, the cheeks white, the back of a green colour, the belly yellowiſh green, divided in the middle by a bed of black which extends to the vent; the rump of a blueiſh grey, the legs of a lead colour, the toes divided to the very origin, and the back toe very large and ſtrong. This ſpecies ſometimes viſits our gardens; but for the moſt part inhabits woods, where it builds in hollow trees, laying about ten eggs. It feeds on inſects, which it finds in the bark of trees. In the ſpring they do a great deal of miſchief by picking off the tender buds of the fruit-trees. Like wood-peckers, they are perpetually running up and down the bodies of trees in queſt of food. This bird has three cheerful notes, which it begins to utter in the month of February.

3. The *cæruleus*, or blue titmouſe, is a very beautiful bird. The bill is ſhort and duſky; the crown of the head of a fine blue; from the bill to the eyes is a black line; the forehead and cheeks white; the back of a yellowiſh green; the lower ſide of the body yellow; the wings and tail blue, the former marked tranſverſely with a white bar; the legs of a lead colour. They frequent gardens; and do great injury to fruit-trees, by bruiſing the tender buds in ſearch of the inſects which lie under them. It breeds in holes of walls, and lays 12 or 14 eggs.

4. The *virginianus*, or yellow rump, is found in Virginia; and is diſtinguiſhed by a yellow ſpot on its rump. All the reſt of the feathers are brown, with a ſlight tincture of green. It runs about the bodies of trees; and feeds on inſects, which it pecks from the crevices of the bark.

5. The *caudatus*, or long-tailed titmouſe, is about five inches and a quarter in length, and ſeven inches in breadth. The bill is black, very thick and convex, differing from all others of this genus. The top of the head, from the bill to the hind part, is white, mixed with a few dark-grey feathers: this bed of white is entirely ſurrounded with a broad ſtroke of black; which riſing on each ſide of the upper mandible, paſſes over each eye, unites at the hind part of the head, and continues along the middle of the back to the rump. The feathers on each ſide of this black ſtroke are of a purpliſh red, as are thoſe immediately incumbent on the tail. The tail is the longeſt in proportion to the bulk of any Britiſh bird, being in length three inches, the form not unlike that of a magpie, conſiſting of 12 feathers of unequal lengths, the middlemoſt the longeſt, thoſe on each ſide growing gradually ſhorter. Theſe birds are often ſeen paſſing through our gardens, going from one tree to another, as if in their road to ſome other place, never making any halt. They make their neſts with great elegance, of an oval ſhape, and about eight inches deep, having near the upper end a hole for admiſſion. The external materials are moſſes and lichens curiouſly interwoven with wool. On the inſide it is very warmly lined with a thick bed of feathers. The female lays from 10 to 17 eggs. The young follow their parents the whole winter, and, from the ſlimneſs of their bodies, and great length of tail, appear, while flying, like as many darts cutting the air.

6. The *biarmicus*, or bearded titmouſe, has a ſhort, ſtrong, and very convex bill, of box colour; the head of a fine grey; the chin and throat white; the middle of the breaſt fleſh-coloured; the ſides and thighs of a pale orange; the hind part of the neck and back of orange bay; the tail is two inches and three quarters long; the legs of a deep ſhining black. The female wants the fleſh colour on the breaſt, and a triangular tuft of black feathers on each ſide of the bill, which adorn the male. They are found in marſhy places.

7. The *remiz*, or ſmall ſpecies of titmouſe. It is called *parus pendulinus*, and is often found in Lithuania. Mr. Coxe, in his Travels through Poland, gives the following account of this little animal. "The wondrous ſtructure of its pendent neſt induced me to give an engraving, ſee pl. 26, of both that and the birds themſelves. They are of the ſmalleſt ſpecies of titmice. The head is of a very pale blueiſh aſh colour; the forepart of the neck and the breaſt tinged with red; the belly white; wings black; back and rump of a yellowiſh ruſt colour; quill feathers cinereous, with the exterior ſides white; the tail ruſt coloured. The male is ſingularly diſtinguiſhed from the female by a pair of black-pointed whiſkers. Its neſt is in the ſhape of a long purſe, which it forms with amazing art, by interweaving down, goſſamer, and minute fibres, in a cloſe and compact manner, and then lining the inſide with down alone, ſo as to make a ſnug and warm lodge for its young brood. The entrance is at the ſide, ſmall, and round, with its edge more ſtrongly marked than the reſt of this curious fabric: the bird, attentive to the preſervation of its eggs or little ones from noxious animals, ſuſpends it at the leſſer end to the extremity of the ſlender twigs of a willow or ſome other tree over a river. Contrary to the cuſtom of titmice, it lays only four or five eggs: poſſibly Providence hath ordained this ſcantineſs of eggs to the remiz, becauſe, by the ſingular inſtinct imparted to it, it is enabled to ſecure its young much more effectually from deſtruction, than the other ſpecies, which are very prolific."

PASCAL (Blaise), one of the greateſt geniuſes and beſt writers France has produced, was born at Clermont, in Auvergne, in the year 1623. His father, Stephen Paſcal, born in 1588, and of an ancient family, was preſident of the court of aids in his province: he was a very learned man, an able mathematician, and a friend of Deſcartes. Having an extraordinary tenderneſs for this child, his only ſon, he quitted his office in his province, and went and ſettled at Paris in 1631, that he might be quite at leiſure for the inſtruction of him; and Blaiſe never had any maſter but his father. From his infancy he gave proofs of a very extraordinary capacity: for he deſired to know the reaſon of every thing, and when good reaſons were not given him, he would ſeek for better; nor would he ever yield his aſſent but upon ſuch as appeared to him well grounded. There was room to fear, that with ſuch a caſt of mind he would fall into free-thinking, or at leaſt into heterodoxy; yet he was always very far from any thing of this nature.

What is told of his manner of learning the mathematics, as well as the progreſs he quickly made in that ſcience, ſeems almoſt miraculous. His father, perceiving in him an extraordinary inclination to reaſoning, was afraid leſt the knowledge of the mathematics would hinder his learning the languages. He kept him therefore as much as he could from all notions of geometry, locked up all his books of that kind, and refrained even from ſpeaking of it in his preſence. He could not, however, make his ſon refrain from muſing upon proportions; and one day ſurpriſed him at work with charcoal upon his chamber-floor, and in the midſt of figures. He aſked him what he was doing? I am ſearching, ſays Paſcal, for ſuch a thing: which was juſt the 32d propoſition of the firſt book of Euclid. He aſked him then how he came to think of this? It was, ſays Paſcal, becauſe I have found out ſuch another thing: and ſo going backward, and uſing the names of *bar* and *round*, he came at length to the definitions and axioms he had formed to himſelf. Does it not ſeem miraculous that a boy ſhould work his way

into the heart of a mathematical book, without ever having ſeen that or any other book upon the ſubject, or knowing any thing of the terms? Yet we are aſſured of the truth of this by Madame Perier, and ſeveral other writers, the credit of whoſe teſtimony cannot reaſonably be queſtioned. He had, from henceforward, full liberty to indulge his genius in mathematical purſuits. He underſtood Euclid's Elements as ſoon as he caſt his eyes upon them: and this was not ſtrange; for, as we have ſeen, he underſtood them before. At 16 years of age he wrote a treatiſe of conic ſections, which was accounted by the moſt learned a mighty effort of genius; and therefore it is no wonder that Deſcartes, who had been in Holland a long time, ſhould, upon reading it, chooſe to believe that Mr. Paſcal the father was the real author of it. At 19, he contrived an admirable arithmetical machine, which was eſteemed a very wonderful thing, and would have done credit as an invention to any man verſed in ſcience, and much more to ſuch a youth.—About this time his health became impaired, and he was in conſequence obliged to ſuſpend his labours; nor was he in a condition to reſume them till four years after. About that period, having ſeen Torricelli's experiment reſpecting a vacuum and the weight of the air, he turned his thoughts towards theſe objects; and in a conference with Mr. Petit, intendant of fortifications, propoſed to make farther reſearches. In conſequence of this idea, he undertook ſeveral new experiments, one of which was as follows: Having provided a glaſs tube, 46 feet in length, open at one end, and ſealed hermetically at the other, he filled it with red wine, that he might diſtinguiſh the liquor from the tube. He then elevated it in this condition; and having placed it perpendicularly to the horizon, ſtopped up the bottom, and plunged it into a veſſel full of water, to the depth of a foot; after which he opened the extremity of the tube, and the wine deſcended to the diſtance of about 32 feet from the ſurface of the veſſel, leaving a conſiderable vacuum at the upper extremity. He next inclined the tube, and remarked that the wine roſe higher; and having inclined it till the top was within 32 feet of the ground, making the wine thus run out, he found that the water roſe in it, ſo that it was partly filled with that fluid, and partly with wine. He made alſo a great many experiments with ſiphons, ſyringes, bellows, and all kinds of tubes, making uſe of different liquors, ſuch as quickſilver, water, wine, oil, &c.; and having publiſhed them in 1647, diſperſed his work throughout all France, and tranſmitted it alſo to foreign countries. All theſe experiments, however, aſcertained effects, without demonſtrating the cauſes. Paſcal knew that Torricelli conjectured that thoſe phenomena which he had obſerved were occaſioned by the weight of the air; and, in order to diſcover the truth of this theory, he made an experiment at the top and bottom of a mountain in Auvergne, called *Le Puy de Dome*, the reſult of which gave him reaſon to conclude that air was weighty. Of this experiment he publiſhed an account, and ſent copies of it to moſt of the learned men in Europe. He likewiſe renewed it at the top of ſeveral high towers, ſuch as thoſe of Notre Dame at Paris, St. Jacques de la Boucherie, &c.; and always remarked the ſame difference in the weight of the air, at different elevations. This fully convinced him of the weight of the atmoſphere; and from this diſcovery he drew many uſeful and important inferences. He compoſed alſo a large treatiſe, in which he thoroughly explained this ſubject, and replied to all the objections that had been ſtarted againſt it. As he thought this work rather too prolix, and as he was fond of brevity and preciſion, he divided it into two ſmall treatiſes, one of which he entitled, A Diſſertation on the Equilibrium of Liquors; and the other, An Eſſay on the Weight of the Atmoſphere. Theſe labours procured Paſcal ſo much reputation, that the greateſt mathematicians and philoſophers of the age propoſed various queſtions to him, and conſulted him reſpecting ſuch difficulties as they could not ſolve.—Some years after, while tormented with a violent fit of the tooth-ache, he diſcovered the ſolution of a problem propoſed by Father Merſenne, which had baffled the penetration of all thoſe who had attempted it. This problem was, to determine the curve deſcribed in the air by the nail of a coach-wheel, while the machine is in motion. Paſcal offered a reward of 40 piſtoles to any one who ſhould give a ſatisfactory anſwer to it. No one, however, having ſucceeded, he publiſhed his own at Paris: but as he began now to be diſguſted with the ſciences, he would not put his real name to it, but ſent it abroad under that of A. d'Ettenville.—This was the laſt work which he publiſhed in the mathematics; his infirmities now increaſing ſo much, that he was under the neceſſity of renouncing ſevere ſtudy, and of living ſo recluſe, that he ſcarcely admitted any perſon to ſee him.

After he had thus laboured abundantly in mathematical and philoſophical diſquiſitions, he forſook thoſe ſtudies and all human learning at once; and determined to know nothing, as it were, for the future, but Jeſus Chriſt and him crucified. He was not 24 years of age, when the reading ſome pious books had put him upon taking this holy reſolution; and he became as great a devotee as any age has produced. Mr. Paſcal now gave himſelf up entirely to a ſtate of prayer and mortification. He had always in his thoughts theſe great maxims, of renouncing all pleaſure and all ſuperfluity; and this he practiſed with rigour even in his illneſſes, to which he was frequently ſubject, being of a very invalid habit of body: for inſtance, when his ſickneſs obliged him to feed ſomewhat delicately, he took great care not to reliſh or taſte what he ate. He had no violent affection for thoſe he loved; he thought it ſinful, ſince a man poſſeſſes a heart which belongs only to God. He found fault with ſome diſcourſes of his ſiſter, which ſhe thought very innocent; as, if ſhe had ſaid upon occaſion, that ſhe had ſeen a beautiful woman, he would be angry, and tell her, that ſhe might raiſe bad thoughts in footmen and young people. He frequently wore an iron girdle full of points next to his ſkin; and when any vain thought came into his head, or when he took particular pleaſure in any thing, he gave himſelf ſome blows with his elbow, to redouble the prickings, and to recall himſelf to his duty.

Though M. Paſcal had thus abſtracted himſelf from the world, yet he could not forbear paying ſome attention to what was doing in it; and he even intereſted himſelf in the conteſt between the Jeſuits and the Janſeniſts. The Jeſuits, though they had the popes and kings on their ſide, were yet decried by the people, who brought up afreſh againſt them the aſſaſſination of Henry the Great, and all the old ſtories that were likely to make them odious. Paſcal went farther; and by his *Lettres Provinciales*, publiſhed in 1656, under the name of *Louis de Montalte*, made them the ſubject of ridicule. "Theſe letters (ſays Voltaire) may be conſidered as a model of eloquence and humour. The beſt comedies of Moliere have not more wit than the firſt part of theſe letters; and the ſublimity of the latter part of them is equal to any thing in Boſſuet. It is true, indeed, that the whole book was built upon a falſe foundation; for the extravagant notions of a few Spaniſh and Flemiſh Jeſuits were artfully aſcribed to the whole ſociety. Many abſurdities might likewiſe have been diſcovered among the Dominican and Franciſcan caſuiſts: but this would not have anſwered the purpoſe; for the whole raillery was to be levelled only at the Jeſuits. Theſe letters were intended to prove, that the Jeſuits had formed a deſign to corrupt mankind; a deſign which no ſect or ſociety ever had, or can have." Voltaire calls Paſcal the firſt of their ſatiriſts; for Deſpreaux, ſays he, muſt be conſidered as only the ſecond. In another place, ſpeaking of this work of Paſcal, he ſays, that "examples of all the various ſpecies of eloquence are to be found in it. Though it has been,

now written almoſt 100 years, yet not a ſingle word occurs in it, ſavouring of that viciſſitude to which living languages are ſo ſubject. Here then we are to fix the epocha when our language may be ſaid to have aſſumed a ſettled form. The biſhop of Lucon, ſon of the celebrated Buſſy, told me, that aſking one day the biſhop of Meaux what work he would covet moſt to be the author of, ſuppoſing his own performances ſet aſide, Boſſuet replied, The Provincial Letters." Theſe letters have been tranſlated into all languages, and printed over and over again. Some have ſaid, that there were decrees of formal condemnation againſt them; and alſo that Paſcal himſelf, in his laſt illneſs, deteſted them, and repented of having been a Janſeniſt: but both theſe particulars are falſe and without foundation. Father Daniel was ſuppoſed to be the anonymous author of a piece againſt them, entitled *Dialogues of Cleander and Eudoxus.*

Paſcal was only about the age of 30 when theſe letters were publiſhed, yet he was extremely infirm; and his diſorders increaſing ſoon after ſo much that he conceived his end faſt approaching, he gave up all farther thoughts of literary compoſition. He reſolved to ſpend the remainder of his days in retirement and pious meditation; and with this view he broke off all his former connections, changed his habitation, and ſpoke to no one, not even to his own domeſtics. He made his own bed, fetched his dinner from the kitchen, carried it to his apartment, and brought back the plates and diſhes in the evening; ſo that he employed his ſervants only to cook for him, to go to town, and to do ſuch other things as he could not abſolutely do himſelf. In his chamber nothing was to be ſeen but two or three chairs, a table, a bed, and a few books. It had no kind of ornament whatever; he had neither a carpet on the floor nor curtains to his bed: but this did not prevent him from ſometimes receiving viſits; and when his friends appeared ſurpriſed to ſee him thus without furniture, he replied, that he had what was neceſſary, and that any thing elſe would be a ſuperfluity, unworthy of a wiſe man. He employed his time in prayer, and in reading the Holy Scriptures; and he wrote down ſuch thoughts as this exerciſe inſpired. Though his continual infirmities obliged him to uſe very delicate food, and though his ſervants employed the utmoſt care to provide only what was excellent, he never reliſhed what he ate, and ſeemed quite indifferent whether what they brought him was good or bad. When any thing new and in ſeaſon was preſented to him, and when he was aſked, after he had finiſhed his repaſt, how he liked it, he replied, "You ought to have informed me before hand, I ſhould have then taken notice of it." His indifference in this reſpect was ſo great, that, though his taſte was not vitiated, he forbade any ſauce or ragout to be made for him which might excite his appetite. He took without the leaſt repugnance all the medicines that were preſcribed him for the re-eſtabliſhment of his health; and when Madame Perrier, his ſiſter, ſeemed aſtoniſhed at it, he replied ironically, that he could not comprehend how people could ever ſhow a diſlike to a medicine, after being appriſed that it was a diſagreeable one, when they took it voluntarily; for violence or ſurpriſe ought only to produce that effect.

Though Paſcal had now given up intenſe ſtudy, and though he lived in the moſt temperate manner, his health continued to decline rapidly; and his diſorders had ſo enfeebled his organs, that his reaſon became in ſome meaſure affected. He always imagined that he ſaw a deep abyſs on his left ſide, and he never would ſit down till a chair was placed there, to ſecure him from the danger which he apprehended. His friends did every thing in their power to baniſh this melancholy idea from his thoughts, and to cure him of his error, but without the deſired effect: for, though he would become calm and compoſed for a little, the phantom would in a few moments again make its appearance and torment him. The cauſe of his ſeeing this ſingular viſion for the firſt time, is ſaid to have been as follows: His phyſicians, alarmed on account of the exhauſted ſtate to which he was reduced, had adviſed him to ſubſtitute eaſy and agreeable exerciſe for the fatiguing labours of the cloſet. One day, in the month of October 1654, having gone according to cuſtom to take an airing on the Pont de Neuilly, in a coach and four, the two firſt horſes ſuddenly took fright, oppoſite to a place where there was no parapet, and threw themſelves violently into the Seine; but the traces luckily giving way, the carriage remained on the brink of the precipice. The ſhock which Paſcal, in his languiſhing ſituation, muſt have received from this dreadful accident, may eaſily be imagined. It threw him into a fit, which continued for ſome time, and it was with great difficulty that he could be reſtored to his ſenſes. After this period his brain became ſo deranged, that he was continually haunted by the remembrance of his danger, eſpecially when his diſorders prevented him from enjoying ſleep. To the ſame cauſe was attributed a kind of viſion or ecſtaſy that he had ſome time after; a memorandum of which he preſerved during the remainder of his life in a bit of paper, put between the cloth and the lining of his coat, and which he always carried about him. Some of the Jeſuits had the baſeneſs and inhumanity to reproach this great genius with the derangement of his organs. In the Dictionary of Janſeniſt Books, he is called a *hypochondriac*, and a man of a *wrong head* and a *bad heart*. But, as a celebrated writer has obſerved, Paſcal's diſorder had in it nothing more ſurpriſing or diſgraceful than a fever, or the vertigo. During the laſt years of his life, in which he exhibited a melancholy example of the humiliating reverſes which take place in this tranſitory ſcene, and which, if properly conſidered, might teach mankind not to be too proud of thoſe abilities which a moment may take from them, he attended all the ſalutations *, viſited every church in which relics were expoſed, and had always a ſpiritual almanac, which gave an account of all thoſe places where particular acts of devotion were performed. On this occaſion it has been ſaid, that "Religion renders great minds capable of little things, and little minds capable of great."

In company, Paſcal was diſtinguiſhed by the amiableneſs of his behaviour; by his eaſy, agreeable, and inſtructive converſation, and by great modeſty. He poſſeſſed a natural kind of eloquence, which was in a manner irreſiſtible. The arguments he employed for the moſt part produced the effect which he purpoſed: and though his abilities entitled him to aſſume an air of ſuperiority, he never diſplayed that haughty and imperious tone which may often be obſerved in men of ſhining talents. The philoſophy of this great man conſiſted in renouncing all pleaſure, and every ſuperfluity. He not only denied himſelf the moſt common gratifications; but he took alſo without reluctance, and even with pleaſure, either as nouriſhment or as remedies, whatever was diſagreeable to the ſenſes; and he every day retrenched ſome part of his dreſs, food, or other things, which he conſidered as not abſolutely neceſſary. Towards the cloſe of his life, he employed himſelf wholly in pious and moral reflections, writing down thoſe which he judged worthy of being preſerved. The firſt piece of paper he could find was employed for this purpoſe; and he commonly put down only a few words of each ſentence, as he wrote them merely for his own uſe. The bits of paper upon which he had written theſe thoughts, were found after his death filed upon different pieces of ſtring, without any order or connection; and being copied exactly as they were written, they were afterwards arranged and publiſhed.

The celebrated Bayle, ſpeaking of this great man, ſays, An hundred volumes of ſermons are not of ſo much avail as a ſimple account of the life of Paſcal. His humility and his devo-

* Solemn prayers, which are repeated on certain days in the Popiſh churches.

tion mortified the libertines more than if they had been attacked by a dozen of miſſionaries. In a word, Bayle had ſo high an idea of this philoſopher, that he calls him a *paradox in the human ſpecies*. "When we conſider his character (ſays he), we are almoſt inclined to doubt that he was born of a woman, like the man mentioned by Lucretius: *Ut vix humanâ videatur ſtirpe creatus*."

M. Paſcal died at Paris the 19th of Auguſt 1662, aged 39 years. He had been ſome time about a work againſt atheiſts and infidels, but did not live long enough to digeſt the materials he had collected. What was found among his papers was publiſhed under the title of *Penſées*, &c. or *Thoughts upon religion and other ſubjects*, and has been much admired. After his death appeared alſo two other little tracts; one of which is entitled, *The equilibrium of fluids*; and the other, *The weight of the maſs of air*.

The works of Paſcal were collected in five volumes 8vo, and publiſhed at the Hague by De Tune, and at Paris by Nyon ſen. in 1779. This edition of Paſcal's works may be conſidered as the firſt publiſhed; at leaſt the greater part of them were not before collected into one body; and ſome of them had remained only in manuſcript. For this collection, the public were indebted to the Abbé Boſſu, and Paſcal deſerved to have ſuch an editor. "This extraordinary man (ſays he) inherited from nature all the powers of genius. He was a geometrician of the firſt rank, a profound reaſoner, and a ſublime and elegant writer. If we reflect, that in a very ſhort life, oppreſſed by continual infirmities, he invented a curious arithmetical machine, the elements of the calculation of chances, and a method of reſolving various problems reſpecting the cycloid; that he fixed in an irrevocable manner the wavering opinions of the learned reſpecting the weight of the air; that he wrote one of the completeſt works which exiſt in the French language; and that in his thoughts there are paſſages, the depth and beauty of which are incomparable—we ſhall be induced to believe, that a greater genius never exiſted in any age or nation. All thoſe who had occaſion to frequent his company in the ordinary commerce of the world, acknowledged his ſuperiority; but it excited no envy againſt him, as he was never fond of ſhowing it. His converſation inſtructed, without making thoſe who heard him ſenſible of their own inferiority; and he was remarkably indulgent towards the faults of others. It may be eaſily ſeen by his Provincial Letters, and by ſome of his other works, that he was born with a great fund of humour, which his infirmities could never entirely deſtroy. In company, he readily indulged in that harmleſs and delicate raillery which never gives offence, and which greatly tends to enliven converſation; but its principal object generally was of a moral nature. For example, ridiculing thoſe authors who ſay, *My Book*, *my Commentary*, *my Hiſtory*, they would do better (added he) to ſay, *Our Book*, *our Commentary*, *our Hiſtory*; ſince there are in them much more of other people's than their own." An elegant Latin epitaph was inſcribed on his tomb.

PASCHAL, ſomething belonging to the Paſſover, or Eaſter. See Passover and Easter.

PAS EP-A, the chief of the Lamas, particularly eminent for having invented characters for the Moguls. He was much eſteemed by the Chineſe, though the literati exclaimed againſt the manner in which the people demonſtrated their affection. There is ſtill at Pekin a *myau* or temple, built in honour of Paſ-ep-a in the time of the Mogul emperors. He died in 1279.

PASIPHAE (fab. hiſt.), daughter of the Sun by Perſeis, who married Minos king of Crete. She diſgraced herſelf by an unnatural paſſion for a bull, which we are told ſhe was enabled to gratify by means of the artiſt Dædalus. This celebrated bull had been given to Minos by Neptune, to be offered on his altars. But as the monarch refuſed to ſacrifice the animal on account of his beauty, the god revenged his diſobedience by inſpiring Paſiphaë with an unnatural love for him. This fable, which is univerſally believed by the poets, who obſerve that the Minotaur was the fruit of this infamous commerce, is refuted by ſome writers; who ſuppoſe that the infidelity of Paſiphaë to her huſband was betrayed in her affection for an officer of the name of Taurus, and that Dædalus, by permitting his houſe to be the aſylum of the two lovers, was looked upon as acceſſory to the gratification of Paſiphaë's luſt. From this amour with Taurus, as it is farther remarked, the queen became mother of twins; and the name of *Minotaurus* ariſes from the reſemblance of the children to the huſband and the lover of Paſiphaë. Minos had four ſons by Paſiphaë: Caſtreus, Deucalion, Glaucus, and Androgeus; and three daughters, Heçate, Ariadne, and Phædra.

PASQUIN, a mutilated ſtatue at Rome, in a corner of the palace of the Urſini. It takes its name from a cobler of that city called *Paſquin*, famous for his ſneers and gibes, and who diverted himſelf by paſſing his jokes on all that went through that ſtreet. After his death, as they were digging up the pavement before his door, they found in the earth the ſtatue of an ancient gladiator, well cut, but maimed and half ſpoiled: this they ſet up in the place where it was found, and by common conſent named it *Paſquin*. Since that time all ſatires are attributed to that figure; and are either put into its mouth, or paſted upon it, as if they were written by Paſquin redivivus; and theſe are addreſſed by Paſquin to Marſorio, another ſtatue at Rome. When Marſorio is attacked, Paſquin comes to his aſſiſtance; and, when Paſquin is attacked, Marſorio aſſiſts him in his turn; that is, the people make the ſtatues ſpeak juſt what they pleaſe.

PASQUINADE, a ſatirical libel faſtened to the ſtatue of Paſquin: theſe are commonly ſhort, witty, and pointed; and from hence the term has been applied to all lampoons of the ſame caſt.

PASS, or Passade, in fencing, an advance or leap forward upon the enemy. Of theſe there are ſeveral kinds; as paſſes within, above, beneath, to the right, the left, and paſſes under the line, &c. The meaſure of the paſs is when the ſwords are ſo near as that they may touch one another.

Pass, in a military ſenſe, a ſtrait and difficult paſſage, which ſhuts up the entrance into a country.

Pass *Parole*, in military affairs, a command given at the head of an army, and thence communicated to the rear, by paſſing it from mouth to mouth.

PASSADE, in the manege, is a turn or courſe of a horſe backwards or forwards on the ſame ſpot of ground. Hence there are ſeveral ſorts of paſſades, according to the different ways of turning, in order to part or return upon the ſame tread, which is called *cloſing the paſſade*; as the paſſade of one time, the paſſade of five times, and the raiſed or high paſſades, into which the demivolts are made in curvets. See Horsemanship.

PASSAGE *North-weſt*, } See North-*Weſt Paſſage*, North-
Passage *North-eaſt*, } *Eaſt Paſſage, and* Pole.

Right of Passage, in commerce, is an impoſition or duty exacted by ſome princes, either by land or ſea, in certain cloſe and narrow places in their territories, on all veſſels and carriages, and even ſometimes on perſons or paſſengers, coming in or going out of ports, &c. The moſt celebrated paſſage of this kind in Europe is the Sound; the dues for paſſing which ſtrait belong to the king of Denmark, and are paid at Elſinore or Cronenburg.

PASSANT, in heraldry, a term applied to a lion or other animal in a ſhield, appearing to walk leiſurely: for moſt beaſts, except lions, the *trippant* is frequently uſed inſtead of *paſſant*.

PASSAU, an ancient, handſome, and celebrated town of Germany, in Lower Bavaria, with a biſhop's fee and fort. The houſes are well-built, and the cathedral is thought to be the fineſt in all Germany. It is divided into four parts, three of which are fortified; but the other is only a ſuburb, and has nothing but

an old caſtle in which the biſhop generally reſides. It is ſeated at the confluence of the rivers Inn and Iltz, in E. lon. 13. 34. N. lat. 48. 26

PASSAU, a biſhopric of Germany, lying between Lower Bavaria, Auſtria, and Bohemia. It extends not above 20 miles where largeſt; and has no conſiderable place, except the capital, which is of the ſame name.

PASSERAT (JOHN), a celebrated profeſſor of eloquence in the royal college of Paris, and one of the politeſt writers of his time, was born at Troyes, in the province of Champagne, in 1534. He ſpent three years in ſtudying the law under the famous Cujacius at Bourges, where he became profeſſor of eloquence in 1572. He was an indefatigable ſtudent, paſſing frequently whole days without eating a morſel; yet to an extraordinary erudition he joined an uncommon politeneſs of manners and pleaſantry, having nothing of the mere ſcholar except the gown and hood. He gained the eſteem of the kings Charles IX. Henry III. and of all the men of wit and learning in his time. He died in 1602, and left ſeveral admired works behind him.

PASSERES, the name of a claſs of birds. See ZOOLOGY.

PASSIFLORA, or PASSION-FLOWER: a genus of the pentandria order, belonging to the gynandria claſs of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. The calyx is pentaphyllous; there are five petals; the nectarium a crown; the berry is pedicellated. There are near 30 different ſpecies; all of them natives of warm foreign countries, only one of which is ſufficiently hardy to ſucceed well in the open ground here; all the others requiring the ſhelter of a greenhouſe or ſtove, but chiefly the latter. The moſt remarkable are,

1. The *cærulea*, or blue-rayed common palmated paſſion-flower, hath long, ſlender, ſhrubby, purpliſh green ſtalks, branchy, and aſcending upon ſupport by their claſpers thirty or forty feet high; with one large palmated leaf at each joint, and at the axillas large ſpreading flowers with whitiſh-green petals, and a blue radiated nectarium; ſucceeded by a large, oval, yellowiſh fruit. It is in flower from July until October; the flowers are very large, conſpicuous, and their compoſition is exceedingly curious and beautiful. The general ſtructure of the ſingular flowers of this plant is, they come out at the axillas on pedunculi about three inches long, which they terminate, each flower having juſt cloſe under the calyx a three-lobed involucrum-like appendage; a five-lobed calyx, and a five-petalous corolla, the ſize, figure, and colour of the calyx, &c. the petals arranging alternately with the calycinal lobes: the whole, including the involucrum, calyx, and corolla, make juſt 13 lobes and petals, all expanded flat: and within the corolla is the nectarium, compoſed of a multitude of thread-like fibres, of a blue and purple colour, diſpoſed in circular rays round the column of the fructification; the outer ray is the longeſt, flat, and ſpreading on the petals; the inner is ſhort, erect, and narrows towards the centre. in the middle is an erect cylindric club-ſhaped column or pillar, crowned with the roundiſh germen, having at its baſe five horizontal ſpreading filaments, crowned with incumbent yellow antheræ, that move about every way; and from the ſide of the germen ariſe three ſlender ſpreading ſtyles, terminated by headed ſtigmas: the germen afterwards gradually becomes a large oval fleſhy fruit, ripening to a yellowiſh colour.—Theſe wonderful flowers are only of one day's duration, generally opening about 11 or 12 o'clock, and frequently in hot ſunny weather burſt open with elaſticity and continue fully expanded all that day: and the next they gradually cloſe, aſſuming a decayed-like appearance, and never open any more: the evening puts a period to their exiſtence, but they are ſucceeded by new ones daily on the ſame plant.—This plant and flowers are held in great veneration in ſome foreign Catholic countries, where the religious make the leaves, tendrils, and different parts of the flower, to repreſent the inſtruments of our bleſſed Saviour's paſſion; hence the name *paſſiflora*.

2. The *incarnata*, incarnated, or fleſh-coloured Italian paſſion-flower, hath a ſtrong perennial root; ſlender, herbaceous ſtalks, riſing upon ſupport four or five feet high; leaves compoſed of three ſawed lobes, each leaf attended by a twining tendril; and at the axillas long ſlender pedunculi, terminated each by one whitiſh flower, having a greeniſh calyx, and a reddiſh or purple radiated nectarium, ſurrounding the column of the fructification, which ſucceed to a large, round, fleſhy fruit, ripening to a beautiful orange colour.—The flowers of this ſpecies are alſo very beautiful, though of ſhort duration, opening in the morning, and night puts a period to their beauty: but they are ſucceeded by a daily ſupply of new ones.—The fruit of this ſort is alſo very ornamental, as ripening to a fine reddiſh orange colour; but theſe rarely attain perfection here, unleſs the plants are placed in the ſtove; therefore, when there is ſuch accommodation, it highly merits that indulgence, where it will exhibit both flowers and green and ripe fruit, all at the ſame time, in a beautiful manner.

3. The *veſpertilio*, or bat's-wing paſſion-flower, hath ſlender, ſtriated, branchy ſtalks; large, bilobate, or two lobed leaves, the baſe roundiſh and glandular, the lobes acute, widely divaricated like a bat's wings, and dotted underneath; and axillary flowers, having white petals and rays. The leaves of this ſpecies have a ſingular appearance, the two lobes being expanded ſix or ſeven inches wide, reſembling the wings of a bat upon flight: hence the name *veſpertilio*.

As all the ſpecies are natives of warm climates, in this country they are moſtly of a tender quality, except the firſt ſort, which ſucceeds very well in the full ground, in a warm ſituation; only their young branches are ſometimes killed in very ſevere winters; but plenty of new ones generally riſe again in ſpring following: the others, denominated *ſtove kinds*, muſt always be retained in that repoſitory.

PASSION, is a word of which, as Dr. Reid obſerves, the meaning is not preciſely aſcertained either in common diſcourſe or in the writings of philoſophers. In its original import, it denotes every *feeling* of the mind occaſioned by an extrinſic cauſe: but it is generally uſed to ſignify ſome *agitation* of mind oppoſed to that ſtate of tranquillity in which a man is moſt maſter of himſelf. That it was thus uſed by the Greeks and Romans, is evident from Cicero's rendering πάθος, the word by which the philoſophers of Greece expreſſed it, by *perturbatio* in Latin. In this ſenſe of the word, paſſion cannot be itſelf a *diſtinct* and *independent* principle of action; but only an occaſional degree of vehemence given to thoſe diſpoſitions, deſires, and affections, which are at all times preſent to the mind of man; and that this is its proper ſenſe, we need no other proof than that paſſion has always been conceived to bear analogy to a ſtorm at ſea or to a tempeſt in the air.

With reſpect to the number of paſſions of which the mind is ſuſceptible, different opinions have been held by different authors. Le Brun, a French writer on painting, juſtly conſidering the expreſſion of the paſſions as a very important as well as difficult branch of his art, has enumerated no fewer than twenty, of which the ſigns may be expreſſed by the pencil on canvaſs. That there are ſo many different ſtates of mind producing different effects which are viſible on the features and the geſtures, and that thoſe features and geſtures ought to be diligently ſtudied by the artiſt, are truths which cannot be denied; but it is abſurd to conſider all theſe different ſtates of mind as *paſſions*, ſince tranquillity is one of them, which is the reverſe of paſſion.

The common diviſion of the paſſions into *deſire* and *averſion*, *hope* and *fear*, *joy* and *grief*, *love* and *hatred*, has been mentioned by every author who has treated of them, and needs no explication; but it is a queſtion of ſome importance in the philoſophy of the human mind, whether theſe different paſſions be each a degree of an original and innate diſpoſition, diſtinct from the diſpoſitions which are reſpectively the foundations of

the other paſſions, or only different modifications of one or two general diſpoſitions common to the whole race.

The former opinion is held by all who build their ſyſtem of metaphyſics upon a number of diſtinct internal ſenſes; and the latter is the opinion of thoſe who, with Locke and Hartley, reſolve what is commonly called inſtinct into an early aſſociation of ideas. (See INSTINCT.) That without deliberation mankind inſtantly feel the paſſion of fear upon the apprehenſion of danger, and the paſſion of anger or reſentment upon the reception of an injury, are truths which cannot be denied: and hence it is inferred, that the ſeeds of theſe paſſions are innate in the mind, and that they are not generated, but only ſwell to magnitude on the proſpect of their reſpective objects. In ſupport of this argument, it has been obſerved that children, without any knowledge of their danger, are inſtinctively afraid on being placed on the brink of a precipice; and that this paſſion contributes to their ſafety long before they acquire, in any degree equal to their neceſſities, the exerciſe of their rational powers. Deliberate anger, cauſed by a voluntary injury, is acknowledged to be in part founded on reaſon and reflection; but where anger impels one ſuddenly to return a blow, even without thinking of doing miſchief, the paſſion is inſtinctive. In proof of this, it is obſerved, that inſtinctive anger is frequently raiſed by bodily pain occaſioned even by a ſtock or a ſtone, which inſtantly becomes an object of reſentment, that we are violently incited to cruſh to atoms. Such conduct is certainly not rational, and therefore it is ſuppoſed to be neceſſarily inſtinctive.

With reſpect to other paſſions, ſuch as the luſt of power, of fame, or of knowledge, innumerable inſtances, ſays Dr. Reid, occur in life, of men who ſacrifice to them their eaſe, their pleaſure, and their health. But it is abſurd to ſuppoſe that men ſhould ſacrifice the end to what they deſire only as means of promoting that end; and therefore he ſeems to think that theſe paſſions muſt be innate. To add ſtrength to this reaſoning; he obſerves, that we may perceive ſome degree of theſe principles even in brute animals of the more ſagacious kind, who are not thought to deſire means for the ſake of ends which they have in view.

But it is in accounting for the paſſions which are diſintereſted that the advocates for innate principles ſeem moſt completely to triumph. As it is impoſſible not to feel the paſſion of pity upon the proſpect of a fellow-creature in diſtreſs, they argue, that the baſis of that paſſion muſt be innate; becauſe pity being at all times more or leſs painful to the perſon by whom it is felt, and frequently of no uſe to the perſon who is its object, it cannot in ſuch inſtances be the reſult of deliberation, but merely the exertion of an original inſtinct. The ſame kind of reaſoning is employed to prove that gratitude is the exerciſe of an innate principle. That good offices are, by the very conſtitution of our nature, apt to produce good will towards the benefactor, in good and bad men, in the ſavage and in the civilized, cannot ſurely be denied by any one in the leaſt acquainted with human nature. We are grateful not only to the benefactors of ourſelves as individuals, but alſo to the benefactors of our country; and *that*, too, when we are conſcious that from our gratitude neither they nor we can reap any advantage. Nay, we are impelled to be grateful even when we have reaſon to believe that the objects of our gratitude know not our exiſtence. This paſſion cannot be the effect of reaſoning, or of aſſociation founded on reaſoning; for, in ſuch caſes as thoſe mentioned, there are no principles from which reaſon can infer the propriety or uſefulneſs of the feeling. The *public ſpirit*, or the affection which we bear to our country, or to any ſubordinate community of which we are members, is founded on inſtinct; is deemed ſo certain, that the man deſtitute of this affection, if there be any ſuch, has been pronounced as great a monſter as he who has two heads.

All the diſintereſted paſſions are founded on what philoſophers have termed *benevolent affection*. Inſtead therefore of inquiring into the origin of each paſſion ſeparately, which would ſwell this article to no purpoſe, let us liſten to one of the fineſt writers as well as ableſt reaſoners of the age, treating of the origin of benevolent affection. "We may lay it down as a principle (ſays Dr. Reid), that all benevolent affections are in their nature agreeable; that it is eſſential to them to deſire the good and happineſs of their objects; and that their objects muſt therefore be beings capable of happineſs. A thing may be deſired either on its own account, or as the means in order to ſomething elſe. That only can properly be called an object of deſire which is deſired upon its own account: and therefore I conſider as benevolent thoſe affections only which deſire the good of their object ultimately, and not as means in order to ſomething elſe. To ſay that we deſire the good of others, only to procure ſome pleaſure or good to ourſelves, is to ſay that there is no benevolent affection in human nature. This indeed has been the opinion of ſome philoſophers both in ancient and in later times. But it appears as unreaſonable to reſolve all benevolent affections into ſelf-love, as it would be to reſolve hunger and thirſt into ſelf-love. Theſe appetites are neceſſary for the preſervation of the individual. Benevolent affections are no leſs neceſſary for the preſervation of ſociety among men; without which men would become an eaſy prey to the beaſts of the field. The benevolent affections planted in human nature, appear therefore no leſs neceſſary for the preſervation of the human ſpecies than the appetites of hunger and thirſt." In a word, pity, gratitude, friendſhip, love, and patriotiſm, are founded on different benevolent affections; which our learned author holds to be original parts of the human conſtitution.

This reaſoning has certainly great force; yet it muſt be confeſſed, that the philoſophers, who conſider the affections and paſſions as early and deep-rooted aſſociations, ſupport their opinion with very plauſible arguments. On their principles we have endeavoured elſewhere to account for the paſſions of fear and love, (ſee INSTINCT and LOVE); and we may here ſafely deny the truth of what has been ſtated reſpecting fear, which ſeems to militate againſt that account. We have attended with much ſolicitude to the actions of children; and have no reaſon to think that they feel terror on the brink of a precipice till they have been repeatedly warned of their danger in ſuch ſituations by their parents or their keepers. Every perſon knows not only that they have no original or inſtinctive dread of fire, which is as dangerous to them as any precipice; but that it is extremely difficult to keep them from that deſtructive element till they are either capable of weighing the force of arguments, or have repeatedly experienced the pain of being burnt by it. With reſpect to ſudden reſentment, we cannot help conſidering the argument, which is brought in proof of its being inſtinctive, as proving the contrary in a very forcible manner. Inſtinct is ſome myſterious influence of God upon the mind, exciting to actions of beneficial tendency: but can any benefit ariſe from wreaking our impotent vengeance on a ſtock or a ſtone? or is it ſuppoſable that a Being of infinite wiſdom would excite us to actions ſo extravagantly fooliſh? We learn from experience to defend ourſelves againſt rational or ſenſible enemies by retaliating the injuries which they inflict upon us; and if we have been often injured in any particular manner, the idea of that injury becomes in time ſo cloſely aſſociated with the means by which it has been conſtantly repelled, that we never receive ſuch an injury—a blow for inſtance—without being prompted to make the uſual retaliation, without reflecting whether the object be ſenſible or inſenſible. So far from being inſtinctive does reſentment appear to us, that we think an attentive obſerver may eaſily perceive how the ſeeds of it are gradually infuſed into the youthful mind; when the child, from being at firſt a timid creature ſhrinking from every pain, learns by degrees to return blow for blow and threat for threat.

But inſtead of urging what appears to ourſelves of moſt weight againſt the inſtinctive ſyſtem, we ſhall lay before our readers a few extracts from a diſſertation on the Origin of the Paſſions by a writer whoſe elegance of language and ingenuity of inveſtigation do honour to the ſchool of Hartley.

"When an infant is born (ſays Dr. Sayers in his "Diſquiſitions Metaphyſical and Literary,") there is every reaſon to ſuppoſe that he is born without ideas. Theſe are rapidly communicated through the medium of the ſenſes. The ſame ſenſes are alſo the means of conveying to him pleaſure and pain. Theſe are the hinges on which the paſſions turn: and till the child is acquainted with theſe ſenſations, it would appear that no paſſion could be formed in his mind; for, till he has felt pleaſure and pain, how can he deſire any object, or wiſh for its removal? How can he either love or hate? Let us obſerve then the manner in which love and hatred are formed; for on theſe paſſions depend all the reſt. When a child endures pain, and is able to detect the cauſe of it, the idea of pain is connected in his mind with that of the thing which produced it; and if the object which occaſioned pain be again preſented to the child, the idea of pain aſſociated with it ariſes alſo. This idea conſequently urges the child to avoid or to remove the object; and thus ariſes the paſſion of diſlike or hatred. In the ſame manner, the paſſion of liking or love is readily formed in the mind of a child from the aſſociation of pleaſant ideas with certain objects which produced them.

"The paſſions of hope and fear are ſtates of the mind depending upon the good or bad proſpects of gratifying love or hatred; and joy or ſorrow ariſes from the final ſucceſs or diſappointment which attends the exertions produced by love or by hatred. Out of theſe paſſions, which have all a perceptible relation to our own good, and are univerſally acknowledged to be ſelfiſh, all our other paſſions are formed."

To account for the paſſions called *diſintereſted*, he obſerves, that in the hiſtory of the human mind we find many inſtances of our dropping an intermediate idea, which has been the means of our connecting two other ideas together; and that the aſſociation of theſe two remains after the link which originally united them has vaniſhed. Of this fact the reader will find ſufficient evidence in different articles of this work (See INSTINCT, and METAPHYSICS): and, to apply it to the diſintereſted paſſions, let us ſuppoſe, with Dr. Sayers, that any individual has done to us many offices of kindneſs, and has conſequently much contributed to our happineſs; it is natural for us to ſeek with ſome anxiety for the continuance of theſe pleaſures which he is able to communicate. But we ſoon diſcern, that the ſureſt way of obtaining the continuance of his friendly offices is to make them, as much as poſſible, a ſource of pleaſure to himſelf. We therefore do every thing in our power to promote his happineſs in return for the good he has conferred upon us, that thus we may attach him to us as much as we are able. Hitherto all is plainly ſelfiſh. We have been evidently endeavouring, for the ſake of our own future gratification, to promote the happineſs of this perſon: but obſerve the conſequence. We have thus, by contemplating the advantage to be derived to ourſelves from promoting the proſperity of our friend, learned to aſſociate a ſet of pleaſant ideas with his happineſs; but the link which has united them gradually eſcapes us, while the union itſelf remains. Continuing to aſſociate pleaſure with the well-being of our friend, we endeavour to promote it for the ſake of his *immediate* gratification, without looking farther: and in this way his happineſs, which was firſt attended to only as a means of future enjoyment, finally becomes an end. Thus then the paſſion which was originally ſelfiſh, is at length *diſintereſted*; its gratification being completed merely by its ſucceſs in promoting the happineſs of another."

In this way does our author account for the origin of gratitude; which at laſt becomes a habit, and flows ſpontaneouſly towards every man who has either been or intended to be our benefactor. According to him, it is eaſy to obſerve alſo, that from aſſociating pleaſure with the happineſs of an individual when we procure it ourſelves, it muſt of courſe ſoon follow, that we ſhould experience pleaſure from a view of his happineſs any way produced; ſuch happineſs raiſing at all times pleaſant ideas when it is preſented to our minds. This is another feature of a diſintereſted affection, to feel delight from the mere increaſe of happineſs in the object whom we love.

"It may be objected, perhaps, that parents ſeem to have an *inſtinctive* diſintereſted love of their offspring: but ſurely the love of a parent for a new-born infant is not uſually equal to that for a child of four or five years old. When a child is firſt born, the proſpect and hopes of future pleaſure from it are ſufficient to make a parent anxious for its preſervation. As the child grows up, the hope of future enjoyment from it muſt increaſe: hence would pleaſure be aſſociated with the well-being of the child, the love of which would of courſe become in due time diſintereſted."

Our author does not analyſe *pity*, and trace it to its ſource in ſelfiſhneſs; but he might eaſily have done it, and it has been ably done by his maſter. Pity or compaſſion is the uneaſineſs which a man feels at the miſery of another. It is generated in every mind during the years of childhood; and there are many circumſtances in the conſtitution of children, and in the mode of their education, which make them particularly ſuſceptible of this paſſion. The very appearance of any kind of miſery which they have experienced, or of any ſigns of diſtreſs which they underſtand, excite in their minds painful feelings, from the remembrance of what they have ſuffered, and the apprehenſion of their ſuffering it again. We have ſeen a child a year old highly entertained with the noiſe and ſtruggles made by its elder brother when plunged naked into a veſſel filled with cold water. This continued to be the caſe for many days, till it was thought proper to plunge the younger as well as the elder; after which the daily entertainment was ſoon at an end. The little creature had not been itſelf plunged above twice till it ceaſed to find diverſion in its brother's ſufferings. On the third day it cried with all the ſymptoms of the bittereſt anguiſh upon ſeeing its brother plunged, though no preparation was then made for plunging itſelf: but ſurely this was not diſintereſted ſympathy, but a feeling wholly ſelfiſh, excited by the remembrance of what it had ſuffered itſelf, and was apprehenſive of ſuffering again. In a ſhort time, however, the painful feelings accompanying the ſight of its brother's ſtruggles, and the ſound of his cries, were doubtleſs ſo aſſociated with that ſight and that ſound, that the appearance of the latter would have brought the former along with them, even though the child might have been no longer under apprehenſion of a plunging itſelf. This aſſociation, too, would ſoon be tranſferred to every boy in the ſame circumſtances, and to ſimilar ſounds and ſtruggles, from whatever cauſe they might proceed.

Thus, as Dr. Hartley obſerves, "when ſeveral children are educated together, the pains, the denials of pleaſure, and the ſorrows which affect one, generally extend to all in ſome degree, often in an equal one. When their parents, companions, or attendants are ſick or afflicted, it is uſual to raiſe in their minds the naſcent ideas of pains and miſeries by ſuch words and ſigns as are ſuited to their capacities. They alſo find themſelves laid under many reſtraints, on account of the ſickneſs or affliction of others; and when theſe and ſuch like circumſtances have raiſed in their minds deſires to remove the cauſes of their own internal feelings, *i. e.* to eaſe the miſeries of others, a variety of internal feelings and deſires become ſo blended and aſſociated together, as that no part can be diſtinguiſhed ſepa-

rately from the reſt, and the child may properly be ſaid to have compaſſion. The ſame ſources of compaſſion remain, though with ſome alteration, during our whole progreſs through life. This is ſo evident, that a reflecting perſon may plainly diſcern the conſtituent parts of his compaſſion while they are yet the mere internal and, as one may ſay, ſelfiſh feelings above mentioned; and before they have put on the nature of compaſſion, by coaleſcence with the reſt. Agreeably to this method of reaſoning, it may be obſerved, that perſons whoſe nerves are eaſily irritable, and thoſe who have experienced great trials and afflictions, are in general more diſpoſed to compaſſion than others; and that we are moſt apt to pity others in thoſe diſeaſes and calamities which we either have felt, or of which we apprehend ourſelves to be in danger."

The origin of patriotiſm and public ſpirit is thus traced by Dr. Sayers: "The pleaſures which our country affords are numerous and great. The wiſh to perpetuate the enjoyment of thoſe pleaſures, includes the wiſh to promote the ſafety and welfare of our country, without which many of them would be loſt. All this is evidently ſelfiſh; but, as in the progreſs of gratitude, it finally becomes diſintereſted. Pleaſant ideas are thus ſtrongly connected with the welfare of our country, after the tie which firſt bound them together has eſcaped our notice. The proſperity which was at firſt deſirable as the means of future enjoyment, becomes itſelf an end: we feel delight in ſuch proſperity, however produced; and we look not beyond this immediate delight. It is thus not difficult to obſerve in what manner a general and diſintereſted benevolence takes place in a mind which has already received pleaſure from the happineſs of a few; the tranſition is eaſy towards aſſociating it with *happineſs in general*, with the happineſs of any being, whether produced by ourſelves or by any other cauſe whatever."

From this reaſoning, our author concludes, that all our paſſions may be traced up to original feelings of regard for ourſelves. "Thus, in the forcible language of a learned writer of the ſame ſchool, (Warburton,) does ſelf-love, under the varying appearance of natural affection, domeſtic relation, and the connections of ſocial habitude, at firſt work blindly on, obſcure and deep, in dirt: But as it makes its way, it continues riſing, till it emerges into light; and then ſuddenly expiring, leaves behind it the faireſt iſſue,"—benevolent affection.

> Self-love forſook the path it firſt purſu'd,
> And found the private in the public good.

Thus have we ſtated the two oppoſite theories reſpecting the origin of paſſions in the mind, and given our readers a ſhort ſpecimen of the reaſonings by which they are ſupported by their reſpective patrons. Were we called upon to decide between them, we ſhould be tempted to ſay, that they have both been carried to extremes by ſome of their advocates, and that the truth lies in the middle between them. "It is impoſſible (ſays Dr. Price) but that creatures capable of pleaſant and painful ſenſations ſhould love and chooſe the one, and diſlike and avoid the other. No being who knows what happineſs and miſery are, can be ſuppoſed indifferent to them, without a plain contradiction. Pain is not a *poſſible* object of deſire, nor happineſs of *averſion*." To prefer a greater good though diſtant, to a leſs good that is preſent; or to chooſe a preſent evil, in order to avoid a greater future evil—is indeed wiſe and rational conduct; but to chooſe evil ultimately, is abſolutely impoſſible. Thus far then muſt be admitted, that every being poſſeſſed of ſenſe and intellect neceſſarily deſires his own good as ſoon as he knows what it is; but if this knowledge be not innate, neither can the deſire. Every human being comes into the world with a capability of knowledge, and of courſe with a capability of affections, deſires, and paſſions: but it ſeems not to be conceivable how he can actually love, or hate, or dread any thing, till he know whether it be good, or ill, or dangerous. If, therefore, we have no innate ideas, we cannot poſſibly have innate deſires or averſions. Thoſe who contend that we have, ſeem to think, that without them reaſon would be inſufficient, either for the preſervation of the individual or the continuation of the ſpecies; and ſome writers have alledged, that if our affections and paſſions were the mere reſult of early aſſociations, they would neceſſarily be more capricious than we ever find them. But this objection ſeems to ariſe from their not rightly underſtanding the theory of their antagoniſts. The diſciples of Locke and Hartley do not ſuppoſe it poſſible for any man in ſociety to prevent ſuch aſſociations from being formed in his mind as ſhall neceſſarily produce deſires and averſions; far leſs do they think it poſſible to form aſſociations of ideas utterly repugnant, ſo as to deſire that as good which his ſenſes and intellect have experienced to be evil. Aſſociations are formed by the very ſame means, and at the very ſame time, that ideas and notions are impreſſed upon the mind; but as pain is never miſtaken for pleaſure by the ſenſes, ſo an object which has given us only pain, is never aſſociated with any thing that makes it deſirable;—we ſay, an object that has given us only pain, becauſe it is poſſible to form ſuch an aſſociation between life and the loſs of a limb, as to make us grateful to the ſurgeon by whom it was amputated. Aſſociations being formed according to the ſame laws by which knowledge is acquired, it by no means follows that paſſions reſulting from them ſhould be more capricious than they are found to be; and they certainly are ſufficiently capricious to make us ſuſpect that the greater part of them has this origin, rather than that they are all infuſed into the mind by the immediate agency of the Creator. If man be a being formed with no innate ideas, and with no other inſtinctive principles of action than what are abſolutely neceſſary to preſerve his exiſtence and perpetuate the ſpecies, it is eaſy to perceive why he is placed in this world as in a ſtate of probation, where he may acquire habits of virtue to fit him for a better. It is likewiſe eaſy to perceive why ſome men are better than others, and why ſome are the ſlaves of the moſt criminal paſſions. But all this is unintelligible, upon the ſuppoſition that the ſeeds of every paſſion are innate, and that man is a compound of reaſon and of inſtincts ſo numerous and various as to ſuit every circumſtance in which he can be placed.

If paſſions, whatever be their origin, operate inſtantaneouſly, and if they be formed according to fixed laws, it may be thought a queſtion of very little importance whether they be inſtinctive or acquired. But this, we think, upon mature reflection, is by no means the caſe. If paſſions be the reſult of early aſſociations, it is of the utmoſt conſequence that no improper aſſociations be formed in the minds of children, and that none of their unreaſonable deſires be gratified. Upon this theory it ſeems indeed to depend almoſt wholly upon education, whether a child ſhall become a calm, benevolent, ſteady, and upright man; or a paſſionate, capricious, ſelfiſh miſcreant. By teaching him to reſent every petty injury, the ſeeds of iraſcibility are ſown in his mind, and take ſuch root, that before the age of manhood he becomes intolerable to all with whom he muſt converſe. By exciting numberleſs deſires in his youthful mind, and inſtantly gratifying them, you make him capricious, and impatient of diſappointment; and by repreſenting other children as in any degree inferior to him, you inſpire him with the hateful paſſion of pride. According to the inſtinctive theory, education can only augment or diminiſh the ſtrength of paſſions; according to the other theory, it is the ſource of by far the greater part of them. On either ſuppoſition, parents ſhould watch with ſolicitude over the actions of their children; but they will ſurely think themſelves obliged to

be doubly watchful, if they believe, that through their neglect their children may acquire hateful paſſions, to which, if properly educated, they might have remained ſtrangers through their whole lives. And let it be remembered, that this ſolicitude ſhould begin at an early period; becauſe the mind is ſuſceptible of deep aſſociations much ſooner than is ſometimes imagined. Without this ſuſceptibility, no language could be learned; and therefore a child by the time he learns to ſpeak, may have planted in his mind the ſeeds of paſſions, on the juſt regulation and ſubordination of which depends in a great meaſure the happineſs of mankind. See MORAL *Philoſophy*, Part I. Chap. 1 & 2. Part III.

PASSIONS *and Emotions*, difference between them. See EMOTIONS *and Paſſions*.

External Signs of Emotions and PASSIONS. So intimately connected are the ſoul and body, that every agitation in the former produces a viſible effect upon the latter. There is, at the ſame time, a wonderful uniformity in that operation; each claſs of emotions and paſſions being invariably attended with an external appearance peculiar to itſelf. Theſe external appearances, or ſigns, may not improperly be conſidered as a natural language, expreſſing to all beholders emotions and paſſions as they ariſe in the heart. Hope, fear, joy, grief, are diſplayed externally: the character of a man can be read in his face; and beauty, which makes ſo deep an impreſſion, is known to reſult, not ſo much from regular features and a fine complexion, as from good-nature, good-ſenſe, ſprightlineſs, ſweetneſs, or other mental quality, expreſſed upon the countenance. Though perfect ſkill in that language be rare, yet what is generally known is ſufficient for the ordinary purpoſes of life. But by what means we come to underſtand the language, is a point of ſome intricacy. It cannot be by ſight merely; for upon the moſt attentive inſpection of the human viſage, all that can be diſcerned are, figure, colour, and motion, which, ſingly or combined, never can repreſent a paſſion nor a ſentiment: the external ſign is indeed viſible; but to underſtand its meaning, we muſt be able to connect it with the paſſion that cauſes it; an operation far beyond the reach of eye-ſight. Where then is the inſtructor to be found that can unveil this ſecret connection? If we apply to experience, it is yielded, that from long and diligent obſervation, we may gather, in ſome meaſure, in what manner thoſe we are acquainted with expreſs their paſſions externally: but with reſpect to ſtrangers, we are left in the dark; and yet we are not puzzled about the meaning of theſe external expreſſions in a ſtranger, more than in a boſom-companion. Farther, had we no other means but experience for underſtanding the external ſigns of paſſion, we could not expect any uniformity, nor any degree of ſkill, in the bulk of individuals: yet matters are ſo much better ordered, that the external expreſſions of paſſion form a language underſtood by all, by the young as well as the old, by the ignorant as well as the learned: We talk of the plain and legible characters of that language; for undoubtedly we are much indebted to experience, in deciphering the dark and more delicate expreſſions. Where then ſhall we apply for a ſolution of this intricate problem, which ſeems to penetrate deep into human nature? Undoubtedly, if the meaning of external ſigns be not derived to us from ſight, nor from experience, there is no remaining ſource whence it can be derived but from nature.

We may then venture to pronounce, with ſome degree of confidence, that man is provided by nature with a ſenſe or faculty that lays open to him every paſſion by means of its external expreſſions. And we cannot entertain any reaſonable doubt of this, when we reflect, that the meaning of external ſigns is not hid even from infants: an infant is remarkably affected with the paſſions of its nurſe expreſſed on her countenance; a ſmile cheers it, a frown makes it afraid: but fear cannot be without apprehending danger; and what danger can the infant apprehend, unleſs it be ſenſible that its nurſe is angry? We muſt therefore admit that a child can read anger in its nurſe's face; of which it muſt be ſenſible intuitively, for it has no other mean of knowledge. We do not affirm, that theſe particulars are clearly apprehended by the child; for to produce clear and diſtinct perceptions, reflection and experience are requiſite: but that even an infant, when afraid, muſt have ſome notion of its being in danger, is evident.

That we ſhould be conſcious intuitively of a paſſion from its external expreſſions, is conformable to the analogy of nature: the knowledge of that language is of too great importance to be left upon experience; becauſe a foundation ſo uncertain and precarious would prove a great obſtacle to the formation of ſocieties. Wiſely therefore is it ordered, and agreeably to the ſyſtem of providence, that we ſhould have nature for our inſtructor.

Such is the philoſophy of Lord Kames, to which objections unanſwerable may be made. It is part of the inſtinctive ſyſtem of metaphyſics, which his Lordſhip has carried farther than all who wrote before him, and perhaps farther than all who have ſucceeded him in this department of ſcience. That a child intuitively reads anger in its nurſe's face, is ſo far from being true, that for ſome ſhort time after birth it is not terrified by the moſt menacing geſtures. It is indeed abſolutely incapable of fear till it has ſuffered pain, (ſee INSTINCT); and could we conſtantly careſs it with what is called an *angry look*, it would be cheered by that look, and frightened at a ſmile. It feels, however, the *effects* of anger, and is ſoon capable of obſerving the peculiarity of feature with which that paſſion is uſually accompanied; and theſe two become in a ſhort time ſo linked together in its tender mind, that the appearance of the one neceſſarily ſuggeſts to it the reality of the other.

Should it be ſaid that a loud and ſudden noiſe ſtartles a child immediately after birth, and that, therefore, the infant muſt be inſtinctively afraid, the fact may be admitted, without any neceſſity of admitting the inference. The nerves of an infant are commonly very irritable, and the ſtrong impulſe on the *auditory* nerves may agitate its whole frame, without inſpiring it with the paſſion of fear. The loud noiſe is, in all probability, not the ſign of approaching danger, but the immediate cauſe of real pain, from which the infant ſhrinks, as it would from the prick of a pin, or the ſcorching of a candle. But we have ſaid enough in the article immediately preceding, and in others which are there quoted, to ſhow how the paſſions may be formed by aſſociations even in early infancy, and yet operate as if they were inſtinctive. This being the caſe, we ſhall through the remainder of this article ſuffer his Lordſhip to ſpeak his own language, without making any further remarks upon it. We are induced to do this for two reaſons; of which the firſt is, that many of our readers will probably prefer his theory to ours; and the ſecond is, that his concluſions reſpecting the ſigns and language of paſſion hold equally good from either theory.

We perfectly agree with him, that manifold and admirable are the purpoſes to which the external ſigns of paſſion are made ſubſervient by the Author of our nature.

1. The ſigns of internal agitation diſplayed externally to every ſpectator, tend to fix the ſignification of many words. The only effectual means to aſcertain the meaning of any doubtful word, is an appeal to the thing it repreſents: and hence the ambiguity of words expreſſive of things that are not objects of external ſenſe; for in that caſe an appeal is denied. Paſſion, ſtrictly ſpeaking, is not an object of external ſenſe; but its external ſigns are: and by means of theſe ſigns, paſſions may be appealed to with tolerable accuracy: thus the words that denote our paſſions, next to thoſe that denote external objects, have the moſt diſtinct meaning. Words ſignifying internal action and the more delicate feelings, are leſs diſtinct. This defect, with regard to internal action,

is what chiefly occaſions the intricacy of logic: the terms of that ſcience are far from being ſufficiently aſcertained, even after much care and labour beſtowed by Mr. Locke, to whom, however, the world is greatly indebted for removing a mountain of rubbiſh, and moulding the ſubject into a rational and correct form. The ſame defect is remarkable in criticiſm, which has for its object the more delicate feelings; the terms that denote theſe feelings being not more diſtinct than thoſe of logic.

2. Society among individuals is greatly promoted by that univerſal language. Looks and geſtures give direct acceſs to the heart; and lead us to ſelect, with tolerable accuracy, the perſons who are worthy of our confidence. It is ſurpriſing how quickly, and for the moſt part how correctly, we judge of character from external appearance.

3. After ſocial intercourſe is commenced, theſe external ſigns, which diffuſe through a whole aſſembly the feelings of each individual, contribute above all other means to improve the ſocial affections. Language, no doubt, is the moſt comprehenſive vehicle for communicating emotions: but in expedition, as well as in power of conviction, it falls ſhort of the ſigns under conſideration; the involuntary ſigns eſpecially, which are incapable of deceit. Where the countenance, the tones, the geſtures, the actions, join with the words in communicating emotions, theſe united have a force irreſiſtible. Thus, all the pleaſant emotions of the human heart, with all the ſocial and virtuous affections, are, by means of theſe external ſigns, not only perceived but felt. By this admirable contrivance, converſation becomes that lively and animating amuſement, without which life would at beſt be inſipid: one joyful countenance ſpreads cheefulneſs inſtantaneouſly through a multitude of ſpectators.

4. Diſſocial paſſions, being hurtful by prompting violence and miſchief, are noted by the moſt conſpicuous external ſigns, in order to put us upon our guard: thus anger and revenge, eſpecially when ſudden, diſplay themſelves on the countenance in legible characters. The external ſigns, again, of every paſſion that threatens danger raiſe in us the paſſion of fear: which frequently operating without reaſon or reflection, moves us by a ſudden impulſe to avoid the impending danger.

5. Theſe external ſigns are remarkably ſubſervient to morality. A painful paſſion, being accompanied with diſagreeable external ſigns, muſt produce in every ſpectator a painful emotion: but then, if the paſſion be ſocial, the emotion it produces is attractive, and connects the ſpectator with the perſon who ſuffers. Diſſocial paſſions only are productive of repulſive emotions, involving the ſpectator's averſion, and frequently his indignation. This artful contrivance makes us cling to the virtuous, and abhor the wicked.

6. Of all the external ſigns of paſſion, thoſe of affliction or diſtreſs are the moſt illuſtrious with reſpect to a final cauſe, and deſervedly merit a place of diſtinction. They are illuſtrious by the ſingularity of their contrivance; and alſo by inſpiring ſympathy, a paſſion to which human ſociety is indebted for its greateſt bleſſing, that of providing relief for the diſtreſſed. A ſubject ſo intereſting deſerves a leiſurely and attentive examination. The conformity of the nature of man to his external circumſtances is in every particular wonderful; his nature makes him prone to ſociety; and ſociety is neceſſary to his well-being, becauſe in a ſolitary ſtate he is a helpleſs being, deſtitute of ſupport, and in his diſtreſſes deſtitute of relief: but mental ſupport, the ſhining attribute of ſociety, is of too great moment to be left dependent upon cool reaſon; it is ordered more wiſely, and with greater conformity to the analogy of nature, that it ſhould be enforced even inſtinctively by the paſſion of ſympathy. Here ſympathy makes a capital figure; and contributes more than any other means to make life eaſy and comfortable. But however eſſential the ſympathy of others may be to our well-being, one beforehand would not readily conceive how it could be raiſed by external ſigns of diſtreſs: for, conſidering the analogy of nature, if theſe ſigns be agreeable, they muſt give birth to a pleaſant emotion leading every beholder to be pleaſed with human woes: if diſagreeable, as they undoubtedly are, ought they not naturally to repel the ſpectator from them, in order to be relieved from pain? Such would be the reaſoning beforehand; and ſuch would be the effect were man purely a ſelfiſh being. But the benevolence of our nature gives a very different direction to the painful paſſion of ſympathy, and to the deſire involved in it: inſtead of avoiding diſtreſs, we fly to it in order to afford relief; and our ſympathy cannot be otherwiſe gratified but by giving all the ſuccour in our power. Thus external ſigns of diſtreſs, though diſagreeable, are attractive: and the ſympathy they inſpire is a powerful cauſe, impelling us to afford relief even to a ſtranger, as if he were our friend or relation.

It is a noted obſervation, that the deepeſt tragedies are the moſt crowded: which in an overly view will be thought an unaccountable bias in human nature. Love of novelty, deſire of occupation, beauty of action, make us fond of theatrical repreſentations; and when once engaged, we muſt follow the ſtory to the concluſion, whatever diſtreſs it may create. But we generally become wiſe by experience; and when we foreſee what pain we ſhall ſuffer during the courſe of the repreſentation, is it not ſurpriſing that perſons of reflection do not avoid ſuch ſpectacles altogether? And yet one who has ſcarce recovered from the diſtreſs of a deep tragedy, reſolves coolly and deliberately to go to the very next, without the ſlighteſt obſtruction from ſelf-love. The whole myſtery is explained by a ſingle obſervation: That ſympathy, though painful, is attractive; and attaches us to an object in diſtreſs, inſtead of prompting us to fly from it. And by this curious mechaniſm it is, that perſons of any degree of ſenſibility are attracted by affliction ſtill more than by joy.

To conclude: The external ſigns of paſſion are a ſtrong indication, that man, by his very conſtitution, is framed to be open and ſincere. A child, in all things obedient to the impulſes of nature, hides none of its emotions; the ſavage and clown, who have no guide but pure nature, expoſe their hearts to view, by giving way to all the natural ſigns. And even when men learn to diſſemble their ſentiments, and when behaviour degenerates into art, there ſtill remain checks, that keep diſſimulation within bounds, and prevent a great part of its miſchievous effects: the total ſuppreſſion of the voluntary ſigns during any vivid paſſion begets the utmoſt uneaſineſs, which cannot be endured for any conſiderable time: this operation becomes indeed leſs painful by habit; but luckily the involuntary ſigns cannot, by any effort, be ſuppreſſed nor even diſſembled. An abſolute hypocriſy, by which the character is concealed and a fictitious one aſſumed, is made impracticable; and nature has thereby prevented much harm to ſociety. We may pronounce, therefore, that Nature, herſelf ſincere and candid, intends that mankind ſhould preſerve the ſame character, by cultivating ſimplicity and truth, and baniſhing all ſorts of diſſimulation tending to miſchief.

Influence of PASSION *with reſpect to our Perceptions, Opinions, and Belief.* So intimately are our perceptions, paſſions, and actions, connected, it would be wonderful if they ſhould have no mutual influence. That our actions are too much influenced by paſſion, is a known truth; but it is not leſs certain, though not ſo well known, that paſſion hath alſo an influence upon our perceptions, opinions, and belief. For example, the opinions we form of men and things are generally directed by affection. An advice given by a man of figure hath great weight; the ſame advice from one in a low condition is deſpiſed or neglected: a man of courage under-rates danger; and to the indolent the ſlighteſt obſtacle appears unſurmountable. All this may be accounted for by the ſimple principle of aſſociation.

There is no truth more univerſally known, than that tranquillity and ſedateneſs are the proper ſtate of mind for accurate

perception and cool deliberation; and for that reaſon, we never regard the opinion even of the wiſeſt man, when we diſcover prejudice or paſſion behind the curtain. Paſſion hath ſuch influence over us, as to give a falſe light to all its objects. Agreeable paſſions prepoſſeſs the mind in favour of their objects; and diſagreeable paſſions, not leſs againſt their objects: A woman is all perfection in her lover's opinion, while in the eye of a rival beauty ſhe is awkward and diſagreeable: when the paſſion of love is gone, beauty vaniſhes with it;—nothing is left of that genteel motion, that ſprightly converſation, thoſe numberleſs graces, which formerly, in the lover's opinion, charmed all hearts. To a zealot every one of his own ſect is a ſaint, while the moſt upright of a different ſect are to him children of perdition: the talent of ſpeaking in a friend, is more regarded than prudent conduct in any other. Nor will this ſurpriſe any one acquainted with the world; our opinions, the reſult frequently of various and complicated views, are commonly ſo ſlight and wavering, as readily to be ſuſceptible of a bias from paſſion.

With that natural bias another circumſtance concurs, to give paſſion an undue influence on our opinions and belief; and that is a ſtrong tendency in our nature to juſtify our paſſions as well as our actions, not to others only, but even to ourſelves. That tendency is peculiarly remarkable with reſpect to diſagreeable paſſions: by its influence, objects are magnified or leſſened, circumſtances ſupplied or ſuppreſſed, every thing coloured and diſguiſed, to anſwer the end of juſtification. Hence the foundation of ſelf-deceit, where a man impoſes upon himſelf innocently, and even without ſuſpicion of a bias.

To illuſtrate the foregoing obſervations, the poets furniſh numerous examples. Thus, gratitude, when warm, is often exerted upon the children of the benefactor; eſpecially where he is removed out of reach by death or abſence. The paſſion in this caſe being exerted for the ſake of the benefactor, requires no peculiar excellence in his children: but the practice of doing good to theſe children produces affection for them, which never fails to advance them in our eſteem. By ſuch means, ſtrong connections of affection are often formed among individuals, upon the ſlight foundation now mentioned.

Envy is a paſſion, which, being altogether unjuſtifiable, cannot be excuſed but by diſguiſing it under ſome plauſible name. At the ſame time, no paſſion is more eager than envy to give its object a diſagreeable appearance: it magnifies every bad quality, and fixes on the moſt humbling circumſtances.

Passions, in medicine, make one of the non-naturals, and produce very ſenſible effects. Joy, anger, and fear, are the principal. In the two firſt, the ſpirits are hurried with too great vivacity; whereas, in fear or dread, they are as it were curbed and concentrated: whence we may conclude, that they have a very bad effect upon health; and therefore it is of importance to keep them within bounds as much as poſſible, and to preſerve an inward ſerenity, calmneſs, and tranquillity.

Passions, in painting, are the external expreſſions of the different diſpoſitions and affections of the mind; but particularly their different effects upon the ſeveral features of the face: for though the arms, and indeed every part of the body, ſerve likewiſe, by their quick, languid, and variouſly diverſified motions, to expreſs the paſſions of the ſoul; yet, in painting, this difference is moſt conſpicuous in the face. See Painting and Drawing.

As we have given engravings of Le Brun's drawings of the paſſions, we ſhall here ſubjoin the account which he has given of each of theſe heads. See plates 28 and 29.

1. The effects of *attention* are, to make the eye-brows ſink and approach the ſides of the noſe; to turn the eye-balls toward the object that cauſes it; to open the mouth, and eſpecially the upper part; to decline the head a little, and fix it without any other remarkable alteration.

2. *Admiration* cauſes but little agitation in the mind, and therefore alters but very little the parts of the face; nevertheleſs the eye-brow riſes; the eye opens a little more than ordinary; the eye-ball placed equally between the eye-lids appears fixed on the object; the mouth half opens, and makes no ſenſible alteration in the cheeks.

3. The motions that accompany *admiration with aſtoniſhment* are hardly different from thoſe of ſimple admiration, only they are more lively and ſtronger marked; the eye brows more elevated; the eyes more open; the eye ball further from the lower eye-lid, and more ſteadily fixed: the mouth is more open, and all the parts in a much ſtronger emotion.

4. Admiration begets eſteem, and this produces *veneration*, which, when it has for its object ſomething divine or beyond our comprehenſion, makes the face decline, and the eye-brows bend down: the eyes are almoſt ſhut and fixed: the mouth is ſhut. Theſe motions are gentle, and produce but little alterations in the other parts.

5. Although *rapture* has the ſame object as veneration, only conſidered in a different manner, its motions are not the ſame; the head inclines to the left ſide; the eye-balls and eye-brows riſe directly up; the mouth half opens, and the two corners are alſo a little turned up: the other parts remain in their natural ſtate.

6. The paſſion of *deſire* brings the eye-brows cloſe together and forwards toward the eyes, which are more open than ordinary; the eye-ball is inflamed, and places itſelf in the middle of the eye; the noſtrils riſe up, and are contracted towards the eyes; the mouth half opens, and the ſpirits being in motion give a lively glowing colour.

7. Very little alteration is remarked in the face of thoſe that feel within themſelves the *ſweetneſs of joy*, or *joy with tranquillity*. The forehead is ſerene; the eye-brow without motion, elevated in the middle; the eye pretty open and with a laughing air; the eye-ball lively and ſhining; the corners of the mouth turn up a little; the complexion is lively; the cheeks and lips are red.

8. *Laughter*, which is produced by joy mixed with ſurpriſe, makes the eye-brows riſe towards the middle of the eye, and bend towards the ſides of the noſe; the eyes are almoſt ſhut, and ſometimes appear wet, or ſhed tears, which make no alteration in the face; the mouth half open ſhows the teeth; the corners of the mouth drawn back cauſe a wrinkle in the cheeks, which appear ſo ſwelled as to hide the eyes in ſome meaſure; the noſtrils are open, and all the face is of a red colour.

9. *Acute pain* makes the eye-brows approach one another, and riſe towards the middle; the eye-ball is hid under the eye-brows; the noſtrils riſe and make a wrinkle in the cheeks; the mouth half opens and draws back: all the parts of the face are agitated in proportion to the violence of the pain.

10. *Simple bodily pain* produces proportionally the ſame motions as the laſt, but not ſo ſtrong. The eye-brows do not approach and riſe ſo much; the eye-ball appears fixed on ſome object; the noſtrils riſe, but the wrinkles in the cheeks are leſs perceivable; the lips are further aſunder towards the middle, and the mouth is half open.

11. The dejection that is produced by *ſadneſs* makes the eye-brows riſe towards the middle of the forehead more than towards the cheeks; the eye-ball appears full of perturbation; the white of the eye is yellow; the eye-lids are drawn down, and a little ſwelled; all about the eyes is livid; the noſtrils are drawn downward; the mouth is half open, and the corners are drawn down; the head careleſsly leaning on one of the ſhoulders: the face is of a lead colour; the lips pale.

12. The alterations that *weeping* occaſions are ſtrongly marked. The eye-brows ſink down towards the middle of the forehead; the eyes are almoſt cloſed, wet, and drawn down

towards the cheeks; the noſtrils ſwelled; the muſcles and veins of the forehead appear; the mouth is ſhut, and the ſides of it are drawn down, making wrinkles on the cheeks; the under lip puſhed out, preſſes the upper one: all the face is wrinkled and contracted; its colour is red, eſpecially about the eye-brows, the eyes, the noſe, and the cheeks.

13. The lively attention to the misfortunes of another, which is called *compaſſion*, cauſes the eye-brows to ſink towards the middle of the forehead; the eye-ball to be fixed upon the object; the ſides of the noſtrils next the noſe to be a little elevated, making wrinkles in the cheeks; the mouth to be open; the upper lip to be lifted up and thruſt forwards; the muſcles and all the parts of the face ſinking down and turning towards the object which excites the paſſion.

14. The motions of *ſcorn* are lively and ſtrong. The forehead is wrinkled; the eye-brow is knit; the ſide of it next the noſe ſinks down, and the other ſide riſes very much; the eye is very open, and the eye-ball is in the middle; the noſtrils riſe, and draw towards the eyes, and make wrinkles in the cheeks; the mouth ſhuts, its ſides ſinking down, and the under lip is puſhed out beyond the upper one.

15. An object deſpiſed ſometimes cauſes *horror*, and then the eye-brow knits, and ſinks a great deal more. The eye-ball, placed at the bottom of the eye, is half covered by the lower eye-lid; the mouth is half open, but cloſer in the middle than the ſides, which being drawn back, makes wrinkles in the cheeks; the face grows pale, and the eyes become livid; the muſcles and the veins are marked.

16. The violence of *terror or fright* alters all the parts of the face; the eye-brow riſes in the middle: its muſcles are marked, ſwelled, preſſed one againſt the other, and ſunk towards the noſe, which draws up as well as the noſtrils; the eyes are very open; the upper eye-lid is hid under the eye-brow; the white of the eye is encompaſſed with red; the eye-ball fixes toward the lower part of the eye; the lower part of the eye-lid ſwells and becomes livid; the muſcles of the noſe and cheeks ſwell, and theſe laſt terminate in a point toward the ſides of the noſtrils; the mouth is very open, and its corners very apparent; the muſcles and veins of the neck ſtretched; the hair ſtands on end; the colour of the face, that is, the end of the noſe, the lips, the ears, and round the eyes, is pale and livid; and all ought to be ſtrongly marked.

17. The effects of *anger* ſhow its nature. The eyes become red and inflamed; the eye-ball is flaring and ſparkling; the eye-brows are ſometimes elevated and ſometimes ſunk down equally; the forehead is very much wrinkled, with wrinkles between the eyes; the noſtrils are open and enlarged; the lips preſſing againſt one another, the under one riſing over the upper one leaves the corners of the mouth a little open, making a cruel and diſdainful grin.

18. *Hatred or jealouſy* wrinkles the forehead; the eye-brows are ſunk down and knit; the eye-ball is half hid under the eye-brows, which turn towards the object; it ſhould appear full of fire, as well as the white of the eye and the eye-lid; the noſtrils are pale, open, more marked than ordinary, and drawn backward ſo as to make wrinkles in the cheeks; the mouth is ſo ſhut as to ſhow the teeth are cloſed; the corners of the mouth are drawn back and very much ſunk; the muſcles of the jaw appear ſunk; the colour of the face is partly inflamed and partly yelloviſh; the lips pale or livid.

19. As *deſpair* is extreme, its motions are ſo likewiſe; the forehead wrinkles from the top to the bottom; the eye-brows bend down over the eyes, and preſs one another on the ſides of the noſe; the eye ſeems to be on fire, and full of blood; the eye-ball is diſturbed, hid under the eye-brow, ſparkling and unfixed; the eye-lid is ſwelled and livid; the noſtrils are large, open, and lifted up; the end of the noſe ſinks down; the muſcles, tendons, and veins are ſwelled and ſtretched; the upper part of the cheeks is large, marked, and narrow towards the jaw; the mouth drawn backwards is more open at the ſides than in the middle; the lower lip is large and turned out; they gnaſh their teeth; they foam; they bite their lips, which are pale; as is the reſt of the face; the hair is ſtraight, and ſtands on end.

Passion-*Flower*. See Passiflora.

Passion-*Week*, the week immediately preceding the feſtival of Eaſter; ſo called, becauſe in that week our Saviour's paſſion and death happened. The Thurſday of this week is called *Maunday Thurſday*; the Friday, *Good-Friday*; and the Saturday, the *Great Sabbath*.

PASSIVE, in general, denotes ſomething that ſuffers the action of another, called an *agent* or *active power*. In grammar, the verb or word that expreſſes this paſſion is termed a *paſſive verb*; which, in the learned languages, has a peculiar termination; as *amor, doceor*, &c. in Latin; that is, an *r* is added to the actives *amo, doceo*: and, in the Greek, the inflection is made by changing *ω* into *ομαι*; as *τυπτω τυπτομαι*, &c. But, in the modern languages, the paſſive inflection is performed by means of auxiliary verbs, joined to the participle of the paſt tenſe; as, "I am praiſed," in Latin *laudor*, and in Greek *επαινεομαι*; or, "I am loved," in Latin *amor*, and in Greek *φιλεομαι*. Thus, it appears that the auxiliary verb *am* ſerves to form the paſſives of Engliſh verbs: and the ſame holds of the French; as, *Je ſuis loué*, "I am praiſed;" *j'ai été loué*, "I have been praiſed," &c. See Grammar.

Passive *Obedience*, a political doctrine which has been much miſrepreſented, and is, of courſe, very obnoxious to the friends of freedom. Some non-jurors in the end of the laſt and in the beginning of the paſſing century, imagining that monarchy is the only lawful form of government, and that hereditary monarchy is the only lawful ſpecies of that government, have coupled with paſſive obedience the ridiculous notion of a divine, hereditary, indefeaſible right of certain families to govern with deſpotic ſway all other families of the ſame nation. The abſurdity of this notion needs not be dwelt upon; but it may not be improper to obſerve, that it has nothing to do with paſſive obedience.

As taught by the ableſt reaſoners, who think that they are ſupported by holy ſcripture, paſſive obedience is as much a duty under republican as under monarchical governments; and it means no more, but that private individuals are bound by the moſt ſolemn moral ties not to reſiſt the ſupreme power whereſoever placed in any nation. The ſupreme power can only be the legiſlature; and no man or body of men, who have not the power of enacting and abrogating laws, can, on this principle, claim paſſive obedience from any ſubject. Whether the principle be well or ill-founded, the abſurdity which commonly attaches to the phraſe *paſſive obedience*, originates from the miſtaken loyalty of the adherents of the houſe of Stuart, who, to aggravate the illegality of the Revolution, were wont to repreſent James II. as ſupreme over both houſes of parliament, and of courſe over all law. That ſuch reveries were fooliſh, we need no other evidence than the ſtatute-book, which ſhows, that in the office of legiſlation, the king, lords, and commons, are co-ordinate; and that when any one of theſe powers ſhall take upon itſelf to counteract the other two, the duty of paſſive obedience will oblige the ſubject to ſupport the legiſlature. That reſiſtance to the legiſlature, if lawful on any occaſion, can be ſo only to oppoſe the moſt violent tyranny, has been ſhown by Mr. Hume with great cogency of argument, and is indeed a propoſition ſelf-evident. That it can never be lawful on any occaſion, Biſhop Berkeley endeavoured to prove by a chain of reaſoning which it would be difficult to break. We enter not into the controverſy, but refer our readers to *Hume's Eſſays*

nd *Berkely's Paſſive Obedience and Nonreſiſtance*, or, as it was entitled by a late editor, *The Meaſure of Submiſſion to civil Government*. We ſhall only obſerve, that there is a great difference between *active* and *paſſive* obedience; and that many who conſider themſelves as bound on *no account* whatever to reſiſt the ſupreme power, would yet *ſuffer death* rather than do an immoral action in obedience to any law of earthly origin.

PASSIVE *Prayer*, among the *myſtic divines*, is a total ſuſpenſion or ligature of the intellectual faculties; in virtue whereof, the ſoul remains of itſelf, and as to its own power, impotent with regard to the producing of any effects. The paſſive ſtate, according to Fenelon, is only paſſive in the ſame ſenſe as contemplation is, *i. e.* it does not exclude peaceable, diſintereſted acts, but only unquiet ones, or ſuch as tend to our own intereſt. In the paſſive ſtate, the ſoul has not properly any activity, any ſenſation, of its own: it is a mere infinite flexibility of the ſoul, to which the feebleſt impulſe of grace gives motion.

PASSOVER, a ſolemn feſtival of the Jews, inſtituted in commemoration of their coming out of Egypt; becauſe the night before their departure, the deſtroying angel, who put to death the firſt-born of the Egyptians, paſſed over the houſes of the Hebrews without entering therein, becauſe they were marked with the blood of the lamb which was killed the evening before, and which for this reaſon was called the *paſchal lamb*. This feaſt was called *paſcha* by the old Greeks and Romans; not we preſume from πασχω "I ſuffer," as Chryſoſtom, Irenæus and Tertullian ſuppoſe, but from the Hebrew word *peſaph*, *paſſage, leap*. The following is what God ordained concerning the paſſover of the Jews, (Exod. xii.) The month of the coming forth from Egypt was looked upon from this time to be the firſt month of the ſacred or eccleſiaſtical year; and the fourteenth day of this month, between the two veſpers, that is, between the ſun's decline and his ſetting; or rather, according to our manner of reckoning, between two o'clock in the afternoon and ſix o'clock in the evening at the equinox, they were to kill the paſchal lamb, and to abſtain from leavened bread. The day following being the fifteenth, counting from ſix o'clock of the foregoing evening, which concluded the fourteenth, was the grand feaſt of the paſſover, which continued ſeven days. But it was only the firſt and the ſeventh day that were ſolemn. The lamb that was killed ought to be without any defect, a male, and yeaned that year. If no lamb could be found, they might take a kid. They killed a lamb or a kid in every family; and if the number of thoſe that lived in the houſe was not ſufficient to eat a lamb, they might join two houſes together. With the blood of the paſchal lamb they ſprinkled the door-poſts and lintel of every houſe, that the deſtroying angel, at the ſight of the blood, might paſs over them, and ſave the Hebrew children. They were to eat the lamb the ſame night that followed the ſacrifice; they ate it roaſted, with unleavened bread, and a ſallad of wild lettuce. The Hebrew ſays literally, with bitter things, as ſuppoſe muſtard, or any thing of this nature to give a reliſh. It was forbid to eat any part of it raw, or boiled in water, nor were they to break a bone, (Exod. xii. 46. Numb. ix. 12. John xix. 36.); and if any thing remained to the day following, it was thrown into the fire. They that ate it were to be in the poſture of travellers, having their reins girt, their ſhoes on their feet, their ſtaves in their hands, and eating in a hurry. But this laſt part of the ceremony was but little obſerved, at leaſt it was of no obligation, but only upon that night they came forth out of Egypt. For the whole eight days of the paſſover no leavened bread was to be uſed; and whoever ſhould eat any was threatened to be cut off from his people. With regard to the ceremonies which are obſerved in relation to the bread, ſee the article BREAD.

They kept the firſt and laſt day of the feaſt, yet ſo as that it was allowed to dreſs victuals, which was forbidden on the Sabbath-day. The obligation of keeping the paſſover was ſo ſtrict, that whoever ſhould neglect to do it was condemned to death, (Numb. ix. 13.) But thoſe who had any lawful impediment, as a journey, ſickneſs, or any uncleanneſs, voluntary or involuntary; for example, thoſe that had been preſent at a funeral, or by any other accident had been defiled, were to defer the celebration of the paſſover till the ſecond month of the eccleſiaſtical year, or to the fourteenth day of the month Jiar, which anſwers to April and May. It was thus the Lord ordered Moſes, upon the occaſion of the inquiry of ſome Iſraelites, who had been obliged to pay their laſt offices to ſome of their relations, and who, being thus polluted, were not capable of partaking of the paſchal ſacrifice, (2 Chr. xxx. 1, 2, &c.) The modern Jews obſerve in general the ſame ceremonies that were practiſed by their anceſtors, in the celebration of the paſſover. On the fourteenth of Niſan, the firſt-born faſt in memory of God's ſmiting the firſt-born of the Egyptians. The morning prayers are the ſame with thoſe ſaid on other feſtivals. They take the roll of the Pentateuch out of the cheſt, and read as far as the end of the twelfth chapter of Exodus, and what is contained in the eighteenth chapter of Numbers, relating to the paſſover. The matron of the family then ſpreads a table, and ſets on it two unleavened cakes, and two pieces of the lamb, a ſhoulder boiled and another roaſted, to put them in mind that God delivered them with a ſtretched-out arm. To this they add ſome ſmall fiſhes, becauſe of the leviathan; a hard egg, becauſe of the ziz; ſome meal, becauſe of the behemoth, (theſe three animals being appointed for the feaſt of the elect in the other life); and peas and nuts for the children, to provoke their curioſity to aſk the reaſon of this ceremony. They likewiſe uſe a kind of muſtard, which has the appearance of mortar, to repreſent their making bricks in Egypt. The father of the family ſits down with his children and ſlaves, becauſe on this day all are free. Being ſet down, he takes bitter herbs, and dips them in the muſtard, then eats them, and diſtributes to the reſt. Then they eat of the lamb, the hiſtory and inſtitution of which is at that time recited by the maſter of the family. The whole repaſt is attended with hymns and prayers. They pray for the prince under whoſe dominion they live, according to the advice of Jeremiah (xxix. 7.), "Seek the peace of the city whither I have cauſed you to be carried away captives, and pray unto the Lord for it: for in the peace thereof ſhall ye have peace." See the article FEAST, &c. The ſame things are put in practice the two following days; and the feſtival is concluded by the ceremony habdala or diſtinction. This ceremony is performed at the cloſing of the Sabbath-day, at which time the maſter of the houſe pronounces certain benedictions, accompanied with certain formalities, requeſting that every thing may ſucceed well the week following. After going out of the ſynagogue, they then eat leavened bread for the laſt time. (Leo of Modena, p. iii. c. 3. and the Rabbins.) While the temple was ſtanding, they brought their lambs thither, and ſacrificed them, offering the blood to the prieſt, who poured it out at the foot of the altar. The paſſover was typically predictive of Chriſt our chriſtian paſſover, (1 Cor. v. 7.) As the deſtroying angel paſſed over the houſes marked with the blood of the paſchal lamb, ſo the wrath of God paſſes over them whoſe ſouls are ſprinkled with the blood of Chriſt. The paſchal lamb was killed before Iſrael was delivered, ſo it is neceſſary Chriſt ſhould ſuffer before we could be redeemed. It was killed before Moſes's law or Aaron's ſacrifices were enjoined, to ſhow that deliverance comes to mankind by none of them; but only the true paſſover, that Lamb of God ſlain from the foundation of the world, (Rom. iii. 25. Heb. ix. 14.). It was killed the firſt month of the year, which prefigured that

Chriſt ſhould ſuffer death in this month, (John xviii. 28.) It was killed in the evening, (Exod. xii. 6.) So Chriſt ſuffered in the laſt days, and at this time of the day, (Matt. xxvii. 46. Heb. i. 2.) At even alſo the ſun ſets; which ſhows, that it was the Sun of Righteouſneſs who was to ſuffer and die, and that at his paſſion univerſal darkneſs ſhould be upon the whole earth, (Luke xxiii. 44.) The paſſover was roaſted with fire, to denote the ſharp and dreadful pains which Chriſt ſhould ſuffer, not only from men, but from God alſo. It was to be eaten with bitter herbs, not only to put them in remembrance of their bitter bondage in Egypt, but alſo to typify our mortification to ſin, and readineſs to undergo afflictions for Chriſt, (Col. i. 24.) Many erroneouſly imagine, that the paſſover was inſtituted in memory of the Iſraelites paſſing the Red Sea; though it is certain the feaſt was held, and had its name, before the Iſraelites took a ſtep of their way out of Egypt, and, conſequently, ſeveral days before their paſſing the Red Sea. Beſides the paſſover celebrated on the fourteenth of the firſt month, there was a ſecond paſſover held on the fourteenth of the ſecond month after the equinox, inſtituted by God in favour of travellers and ſick perſons, who could not attend at the firſt, nor be at Jeruſalem on the day. The Greeks, and even ſome of the catholic doctors, from the thirteenth, eighteenth, and nineteenth chapters of St. John, take occaſion to conclude, that Jeſus anticipated the day marked for the paſſover in the law; but the authority of three evangeliſts ſeems to evince the contrary. See Whitby's Diſſertation on this ſubject, in an appendix to the fourteenth chapter of St. Mark. F. Lamy ſuppoſes, that our Lord did not attend at the paſſover the laſt year of his life; which ſentiment has drawn upon him abundance of oppoſers. F. Hardouin aſſerts, that the Galileans celebrated the paſſover on one day, and the Jews on another.

PASSPORT, or Pass, a licence or writing obtained from a prince or governor, granting permiſſion and a ſafe conduct to paſs through his territories without moleſtation: Alſo a permiſſion granted by any ſtate to navigate in ſome particular ſea, without hindrance or moleſtation from it. It contains the name of the veſſel, and the name of the maſter, together with her tonnage and the number of her crew, certifying that ſhe belongs to the ſubjects of a particular ſtate, and requiring all perſons at peace with that ſtate to ſuffer her to proceed on her voyage without interruption.

The violation of ſafe-conducts or paſſports expreſsly granted by the king or by his ambaſſadors to the ſubjects of a foreign power in time of mutual war, or committing acts of hoſtility againſt ſuch as are in amity, league, or truce with us, who are here under a general implied ſafe-conduct, are breaches of the public faith, without which there can be no intercourſe or commerce between one nation and another; and ſuch offences may, according to the writers upon the law of nations, be a proper ground of a national war. And it is enacted by the ſtatute 31 Hen. VI. cap. 4. ſtill in force, that if any of the king's ſubjects attempt or offend upon the ſea, or in any port within the king's obeyſance, or againſt any ſtranger in amity, league, or truce, or under ſafe-conduct, and eſpecially by attacking his perſon, or ſpoiling him, or robbing him of his goods; the lord-chancellor, with any of the juſtices of either the king's-bench or common-pleas, may cauſe full reſtitution and amends to be made to the party injured. Paſquier ſays, that *paſſport* was introduced for *paſſe-par-tout*. Balzac mentions a very honourable paſſport given by an emperor to a philoſopher in theſe terms: "If there be any one on land or ſea hardy enough to moleſt Potamon, let him conſider whether he be ſtrong enough to wage war with Cæſar."

Passport, is uſed likewiſe for a licence granted by a prince for the importing or exporting merchandizes, moveables, &c. without paying the duties. Merchants procure ſuch paſſports for certain kinds of commodities; and they are always given to ambaſſadors and miniſters for their baggage, equipage, &c.

Passport is alſo a licence obtained for the importing or exporting of merchandizes deemed contraband, and declared ſuch by tariffs, &c. as gold, ſilver, precious ſtones, ammunition of war, horſes, corn, wool, &c. upon paying duties.

PASSUS, among the Romans, a meaſure of length, being about four feet ten inches, or the thouſandth part of a Roman mile. The word properly ſignifies, the ſpace betwixt the feet of a man walking at an ordinary rate. See Measure.

PASTE, in cookery, a ſoft compoſition of flour, wrought up with proper fluids, as water, milk, or the like, to ſerve for caſes or coffins, therein to bake meats, fruits, &c. It is the baſis or foundation of pyes, tarts, patties, paſties, and other works of paſtry. It is alſo uſed in confectionary, &c. for a preparation of ſome fruit, made by beating the pulp thereof, with ſome fluid or other admixture, into a ſoft pappy conſiſtence, ſpreading it in a diſh, and drying it with ſugar till it becomes as pliable as an ordinary paſte. It is uſed occaſionally alſo for making the cruſts and bottoms of pyes, &c. Thus, with proper admixtures, are made almond paſtes, apple paſtes, apricot paſtes, cherry, currant, lemon, plum, peach, and pear paſtes.

Paste is likewiſe uſed for a preparation of wheaten flour, boiled up and incorporated with water; uſed by various artificers, as upholſterers, ſadlers, bookbinders, &c. inſtead of glue or ſize, to faſten or cement their cloths, leathers, papers, &c. When paſte is uſed by bookbinders, or for paper-hangings to rooms, they mix a fourth, fifth, or ſixth, of the weight of the flour of powdered reſin; and where it is wanted ſtill more tenacious, gum arabic or any kind of ſize may be added. Paſte may be preſerved, by diſſolving a little ſublimate, in the proportion of a dram to a quart, in the water employed for making it; which will prevent not only rats and mice, but any other kind of vermin and inſects, from preying upon it.

Pastes, in the glaſs trade, or the imitation or counterfeiting of gems in glaſs. See Gem.

PASTEBOARD, a kind of thick paper, formed of ſeveral ſingle ſheets paſted one upon another, and afterwards well preſſed. The chief uſe of paſteboard is for binding books, making letter-caſes, &c.

PASTERN *of a* Horse, in the manege, is the diſtance betwixt the joint next the foot and the coronet of the hoof. This part ſhould be ſhort, eſpecially in middle-ſized horſes; becauſe long paſterns are weak, and cannot ſo well endure travelling.

Pastern-*Joint*, the joint next a horſe's foot.

PASTIL or Pastel, among painters, a kind of paſte made of different colours ground up with gum-water, in order to make Crayons.

Pastil, in pharmacy, is a dry compoſition of ſweet-ſmelling reſins, aromatic woods, &c. ſometimes burnt to clear and ſcent the air of a chamber.

PASTINACA, the Parsnep: a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The fruit is an elliptical compreſſed plane; the petals are involuted and entire. There are only two ſpecies of this genus; the principal of which is the *paſtinaca ſativa*, or garden parſnep; which is an exceeding fine eſculent root. It is to be propagated by ſowing the ſeeds in February or March, in a rich mellow ſoil, which muſt be deep dug, that the roots may be able to run deep without hindrance.

It is a common practice to ſow carrots at the ſame time upon the ſame ground with the parſneps; and if the carrots are deſigned to be drawn young, there is no harm in it. The parſneps, when they are grown up a little, muſt be thinned to

a foot diſtance, and carefully kept clear of weeds. They are fineſt taſted juſt at the ſeaſon when the leaves are decayed: and ſuch as are deſirous to eat them in ſpring ſhould have them taken up in autumn, and preſerved in ſand. When the ſeeds are to be ſaved, ſome very ſtrong and fine plants ſhould be left four feet diſtant; and towards the end of Auguſt, or in the beginning of September, the ſeeds will be ripe: they muſt then be carefully gathered, and dried on a coarſe cloth. They ſhould always be ſown the ſpring following; for they do not keep well.

Hints have been given and experiments made by agricultural ſocieties, reſpecting parſneps, in order to raiſe them for winter food to cattle. It has long been a cuſtom in ſome parts of Brittany, to ſow parſneps in the open field for the food of cattle; as we are informed by the firſt volume of the Tranſactions of a Society inſtituted in that province, for the encouragement of the œconomical and commercial intereſts of their country. "It is of great importance (ſay they) that parſneps ſhould be univerſally cultivated; becauſe they afford an excellent and wholeſome food for all kinds of cattle during the winter, and may be uſed to great advantage to fatten them. Our hogs have no other food in all that ſeaſon, and our bullocks and oxen thrive well upon it. Our cows fed with parſneps give more milk than with any other winter fodder, and that milk yields better butter than the milk of cows nouriſhed with any other ſubſtance. Our horſes fatten with this food; though ſome pretend that it renders them leſs mettleſome, and hurts their legs and eyes. Cattle eat theſe roots raw at firſt ſliced lengthwiſe; and when they begin not to reliſh them, they are cut in pieces, put into a large copper, preſſed down there, and boiled with only ſo much water as fills up the chaſms between them. They then eat them very greedily, and continue to like them." See Panax and Opopanax.

PASTOPHORI, amongſt the ancients, were prieſts whoſe office it was to carry the images, along with the ſhrines of the gods, at ſolemn feſtivals, when they were to pray to them for rain, fair weather, or the like. The Greeks had a college of this order of prieſts in Sylla's time. The cells or apartments near the temples, where the paſtophori lived, were called *paſtophoria*. There were ſeveral lodging-rooms for the prieſts of a ſimilar kind in the temple of Jeruſalem.

PASTORAL, in general, ſomething that relates to ſhepherds: hence we ſay, paſtoral life, manners, poetry, &c. Dr. Blair conſiders paſtoral life in three different views; either ſuch as it now actually is; when the ſtate of ſhepherds is reduced to be a mean, ſervile, and laborious ſtate; when their employments are become diſagreeable, and their ideas groſs and low: or ſuch as we may ſuppoſe it once to have been, in the more early and ſimple ages, when it was a life of eaſe and abundance; when the wealth of men conſiſted chiefly in flocks and herds, and the ſhepherd, though unrefined in his manners, was reſpectable in his ſtate: or, laſtly, ſuch as it never was, and never can in reality be, when, to the eaſe, innocence, and ſimplicity of the early ages, we attempt to add the poliſhed taſte and cultivated manners of modern times. Of theſe three ſtates, the firſt is too groſs and mean, the laſt too refined and unnatural, to be made the ground work of paſtoral poetry. Either of theſe extremes is a rock upon which the poet will ſplit, if he approach too near it. We ſhall be diſguſted if he give us too much of the ſervile employments and low ideas of actual peaſants, as Theocritus is cenſured for having ſometimes done; and if, like ſome of the French and Italian writers of paſtorals, he makes his ſhepherds diſcourſe as if they were courtiers and ſcholars, he then retains the name only, but wants the ſpirit of paſtoral poetry.

Pastoral *Poetry*. See Poetry.

PASTRY, that branch of cookery which is chiefly taken up in making pies, paſties, cakes, &c. See Paste. Dr. Cullen obſerves, that paſte is very hard and indigeſtible without butter; and, even with it, is apt to produce heart-burn and acesceny. Perhaps this is increaſed by the burned butter, from a certain ſenſibility in the ſtomach, which occaſions all empyreumatic oils to be long retained, and ſo turn ranceſcent and acid.

PASTURE, or Pasture-*Land*, is that reſerved for feeding cattle. Paſture land is of ſuch advantage to huſbandry, that many prefer it even to corn-land, becauſe of the ſmall hazard and labour that attend it, and as it lays the foundation for moſt of the profit that is expected from the arable land, becauſe of the manure afforded by the cattle which are fed upon it. Paſture-ground is of two ſorts; the one is meadow land, which is often overflowed; and the other is upland, which lies high and dry. The firſt of theſe will produce a much greater quantity of hay than the latter, and will not require manuring or dreſſing ſo often: but then the hay produced on the upland is much preferable to the other; as is alſo the meat which is fed in the upland more valued than that which is fatted in rich meadows; though the latter will make the fatter and larger cattle, as is ſeen by thoſe which are brought from the low rich lands in Lincolnſhire. But where people are nice in their meat, they will give a much larger price for ſuch as hath been fed on the downs, or in ſhort upland paſture, than for the other, which is much larger. Beſides this, dry paſtures have an advantage over the meadows, that they may be fed all the winter, and are not ſo ſubject to poach in wet weather; nor will there be ſo many bad weeds produced; which are great advantages, and do in a great meaſure recompenſe for the ſmallneſs of the crop.

We have already mentioned the advantages of meadow land, or ſuch as is capable of being overflowed with water, and given directions for draining and improving low paſture land, under the article Meadow; therefore ſhall not repeat that here, but juſt mention ſome methods for improving of upland paſture.

The firſt improvement of upland paſture is, by fencing it, and dividing it into ſmall fields of four, five, ſix, eight, or ten acres each, planting timber trees in the hedge-rows, which will ſcreen the graſs from the dry pinching winds of March, which will prevent the graſs from growing in large open lands; ſo that if April proves a dry month, the land produces very little hay; whereas, in the ſheltered fields, the graſs will begin to grow early in March, and will cover the ground, and prevent the ſun from parching the roots of the graſs, whereby it will keep growing, ſo as to afford a tolerable crop if the ſpring ſhould prove dry. But in fencing of land the incloſure muſt not be made too ſmall, eſpecially where the hedge-rows are planted with trees; becauſe, when the trees are advanced to a conſiderable height, they will ſpread over the land; and, where they are cloſe, will render the graſs ſour; ſo that, inſtead of being an advantage, it will greatly injure the paſture.

The next improvement of upland paſture is to make the turf good, where, either from the badneſs of the ſoil, or for want of proper care, the graſs hath been deſtroyed by ruſhes, buſhes, or mole-hills. Where the ſurface of the land is clayey and cold, it may be improved by paring it off, and burning it; but if it is an hot ſandy land, then chalk, lime, marle, or clay, are very proper manures to lay upon it; but this ſhould be laid in pretty good quantities, otherwiſe it will be of little ſervice to the land.

If the ground is over-run with buſhes or ruſhes, it will be of great advantage to the land to grub them up towards the latter part of the ſummer, and after they are dried to burn them, and ſpread the aſhes over the ground juſt before the autumnal rains; at which time the ſurface of the land ſhould be levelled, and

ſown with graſs ſeed, which will come up in a ſhort time, and make good graſs the following ſpring. So alſo, when the land is full of mole-hills, theſe ſhould be pared off, and either burnt for the aſhes, or ſpread immediately on the ground when they are pared off, obſerving to ſow the bare patches with graſs-ſeed juſt as the autumnal rains begin.

Where the land has been thus managed, it will be of great ſervice to roll the turf in the months of February and March with an heavy wood roller; always obſerving to do it in moiſt weather, that the roller may make an impreſſion: this will render the ſurface level, and make it much eaſier to mow the graſs than when the ground lies in hills; and will alſo cauſe the turf to thicken, ſo as to have what the people uſually term a *good bottom*. The graſs likewiſe will be the ſweeter for this huſbandry, and it will be a great help to deſtroy bad weeds.

Another improvement of upland paſtures is, the feeding of them; for, where this is not practiſed, the land muſt be manured at leaſt every third year; and where a farmer hath much arable land in his poſſeſſion, he will not care to part with his manure to the paſture. Therefore every farmer ſhould endeavour to proportion his paſture to his arable land, eſpecially where manure is ſcarce, otherwiſe he will ſoon find his error; for the paſture is the foundation of all the profit which may ariſe from the arable land.

Whenever the upland paſtures are mended by manure, there ſhould be a regard had to the nature of the ſoil, and a proper ſort of manure applied: as for inſtance, all hot ſandy land ſhould have a cold manure: neat's dung and ſwine's dung are very proper for ſuch lands; but for cold lands, horſe dung, aſhes, and other warm manures, are proper. And when theſe are applied, it ſhould be done in autumn, before the rains have ſoaked the ground, and rendered it too ſoft to cart on; and it ſhould be carefully ſpread, breaking all the clods as ſmall as poſſible, and then harrowed with buſhes, to let it down to the roots of the graſs. When the manure is laid on at this ſeaſon, the rains in winter will waſh down the ſalts, ſo that the following ſpring the graſs will receive the advantage of it.

There ſhould alſo be great care taken to deſtroy the weeds in the paſture every ſpring and autumn: for, where this is not practiſed, the weeds will ripen their ſeeds, which will ſpread over the ground, and thereby fill it with ſuch a crop of weeds as will ſoon overbear the graſs, and deſtroy it; and it will be very difficult to root them out after they have gotten ſuch poſſeſſion, eſpecially ragwort, and ſuch other weeds as have down adhering to their ſeeds.

The graſs which is ſown in theſe upland paſtures ſeldom degenerates, if the land is tolerably good: whereas the low meadows, which are overflowed in winter, in a few years turn to an harſh ruſhy graſs, though the upland will continue a fine ſweet graſs for many years without renewing.

There is no part of huſbandry of which the farmers are in general more ignorant than that of the paſture: moſt of them ſuppoſe, that when old paſture is ploughed up, it can never be brought to have a good ſward again: ſo their common method of managing their land after ploughing, is to ſow with their crop of barley ſome graſs-ſeeds, as they call them; that is, either the red clover, which they intend to ſtand two years after the corn is taken off the ground, or rye-graſs mixed with trefoil; but as all theſe are at moſt but biennial plants, whoſe roots decay ſoon after their ſeeds are perfected, ſo the ground, having no crop upon it, is again ploughed for corn; and this is the conſtant round which the lands are employed in by the better ſort of farmers.

But whatever may have been the practice of theſe people, it is certainly poſſible to lay down lands which have been in tillage with graſs, in ſuch a manner as that the ſward ſhall be as good, if not better than any natural graſs, and of as long duration. But this is never to be expected in the common method of ſowing a crop of corn with the graſs-ſeeds; for, wherever this has been practiſed, if the corn has ſucceeded well, the graſs has been very poor and weak; ſo that, if the land has not been very good, the graſs has ſcarcely been worth ſaving; for the following year it has produced but little hay, and the year after the crop is worth little, either to mow or feed. Nor can it be expected to be otherwiſe, for the ground cannot nouriſh two crops; and if there were no deficiency in the land, yet the corn, being the firſt and moſt vigorous of growth, will keep the graſs from making any conſiderable progreſs; ſo that the plants will be extremely weak, and but very thin, many of them which come up in the ſpring being deſtroyed by the corn; for, whenever there are roots of corn, it cannot be expected there ſhould be any graſs. Therefore the graſs muſt be thin; and if the land is not in good heart to ſupply the graſs with nouriſhment, that the roots may branch out after the corn is gone, there cannot be any conſiderable crop of clover; and as their roots are biennial, many of the ſtrongeſt plants will periſh ſoon after they are cut; and the weak plants, which had made but little progreſs before, will be the principal part of the crop for the ſucceeding year; which is many times not worth ſtanding.

Therefore, when ground is laid down for graſs, there ſhould be no crop of any kind ſown with the ſeeds; or at leaſt the crop ſhould be ſown very thin, and the land ſhould be well ploughed and cleaned from weeds, otherwiſe the weeds will come up the firſt, and grow ſo ſtrong as to overbear the graſs, and, if they are not pulled up, will entirely ſpoil it. The beſt ſeaſon to ſow the graſs-ſeeds upon dry land, when no other crop is ſown with them, is about the middle of September, or ſooner if there is an appearance of rain; for, the ground being then warm, if there happen ſome good ſhowers of rain after the ſeed is ſown, the graſs will ſoon make its appearance, and get ſufficient rooting in the ground before winter, ſo will not be in danger of having the roots turned out of the ground by froſt, eſpecially if the ground is well rolled before the froſt comes on, which will preſs it down, and fix the earth cloſe to the roots. Where this hath not been practiſed, the froſt has often looſened the ground ſo much, as to let in the air to the roots of the graſs, and done it great damage; and this has been brought as an objection to the autumnal ſowing of graſs; but it will be found to have no weight if the above direction is practiſed: nor is there any hazard of ſowing the graſs at this ſeaſon, but that of dry weather after the ſeeds are ſown; for, if the graſs comes up well, and the ground is well rolled in the end of October, or the beginning of November, and repeated again the beginning of March, the ſward will be cloſely joined at bottom, and a good crop of hay may be expected the ſame ſummer. But where the ground cannot be prepared for ſowing at that ſeaſon, it may be performed the middle or latter end of March, according to the ſeaſon's being early or late; for in backward ſprings, and in cold land, we have often ſown the graſs in the middle of April with ſucceſs; but there is danger, in ſowing late, of dry weather, and eſpecially if the land is light and dry; for we have ſeen many times the whole ſurface of the ground removed by ſtrong winds at that ſeaſon; ſo that the ſeeds have been driven in heaps to one ſide of the field. Therefore, whenever the ſeeds are ſown late in the ſpring, it will be proper to roll the ground well ſoon after the ſeeds are ſown, to ſettle the ſurface, and prevent its being removed.

The ſorts of ſeeds which are the beſt for this purpoſe, are, the beſt ſort of upland hay-ſeeds, taken from the cleaneſt paſtures, where there are no bad weeds: if this ſeed is ſifted to clean it from rubbiſh, three buſhels will be ſufficient to ſow an

acre of land. The other ſort is the *trifolium pratenſe album*, which is commonly known by the names *white Dutch clover*, or *white honeyſuckle graſs*. Eight pounds of this ſeed will be enough for one acre of land. The graſs-ſeed ſhould be ſown firſt, and then the Dutch clover-ſeed may be afterwards ſown; but they ſhould not be mixed together, becauſe the clover ſeeds being the heavieſt will fall to the bottom, and conſequently the ground will be unequally ſown.

When the ſeeds are come up, if the land ſhould produce many weeds, theſe ſhould be drawn out before they grow ſo tall as to overbear the graſs; for, where this has been neglected, the weeds have taken ſuch poſſeſſion of the ground as to keep down the graſs, and ſtarve it; and when theſe weeds have been ſuffered to remain until they have ſhed their ſeeds, the land has been ſo plentifully ſtocked with them as entirely to deſtroy the graſs; therefore it is one of the principal parts of huſbandry never to ſuffer weeds to grow on the land.

If the ground is rolled two or three times at proper diſtances after the graſs is up, it will preſs down the graſs, and cauſe it to make a thicker bottom: for, as the Dutch clover will put out roots from every joint of the branches which are near the ground, ſo, by preſſing down of the ſtalks, the roots will mat ſo cloſely together, as to form a ſward ſo thick as to cover the whole ſurface of the ground, and form a green carpet, and will better reſiſt the drought. For, if we do but examine the common paſtures in ſummer, in moſt of which there are patches of this white honeyſuckle graſs growing naturally, we ſhall find theſe patches to be the only verdure remaining in the fields. And this the farmers in general acknowledge is the ſweeteſt feed for all ſorts of cattle; yet they never had any notion of propagating it by ſeeds, nor has it been long practiſed in England.

As the white clover is an abiding plant, ſo it is certainly the very beſt ſort to ſow, where paſtures are laid down to remain; for, as the hay-ſeeds which are taken from the beſt paſtures will be compoſed of various ſorts of graſs, ſome of which may be but annual, and others biennial; ſo, when thoſe go off, there will be many and large patches of ground left bare and naked, if there is not a ſufficient quantity of the white clover to ſpread over and cover the land. Therefore a good ſward can never be expected where this is not ſown; for in moſt of the natural paſtures we find this plant makes no ſmall ſhare of the ſward: and it is equally good for wet and dry land, growing naturally upon gravel and clay in moſt parts of England: which is a plain indication how eaſily this plant may be cultivated to great advantage in moſt ſorts of land throughout this kingdom.

Therefore the true cauſe why the land which has been in tillage is not brought to a good turf again, in the uſual method of huſbandry, is from the farmers not diſtinguiſhing which graſſes are annual from thoſe which are perennial: for, if annual or biennial graſſes are ſown, theſe will of courſe ſoon decay; ſo that, unleſs where ſome of their ſeeds may have ripened and fallen, nothing can be expected on the land but what will naturally come up. Therefore this, with the covetous method of laying down the ground with a crop of corn, has occaſioned the general failure of increaſing the paſture in many parts of Britain, where it is now much more valuable than any arable land.

After the ground has been ſown in the manner before directed, and brought to a good ſward, the way to preſerve it good is, by conſtantly rolling the ground with an heavy roller, every ſpring and autumn, as hath been before directed. This piece of huſbandry is rarely practiſed by farmers; but thoſe who do, find their account in it, for it is of great benefit to the graſs. Another thing ſhould alſo be carefully performed, which is, to cut up docks, dandelion, knapweed, and all ſuch bad weeds, by their roots every ſpring and autumn; this will increaſe the quantity of good graſs, and preſerve the paſtures in beauty. Dreſſing of theſe paſtures every third year is alſo a good piece of huſbandry; for otherwiſe it cannot be expected the ground ſhould continue to produce good crops. Beſides this, it will be neceſſary to change the ſeaſons of mowing, and not to mow the ſame ground every year, but to mow one ſeaſon and feed the next; for, where the ground is every year mown, it muſt be conſtantly dreſſed, as are moſt of the graſs grounds near London, otherwiſe the ground will be ſoon exhauſted.

PATÆCI, in mythology, images of gods which the Phœnicians carried on the prows of their galleys. Herodotus, lib. iv. calls them παλαικοι. The word is Phœnician, and derived from *pethica*, i. e. *titulus*. See Bochart's Chanaan, lib. ii. cap. 3. But Scaliger does not agree. Morin derives it from πιθηκος; *monkey*, this animal having been an object of worſhip among the Egyptians, and hence might have been honoured by their neighbours. Mr. Elſner has obſerved, that Herodotus does not call the patæci *gods*; but that they obtained this dignity from the liberality of Heſychius and Suidas, and other ancient lexicographers, who place them at the ſtern of ſhips; whereas Herodotus placed them at the prow. Scaliger, Bochart, and Selden have taken ſome pains about this ſubject.—Mr. Morin has alſo given us a learned diſſertation on this head in the *Memoires de l'Acad. d's Inſcript. & Belles Lettres*, tom. i.; but Mr. Elſner thinks it defective in point of evidence.

PATAGONIA, a country of South America, comprehending all that country extending from Chili and Paraguay to the utmoſt extremity of South America; that is, from 35° almoſt to 54° of latitude: being ſurrounded by the countries juſt mentioned, the South and North Seas, and the Straits of Magellan, which ſeparate it from the iſland called *Terra del Fuego*, and extend about 116 leagues in length from ſea to ſea, but only from half a league to three or four in breadth.

This country had the name of *Terra Magellanica*, from Ferdinand Magellan, a Portugueſe officer in the ſervice of the Catholic king, who is reported to have ſailed through the ſtraits that alſo bear his name, from the North to the South Sea, in the year 1519.

The lofty mountains of the Andes, which are covered with ſnow a great part of the year, traverſing the country from north to ſouth, the air is ſaid to be much colder than in the north under the ſame parallels of latitude. Towards the north, it is ſaid to be covered with wood, and ſtored with an inexhauſtible fund of large timber; whereas, to the ſouthward, not ſo much as a ſingle tree fit for any mechanical purpoſe is to be ſeen: yet there is good paſture, and incredible numbers of wild horned cattle and horſes, which were firſt brought hither by the Spaniards, and have increaſed amazingly. Freſh water, we are told by ſome writers, is very ſcarce; but if that were really the caſe, it is difficult to conceive how the preſent inhabitants and ſuch multitudes of cattle could ſubſiſt. The eaſt coaſt is moſtly low land, with few or no good harbours: one of the beſt is Port St. Julian.

Patagonia is inhabited by a variety of Indian tribes: as the Patagons, from which the country takes its name; the Pampas, the Coſſares, &c. of whom we know very little. Only it appears from the accounts of former voyagers, lately confirmed by Commodore Byron and his crew, and the teſtimonies of other navigators, that ſome of them are of a gigantic ſtature, and clothed with ſkins; but it would ſeem that there are others who go almoſt quite naked, notwithſtanding the inclemency of the climate. Some of them alſo, that live about the Straits, if we may credit the navigators who have paſſed that way into the South Sea, are perfect ſavages: but thoſe with whom Commodore Byron and his people converſed, are repreſented as of a

more gentle, humane diſpoſition: only, like other ſavages, they live on fiſh and game, and what the earth produces ſpontaneouſly.

The Spaniards once built a fort upon the Straits, and left a garriſon in it, to prevent any other European nation paſſing that way into the South Sea; but moſt of the men periſhed by famine, whence the place obtained the name of *Port Famine*; and no people have attempted to plant colonies here ever ſince.

About the middle of the Strait is a promontory called *Cape Froiſard*, which is the moſt ſouthern on the continent of South America.

On the coaſts of Patagonia lie a great number of iſlands, or cluſters of iſlands. On the weſt coaſts are the iſlands Madre de Dios, Santa Trinidad, Santa Cruz, the iſles of the Chunians and Huillans, the Sarmientos, and many others; to the number of 80 in all, as ſome ſay. Of thoſe on the ſouth coaſt, the moſt conſiderable are *Terra del Fuego*, and *Staten Land*. See thoſe articles.

A vaſt deal has been ſaid reſpecting the extraordinary ſtature of the Patagonians, by people of different nations, and on various occaſions. We ſhall inſert the following letter from Mr. Charles Clarke, who was on board Byron's ſhip in 1764, and gave this account to Dr. Maty.

"We had not got above 10 or 12 leagues into the ſtraits of Magellan, from the Atlantic Ocean, before we ſaw ſeveral people, ſome on horſeback, ſome on foot, upon the north ſhore (continent), and with the help of our glaſſes could perceive them beckoning to us to come on ſhore, and at the ſame time obſerved to each other, that they ſeemed to be of an extraordinary ſize. However, we continued to ſtand on, and ſhould have paſſed without taking the leaſt farther notice of them, could we have proceeded; but our breeze dying away, and the tide making againſt us, we were obliged to anchor; when the Commodore ordered his boat of 12 oars, and another of ſix, to be hoiſted out, manned and armed. In the firſt went the Commodore, in the other Mr. Cummins, our firſt lieutenant, and myſelf. At our firſt leaving the ſhip, their number did not exceed 40; but as we approached the ſhore we perceived them pouring down from all quarters, ſome galloping, others running, all making uſe of their utmoſt expedition. They collected themſelves into a body juſt at the place we ſteered off for. When we had got within 12 or 14 yards of the beach, we found it a diſagreeable flat ſhore, with very large ſtones, which we apprehended would injure the boats; ſo looked at two or three different places to find the moſt convenient for landing. They ſuppoſed we deferred coming on ſhore through apprehenſions of danger from them; upon which they all threw open the ſkins which were over their ſhoulders, which was the only clothing they had, and conſequently the only thing they could ſecrete any kind of arms with, and many of them lay down cloſe to the water's edge.—The Commodore made a motion for them to go a little way from the water, that we might have room to land; which they immediately complied with, and withdrew 30 or 40 yards: we then landed, and formed each man with his muſket, in caſe any violence ſhould be offered. As ſoon as we were formed, the Commodore went from us to them, then at about 20 yards diſtance. They ſeemed vaſtly happy at his going among them, immediately gathered round him, and made a rude kind of noiſe, which I believe was their method of ſinging, as their countenances beſpoke it a ſpecies of jollity. The Commodore then made a motion to them to ſit down; which they did in a circle, with him in the middle; when Mr. Byron took ſome beads and ribbons, which he had brought for that purpoſe, and tied about the women's necks, with which they ſeemed infinitely pleaſed. We were ſtruck with the greateſt aſtoniſhment at the ſight of people of ſuch a gigantic ſtature, notwithſtanding our previous notice with glaſſes from the ſhip. Their body was increaſed by the time we got in there, to the number of 500, men, women and children. The men and women both rode in the ſame manner; the women had a kind of belt to cloſe their ſkins round the waiſt, which the men had not, as theirs were only ſlung over their ſhoulders, and tied with two little ſlips, cut from the ſkin, round the neck. At the time of the Commodore's motion for them to retire farther up the beach, they all diſmounted, and turned their horſes looſe, which were gentle, and ſtood very quietly. The Commodore having diſpoſed of all his preſents, and ſatisfied his curioſity, thought proper to retire; but they were vaſtly anxious to have him go up into the country to eat with them. That they wanted him to go with them to eat, we could very well underſtand by their motion, but their language was wholly unintelligible to us.—There was a very great ſmoke, to which they pointed, about a mile from us, where there muſt have been ſeveral fires; but ſome intervening hills prevented our ſeeing any thing but the ſmoke. The Commodore returned the compliment, by inviting them on board the ſhip; but they would not favour him with their company; ſo we embarked, and returned to the ſhip. We were with them near two hours, at noon-day, within a very few yards, though none had the honour of ſhaking hands but Mr. Byron and Mr. Cummins: however, we were near enough, and long enough with them, to convince our ſenſes, ſo far as not to be cavilled out of the very exiſtence of thoſe ſenſes at that time, which ſome of our countrymen and friends would abſolutely attempt to do. They are of a copper colour, with long black hair, and ſome of them are certainly nine feet, if they do not exceed it. The Commodore, who is very near ſix feet, could but juſt reach the top of one of their heads, which he attempted on tip-toes; and there were ſeveral taller than him, on whom the experiment was tried. They are prodigious ſtout, and as well and as proportionally made as ever I ſaw people in my life. That they have ſome kind of arms among them, is, I think, indiſputable, from their taking methods to convince us they had none at that time about them. The women, I think, bear much the ſame proportion to the men as our Europeans do; there was hardly a man there leſs than eight feet, moſt of them conſiderably more. The women, I believe, run from ſeven and an half to eight feet.—Their horſes were ſtout and bony, but not remarkably tall; they are, in my opinion, from 15 to 15½ hands. They had a great number of dogs, about the ſize of a middling pointer, with a fox noſe. They continued on the beach till we got under way, which was two hours after we got on board. I believe they had ſome expectations of our returning again; but as ſoon as they ſaw us getting off, they betook themſelves to the country.

"The country of Patagonia is rather hilly, though not remarkably ſo. You have here and there a ridge of hills, but no very high ones. We lay ſome time at Port Deſire, which is not a great way to the northward of the Straits, where we traverſed the country many miles round. We found fire-brands in different places, which convinced us there had been people, and we ſuppoſed them to have been the Patagonians. The ſoil is ſandy, produces nothing but a coarſe harſh graſs, and a few ſmall ſhrubs, of which Sir John Narborough remarked, he could not find one of ſize enough to make the helve of a hatchet; which obſervation we found very juſt. It was ſome time in the winter we made this viſit to our gigantic friends. I am debarred being ſo particular as I could wiſh, from the loſs of my journals, which were demanded by their Lordſhips of the admiralty immediately upon our return."

That the whole of this account is true, we cannot aſſert; but that the writer has been miſled in ſome reſpects, and miſinformed with regard to ſome of his facts, is at leaſt probable: for Capt. Wallis, who went out to the Straits of Magellan after Byron's

return, gives a different turn to many of the obſervations; and with reſpect to the ſtature of the people, he differs very materially. We ſhall give the following epitome of his remarks on what occurred to him—He had three ſhips with him, which entered the Straits on the 16th December 1766, and came to an anchor in a bay ſouth of Cape Virgin Mary, where they were immediately accoſted by a whole troop of Patagonians, who made ſigns for them to come on ſhore. The Captain, having made previous diſpoſitions for the ſecurity of his men in caſe of an attack, manned all the boats belonging to the three ſhips, and with a party of marines landed on the beach where thoſe giants had aſſembled. The commanders of the three ſhips, and moſt of their officers, were of this party. On their leaping aſhore, the Indians ſeemed to welcome them; and being by ſigns deſired to retreat, they all fell back, and made room for the marines to form. When they were drawn up, Captain Wallis advanced, and by ſigns directed the Indians to ſeat themſelves in a ſemicircle, which they readily underſtood and obeyed. He then diſtributed among them knives, ſciſſars, buttons, beads, combs, and particularly ribbons, with which he complimented the women, who received them with a mixture of pleaſure and reſpect. He then gave them to underſtand that he had ſtill more valuable articles to beſtow, and ſhowed them axes and bill-hooks; but, at the ſame time, pointed to ſome guanicoes and oſtriches, intimating that he expected ſome of thoſe in return: but they either did not, or would not, underſtand him; ſo that no traffic took place.

The whole company that were aſſembled on this occaſion had each a horſe, with a ſaddle and bridle. The ſaddle had a ſort of ſtirrups, and the bridle was made of thongs of leather very well put together for the purpoſe of guiding the horſes. The women, as well as the men, rode aſtride. The men, in general, wore each a wooden ſpur; but one of them had a large pair of Spaniſh ſpurs, braſs ſtirrups, and a Spaniſh ſcimitar. Their horſes were nimble and ſpirited, but ſmall in proportion to their riders, ſeemingly not above 14 hands high. Their dogs were of the Spaniſh breed. The Captain, having purpoſely provided himſelf with meaſuring-rods, found that the talleſt man among them meaſured only ſix feet ſeven inches high; ſeveral were within an inch or two as tall; but the ordinary ſize was from five feet ten inches to ſix feet. It is pity that none of our voyagers thought of meaſuring the whole ſize of one of thoſe gigantic men. They tell us, indeed, that they are well made, that they are proportionally large, and that they are robuſt and bony; but they give us no criterion to judge of their bulk, nor one inſtance of their extraordinary ſtrength. As they are repreſented not only peaceable, but remarkably tractable, ſome trials might have been made of the weight they could have lifted, and how much they could exceed in that reſpect the ſtrongeſt man in the ſhips. This, in a great meaſure, would have determined the point, which is yet left doubtful by the different relations that are given by the different voyagers who have ſeen theſe people, no two of them agreeing in the ſame deſcription. All agree, however, that their hair is black, and harſh like briſtles; that they are of a dark-copper colour, and that their features are rather handſome than ugly; that they clothe themſelves decently with the ſkins of guanicoes; that they paint themſelves variouſly; and there is reaſon to ſuſpect, that by that variety they diſtinguiſh their tribes. Thoſe ſeen by Commodore Byron were painted round both eyes, no two of them alike; thoſe ſeen by Captain Wallis had only a red circle round the left eye; and thoſe ſeen by Bougainville had no circle round the eyes, but had their cheeks painted red. This may account for the different reports of voyagers concerning their ſtature: it is not impoſſible, nay, it is very probable, that they may vary in this particular, according to their tribes; as is ſeen in the Highlands of Scotland, where the clan of the Campbells is remarkably tall, and another of the Fraſers remarkably ſhort. Were it not for ſome ſuch natural diſcrimination, there could not be ſo wide a difference in the deſcriptions of gentlemen, who, having no ends to ſerve either in falſifying one another's reports, or in impoſing upon the public, cannot be ſuppoſed to miſtake wilfully.

One remarkable obſervation made by our voyagers is, that, though our people could diſtinguiſh but one word of their language, which the Engliſh pronounce *cheerow*, and the French *ſhaeva*, yet the Patagonians could repeat whole ſentences after our men more diſtinctly than almoſt any European foreigner of what nation ſoever. This appears the more ſingular, as, among the iſlanders between the Tropics, it was hardly poſſible to make them articulate any of our words. Sydney Parkinſon, in a ſpecimen he has given us, ſays, that, though the Engliſh remained at Otaheite three months, the neareſt the natives could approach the ſound of *Cooke* was *Toote*; *Banks*, *Opane*; *Solander*, *Tolano*; *Gore*, *Towara*; *Monk-houſe*, *Mata*; and ſo of the reſt: whereas the Patagonians preſently got by heart this ſentence of invitation, *Come aſhore, Engliſhmen!* which they ſhowed they well underſtood, by repeating it afterwards whenever the ſhips came ſo near the ſhore as to be within call.

Another very remarkable particular is, that they had none of the characters of a ferocious people; there was no offenſive weapon among them, except the ſcimitar already mentioned. The men, indeed, had a kind of ſling, which they uſe in hunting, conſiſting of two round ſtones of about a pound weight each, connected together by a thong. Theſe ſtones were faſtened to the extremities of the thong; and, when they threw them, they held one ſtone in the hand, and ſwung the other about the head. "They are ſo expert in the management of this double-headed ſhot (ſays the writer of the voyage), that they will hit a mark not bigger than a ſhilling with both theſe ſtones at the diſtance of fifteen yards; but their method of availing themſelves of their dexterity againſt the guanicoe and oſtrich is, to ſling the ſtones ſo as to entangle their legs, by which means they are retarded in their flight, and eaſily overtaken. Bougainville ſpeaks of theſe ſlings as common among other Indian nations in South America; but we do not remember to have ſeen this aſſertion confirmed by any other voyager.

Theſe people certainly dreſs differently as well as paint differently; for the dreſs deſcribed by Bougainville is very unlike the dreſs of thoſe ſeen by the Engliſh voyagers. Captain Wallis invited ſome of them on board his ſhip: but, among all the wonders that were ſhown them, none ſeemed to attract their notice ſo much as the looking-glaſſes: they looked in the glaſſes and at each other; they laughed and gazed, and gazed again and laughed; in ſhort, there was no end to their merriment when in poſſeſſion of this article of curioſity. They ate whatever was given them, but would drink nothing but water. In this they differ from all the tribes of Indians in North America, who are immoderately fond of ſpirituous liquors. They admired the European ſheep, hogs, and poultry; but did not ſeem over-deſirous of any thing they ſaw except clothes. When the marines were exerciſed to entertain them, they appeared diſconcerted; an old man among them made ſigns, by ſtriking his breaſt, and tumbling down and lying as if he had been dead upon deck, that he knew the effect of their guns; and none of them ſeemed eaſy till the firing was over. When the Captain had ſatisfied his own curioſity, and, as he imagined, theirs, he gave them to underſtand, that he was going to ſail, and that they muſt depart; which they were very unwilling to do. However, having given each of them a canvas bag, with ſome needles ready threaded, a knife, a pair of ſciſſars, a few beads, a comb, and a looking-glaſs, he

diſmiſſed them, with great reluctance on their part, particularly on that of the old man, who by very ſignificant ſigns expreſſed his deſire to ſtay till ſunſet.

PATAGONULA, in botany; a genus of the monogynia order, and of the pentandria claſs of plants. The characters are theſe: the cup is an extremely ſmall perianthium, divided into five ſegments, and remains after the flower is fallen; the flower conſiſts of a ſingle petal, with almoſt no tube, the margin of which is divided into five acute oval ſegments; the ſtamina are five filaments of the length of the flower; the antheræ ſimple; the germen of the piſtil is oval and pointed; the ſtyle is ſlender and ſlightly bifid, its ramifications are alſo bifid; this is of the ſame length with the ſtamina, and remains when the flower is fallen; the ſtigmata are ſimple; the fruit is an oval and pointed capſule, ſtanding on a large cup, made up of five long ſegments emarginated or rimmed round their edges; the ſeeds of this plant are yet unknown; but the conſtruction of the cup, in which the capſule ſtands, is alone a ſufficient diſtinction for this genus. There is but a ſingle ſpecies.

PATAN, a kingdom of Aſia, in the Eaſt Indies, and in the peninſula of Malacca, and on the eaſtern coaſt between the kingdoms of Siam and Paha. The inhabitants are partly Mahometans and partly Gentoos; but they are all very voluptuous. The air is wholeſome, though very hot; and they have no ſeaſons but the winter and ſummer. The former is more properly the rainy ſeaſon; and contains the months of November, December, and January. The woods are full of elephants and many wild animals. Some voyagers pretend that this country is governed by a queen, who never marries, but may have as many gallants as ſhe pleaſes. They have ſome trade with the Chineſe; and the principal town is of the ſame name, which is one of the ſtrongeſt in theſe parts, having a well-defended harbour.

Patan, a town of Aſia, and capital of a province of the ſame name, in the dominions of the Great Mogul; it is very little known. E. lon. 109. 0. N. lat. 27. 30.

PATAVINITY, among critics, denotes a peculiarity of Livy's diction; derived from Patavium or Padua, the place of his nativity; but wherein this patavinity conſiſts, they are by no means agreed. Aſinius Pollio, according to Quintilian, taxed Livy with patavinity. But what he meant by this cenſure we believe no man can ſay. Morhof believes it to be a ſingular turn of expreſſion, and ſome phraſes peculiar to the Padueſe. All we certainly know about it is, that it was a fault in the language of Livy, not in the ſentiments or manner. In all probability, it is one of thoſe delicacies that are loſt in a dead language. Dan. Georg. Morhof publiſhed a treatiſe *De Patavinitate Liviana*, at Kiel, in 1685, where he explains, very learnedly, the urbanity and peregrinity of the Latin tongue.

PATARA, (Livy, Mela); the capital of Lycia, to the eaſt of the mouth of the river Xanthus, famous for a temple and oracle of Apollo, thence called *Patareus*, three ſyllables only; but *Pataræus*, (Horace). For the ſix winter months, Apollo gave anſwers at Patara; and for the ſix ſummer at Delos, (Virgil, Servius): theſe are the *Lyciæ Sortes* of Virgil. The town was ſituated in a peninſula, called *Lyciorum Cherſoneſus*, (Stephanus). Acts xxi. 1. St. Paul, in his paſſage from Philippi to Jeruſalem, came to Miletus, hence to Coos, then to Rhodes, and from Rhodes to Patara; where having found a ſhip that was bound for Phœnicia, he went on board and arrived at Jeruſalem, to be at the feaſt of Pentecoſt.

PATAVIUM (Tacitus, Strabo), a town of the Tranſpadana, ſituated on the left or north bank of the Medoacus Minor; founded by Antenor the Trojan, (Mela, Virgil, Seneca); *Patavini*, the people, (Livy); who himſelf was a native, and by Aſinius Pollio charged with patavinity. Now *Padua*, in the territory and to the weſt of Venice. E. lon. 12. 15. N. lat. 45. 30.

PATAY, a town of France, in the department of Loiret and late province of Orleanois, remarkable for the defeat of the Engliſh in 1429, by Joan of Arc. It is 15 miles N. W. of Orleans. E. lon. 1. 49. N. lat. 48. 5.

PATE, in fortification, a kind of platform, reſembling what is called an *horſe's ſhoe*.

PATEE, or Pattee, in heraldry, a croſs, ſmall in the centre, and widening to the extremities, which are very broad.

PATELLA, or Knee-pan, in anatomy. See Anatomy.

Patella, or Limpet, a genus of inſects belonging to the order of vermes teſtacea; the animal being of the ſnail kind. The ſhells are of that claſs which is called *univalves*; they have no *contour*, and are in the form of little pointed cones. They are always attached to ſome hard body. Their ſummit is ſometimes acute, ſometimes obtuſe, flatted, turned back, or perforated. The rock or other hard body to which they are always found adhering, ſerves as a kind of ſecond or under ſhell to preſerve them from injury; and for this reaſon Aldrovandus and Rondelet have claſſed them among the bivalves; but in this error they have not been followed by any other writer. Fabius Columna diſtinguiſhes four ſorts of the lepas or limpets: *Lepas vulgaris*, a ſort very common at Naples, of an oval figure and aſh colour. *Lepas major exotica*, which comes from Spain; the ſhell is hard, thick, and ribbed in angles, and the rim is denticulated. The *lepas agrea*, or *ſylveſtris*, which is a ſmall ſhell, irregularly oval, of an aſh colour, marked with radii and zones croſſing each other, and perforated at the top by an aperture which ſerves the fiſh for a vent. And the *patella regalis, quia regis menſa ſit digna*; this is of a mother-of-pearl colour within, and is ribbed and perforated in many places: theſe ſhells have been found on the back of the ſea-tortoiſe, or turtle, and on a large pinna marina. The diſtinguiſhing mark or characteriſtic of the lepas is to have but one convex ſhell, which adheres by its rim to a rock, or ſome other hard ſubſtance. There are 36 ſpecies of this genus, which are principally diſtinguiſhed by peculiarities in their ſhells. Of ſome of theſe ſhells we have given engravings in Plate 30, of which we add the following deſcription:

The limpet marked 1. has large yellow furrows and ridges from the centre to the circumference, which is indented; the eye is perfectly white, and ſhaped like a nipple. That marked 2. is perfectly ſmooth, but radiated with brown ſtreaks, and perforated in the ſummit. Fig. 3. is ribbed, and indented at the circumference; its coat is ſpotted with brown, in a zig-zag form, and its eye is of a ruby colour. Fig. 4. is a ſmall brown ſhell, the ribs or ſtriæ of which are armed with ſmall white points. Fig. 5. is ſtriated with radii, reaching from the eye to the circumference, which are croſſed by other ſtreaks nearly parallel to the circumference; it is of the uſual colour, and its eye is perforated. 6. This is white, ſhaped ſomething like an hand-bell, and has within a protuberance ſomewhat reſembling a clapper. Fig. 7. is a ſeven-ſided limpet, divided at each angle by ridges from the ſummit, which form a ſtar on a white ground, variegated with black ſpots. Fig. 8. is a ſmall ribbed ſhell, of a brown colour, and rough; it has a chamber, and a beak-faſhioned eye placed at one of its extremities. Fig. 9. is the fineſt ſhell of this ſpecies: its ſize, the fine mother-of pearl colour on the inſide, and the beauty of its red ſpots without, which have the appearance of tortoiſe-ſhell, give it the pre-eminence over all others. It is called the *Tortoiſe-ſhell buckler*.

The wild limpet, or *patella fera*, is a name very improperly applied by Rondeletius and Aldrovand to the *aures marinæ*, or *concha veneris*, which certainly is not of the patella kind.

Patella, in the Hiſtory of Inſects, a name given by Liſter and other authors to a little huſk or ſhell, found on the bark of

the cherry, plum, roſe, and other trees, containing an animal within, and uſeful in colouring. Theſe patellæ are of the form of globes, except when they adhere to the tree, and are for the moſt part of a ſhining cheſnut colour. The huſk itſelf ſtrikes a very fine crimſon colour on paper, and within it is found a white maggot which is of no value; this, in time, hatches into a very ſmall but beautiful bee. The ſize of this bee is about half that of an ant. They have a ſting like bees, and three ſpots placed in a triangle on the forehead, which are ſuppoſed to be eyes. They are of a black colour, and have a large round whitiſh or pale yellow ſpot on the back. The upper pair of wings are ſhaded and ſpotted, but the under pair are clear. It might be worth while to try the ſhells or huſks in order to diſcover whether the colour they yield might not be uſeful. It is to be remarked, that the deepeſt-coloured huſks afford the fineſt and deepeſt purple: they muſt be uſed while the animal in them is in the maggot form; for, when it is changed into the bee ſtate, the ſhell is dry and colourleſs. Liſter, who firſt obſerved theſe patellæ, went ſo far, on comparing them with the common kermes, as to aſſert that they were of the ſame nature with that production: but his account of their being the workmanſhip of a bee, to preſerve her young maggot in, is not agreeable to the true hiſtory of the kermes; for that is an inſect of a very peculiar kind. He has in other inſtances been too juſtly cenſured for his precipitancy of judging of things, and perhaps has fallen into an error by means of it here. It is very poſſible that theſe patellæ may be the ſame ſort of animals with the kermes, but then it produces its young within this ſhell or huſk, which is no other than the ſkin of the body of the mother animal; but as there are many flies whoſe worms or maggots are lodged in the bodies of other animals, it may be that this little bee may love to lay its egg in the body of the proper inſect, and the maggot hatched from that egg may eat up the proper progeny, and, undergoing its own natural changes there, iſſue out at length in form of the bee. This may have been the caſe in ſome few which Dr. Liſter examined: and he may have been miſled by this to ſuppoſe it the natural change of the inſect.

PATENT, in general, denotes ſomething that ſtands open or expanded: thus a leaf is ſaid to be patent, when it ſtands almoſt at right angles with the ſtalk.

PATENT, or *Letters Patent*. See LETTER.

PATER-NOSTER, the *Lord's Prayer*, ſo called from the two firſt words thereof in Latin.

PATER-NOSTER, iſlands of Aſia, in the Eaſt Indian ſea, ſo called becauſe of the great number of rocks, which ſailors have likened to the beads with which the Papiſts tell their paternoſter. They abound in corn and fruits, and are very populous.

PATER *Patratus*, was the name of the firſt and principal perſon of the college of heralds called *Fetiales*. Some ſay the Pater Patratus was a conſtant officer and perpetual chief of that body; and others ſuppoſe him to have been a temporary miniſter, elected upon account of making peace or denouncing war, which were both done by him. See FECIALES.

PATERA, among antiquaries, a goblet or veſſel uſed by the Romans in their ſacrifices; wherein they offered their conſecrated meats to the gods, and wherewith they made libations. See SACRIFICE and LIBATION. The word is Latin, formed from *pateo*, "I am open;" *quod pateat*, "becauſe it has a great aperture;" in contradiſtinction to bottles, &c. which have only narrow necks, or whoſe aperture is leſs than the body of the veſſel.

On medals the patera is ſeen in the hands of ſeveral deities, and frequently in the hands of princes, to mark the ſacerdotal authority joined with the imperial, &c. Hence F. Joubert obſerves, that, beſide the patera, there is frequently an altar upon which the patera ſeems to be pouring its contents. The patera was of gold, ſilver, marble, braſs, glaſs, or earth; and they uſed to inclole it in urns with the aſhes of the deceaſed, after it had ſerved for the libations of the wine and liquors at the funeral. The patera is an ornament in architecture, frequently ſeen in the Doric frieze, and the tympans of arches; and they are ſometimes uſed by themſelves, to ornament a ſpace; and in this caſe it is common to hang a ſtring of huſks or drapery over them: ſometimes they are much enriched with foliage, and have a mask or a head in the centre.

PATERCULUS (CAIUS VELLEIUS), an ancient Roman hiſtorian, who flouriſhed in the reign of Tiberius Cæſar, was born in the year of Rome 735. His anceſtors were illuſtrious for their merit and their offices. His grandfather eſpouſed the party of Tiberius Nero, the emperor's father; but being old and infirm, and not able to accompany Nero when he retired from Naples, he ran himſelf through with his ſword. His father was a ſoldier of rank, and ſo was Paterculus himſelf. He was a military tribune when Caius Cæſar, a grandſon of Auguſtus, had an interview with the king of the Parthians, in an iſland of the river Euphrates, in the year 753. He commanded the cavalry in Germany under Tiberius; and accompanied that prince for nine years ſucceſſively in all his expeditions. He received honourable rewards from him; but we do not find that he was preferred to any higher dignity than the prætorſhip. The praiſes he beſtows upon Sejanus give ſome probability to the conjecture, that he was looked upon as a friend of this favourite, and conſequently that he was involved in his ruin. His death is placed by Mr. Dodwell in the year of Rome 784, when he was in his 50th year.

He wrote an Abridgement of the Roman Hiſtory in two books, which is very curious. His purpoſe was only to deduce things from the foundation of Rome to the time wherein he lived; but he began his work with things previous to that memorable era: for, though the beginning of his firſt book is wanting, we yet find in what remains of it, an account of many cities more ancient than Rome. He promiſed a larger hiſtory; and no doubt would have executed it well: for during his military expeditions he had ſeen, as he tells us, the provinces of Thrace, Macedonia, Achaia, Aſia Minor, and other more eaſterly regions; eſpecially upon the ſhores of the Euxine ſea, which had furniſhed his mind with much entertaining and uſeful knowledge. In the Abridgement which we have, many particulars are related that are nowhere elſe to be found; and this makes it the more valuable. The ſtyle of Paterculus, though miſerably diſguiſed through the careleſſneſs of tranſcribers, and impoſſible to be reſtored to purity for want of manuſcripts, is yet manifeſtly worthy of his age, which was the time of pure Latinity. The greateſt excellence of this hiſtorian lies in his manner of commending and blaming thoſe he ſpeaks of; which he does in the fineſt terms and moſt delicate expreſſions. He is, however, condemned, and indeed with the greateſt reaſon, for his partiality to the houſe of Auguſtus; and for making the moſt extravagant eulogies, not only upon Tiberius, but even upon his favourite *Sejanus*: whom, though a vile and cruel monſter, Paterculus celebrates as one of the moſt excellent perſons the Roman commonwealth had produced. Lipſius, though he praiſes him in other reſpects, yet cenſures him moſt ſeverely for his inſincerity and partiality. "Velleius Paterculus (ſays he) raiſes my indignation: he repreſents Sejanus as endowed with all good qualities. The impudence of this hiſtorian! But we know that he was born, and died, to the deſtruction of mankind. After many commendations, he concludes, that Livia was a woman more reſembling the gods than men: and as to Tiberius, he thinks it a crime to ſpeak otherwiſe of him than as of an immortal Jove. What ſincere and honeſt mind can bear this? On the other hand, how artfully does he every where conceal the great qualities of Cæſar Germanicus! how obliquely does he ruin the reputation of Agrippina and others, whom Tiberius was thought to hate! In ſhort, he is nothing but a

court proſtitute. You will ſay, perhaps, it was unſafe to ſpeak the truth at thoſe times: I grant it; but if he could not write the truth, he ought not to have written lies: none are called to account for ſilence." La Mothe le Vayer has made a very juſt remark upon this occaſion: "The ſame fault (ſays he) may be obſerved in many others, who have written the hiſtory of their own times, with a deſign to be publiſhed while they lived."

It is ſtrange, that a work ſo elegant and worthy to be preſerved, and of which, by reaſon of its ſhortneſs, copies might be ſo eaſily taken, ſhould have been ſo near being loſt. One manuſcript only has had the luck to be found, as well of this author among the Latins as of Heſychius among the Greeks: in which, ſays a great critic of our own nation, "the faults of the ſcribes are found ſo numerous, and the defects ſo beyond all redreſs, that, notwithſtanding the pains of the learned and moſt acute critics for two whole centuries, theſe books ſtill are, and are like to continue, a mere heap of errors." No ancient author but Priſcian makes mention of Paterculus: the moderns have done him infinitely more juſtice, and have illuſtrated him with notes and commentaries. He was firſt publiſhed, from the manuſcript of Morbac, by Rhenanus, at Baſil in 1520; afterwards by Lipſius, at Leyden in 1581; then by Gerard Voſſius in 1639; next by Boeclerus at Straſburg in 1642; then by Thyſius and others; and, laſtly, by Peter Burman at Leyden, 1719, in 8vo. To the Oxford edition in 1693, 8vo, were prefixed the *Annales Velleiani* of Mr. Dodwell, which ſhow deep learning and a great knowledge of antiquity.

PATH, in general, denotes the courſe or track marked out or run over by a body in motion. For the path of the moon, &c. See ASTRONOMY.

PATHETIC, whatever relates to the paſſions, or that is proper to excite or awake them. The word comes from the Greek *παθος*, *paſſion* or *emotion*. See PASSION.

PATHETIC, in muſic, ſomething very moving, expreſſive, or paſſionate; capable of exciting pity, compaſſion, anger, or other paſſions. Thus we ſpeak of the pathetic ſtyle, a pathetic figure, pathetic ſong, &c. The chromatic genus, with its greater and leſſer ſemitones, either aſcending or deſcending, is very proper for the pathetic; as is alſo an artful management of diſcords; with a variety of motions, now briſk, now languiſhing, now ſwift, now ſlow. Nieuwentyt ſpeaks of a muſician at Venice who ſo excelled in the pathetic, that he was able to play any of his auditors into diſtraction: he ſays alſo, that the great means he made uſe of was the variety of motions, &c.

PATHOGNOMONIC, among phyſicians, an appellation for a ſymptom, or concourſe of ſymptoms, that are inſeparable from a diſtemper, and are found in that only, and in no other.

PATHOLOGY, that part of medicine which explains the nature of diſeaſes, their cauſes and ſymptoms. See MEDICINE.

PATHOS, a Greek term, literally ſignifying paſſion.

PATHROS, a city and canton of Egypt, of which the prophets Jeremiah and Ezekiel make mention; Jerem. xliv. 1. 15. Ezek. xxix. 14. xxx. 14. We do not very well know its ſituation, though Pliny and Ptolemy the geographer ſpeak of it by the name of Phaturis; and it appears to have been in Upper Egypt. Iſaiah (xii. 2.) calls it Pathros; and it is the country of the Pathruſim, the poſterity of Mizraim, of whom Moſes ſpeaks, Gen. x. 14. Ezekiel threatens them with an entire ruin. The Jews retired thither notwithſtanding the remonſtrances of Jeremiah; and the Lord ſays by Iſaiah, that he will bring them back from thence.

PATIGUMO (a corruption of the words *pate-de-guimauve*); the name of a ſort of paſte or cakes much uſed on the continent as an agreeable and uſeful remedy for catarrhal defluxions, and ſuppoſed by Dr. Percival to conſiſt of gum-arabic combined with ſugar and the whites of eggs. But we have been informed that the powdered ſubſtance of the marſhmallow is the chief ingredient of the compoſition.

PATIN (GUY), profeſſor of phyſic in the royal college of Paris, was born in 1602. He made his way into the world merely by the force of his genius, being at firſt corrector of a printing-houſe. He was a man of great wit and erudition: he ſpoke with the gravity of a Stoic, but his expreſſions were very ſatirical. He hated bigotry, ſuperſtition, and knavery; had an upright ſoul, and a well-diſpoſed heart. He was a moſt tender father, courteous to every body, and polite in the higheſt degree. He died in 1672, and did not owe his reputation to any writings publiſhed in his lifetime upon phyſic; but his letters which appeared after his death have rendered his name very famous. He left a ſon mentioned in the enſuing article.

PATIN (Charles), who made a great figure in the world, and excelled in the knowledge of medals. He was born in Paris in 1633; and made ſo ſurpriſing a progreſs, that he maintained theſes in Greek and Latin, on all parts of philoſophy, in 1647. He ſtudied the law in compliance to an uncle, and was admitted an advocate in the parliament of Paris; but could not lay aſide that of phyſic, for which he always had an inclination. He therefore quitted the law, and devoted himſelf to phyſic: in which, after taking the doctor's degree, he applied himſelf to practice with great ſucceſs. He afterwards travelled into Germany, Holland, England, Switzerland and Italy. In 1676 he was appointed profeſſor of phyſic in Padua; and three years after was created a knight of St. Mark. He died in that city in 1694. His works are many, and well known to the learned world. His wife too, and his daughters, were authoreſſes.

PATMOS (anc. geog.), one of the Sporades (Dionyſius); 30 miles in compaſs (Pliny); concerning which we read very little in authors. It was rendered famous by the exile of St. John and the Revelation ſhowed him there. The greateſt part of interpreters think that St. John wrote them in the ſame place during the two years of his exile; but others think that he did not commit them to writing till after his return to Epheſus. The iſland of Patmos is between the iſland of Icaria and the promontory of Miletus. Nothing has done it more honour than to have been the place of the baniſhment of St. John. It is now called *Patino*, or *Pactino*, or *Patmol*, or *Palmoſa*. Its circuit is five-and-twenty or thirty miles. It has a city called *Patmos*, with a harbour, and ſome monaſteries of Greek monks. It is at preſent in the hands of the Turks. It is conſiderable for its harbours; but the inhabitants derive little benefit from them, becauſe the corſairs have obliged them to quit the town and retire to a hill on which St. John's convent ſtands. This convent is a citadel conſiſting of ſeveral irregular towers, and is a ſubſtantial building ſeated on a very ſteep rock. The whole iſland is very barren, and without wood; however, it abounds with partridges, rabbits, quails, turtles, pigeons, and ſnipes. All their corn does not amount to 1000 barrels in a year. In the whole iſland there are ſcarce 300 men: but there are above 20 women to one man, who expect that all ſtrangers who land in the iſland ſhould carry ſome of them away. To the memory of St. John is an hermitage on the ſide of a mountain, where there is a chapel not above eight paces long and five broad. Overhead they ſhow a chink in the rock, through which they pretend that the Holy Ghoſt dictated to St. John. E. lon. 26. 24. N. lat. 37. 24.

PATNA, a town of Aſia, in the dominions of the Great Mogul, to the north of the kingdom of Bengal, where the Engliſh have factories for ſaltpetre, borax, and raw ſilk. It is the capital of the province of Bahar, a dependency of Bengal, in the empire of Indoſtan, ſituated in a pleaſant country, 400 miles eaſt of Agra. It extends ſeven miles in length on the banks of the Ganges, and is about half a mile in breadth.

Mr. Rennel gives ſtrong reaſons for ſuppoſing it to be the ancient PALIBOTHRA. The town is large and populous, but the houſes are built at a diſtance from each other. E. lon. 85. 40. N. lat. 45. 25.

PATOMACK, a large river of North America, in Virginia, which riſes in the Alleghany mountains, ſeparates Virginia from Maryland, and falls into Cheſapeak bay. It is about ſeven miles broad, and is navigable for near 200 miles.

PATONCE, in heraldry, is a croſs, flory at the ends; from which it differs only in this, that the ends, inſtead of turning down like a fleur-de-lis, are extended ſomewhat in the pattee form. See FLORY.

PATRÆ, a city of Achaia. This place was viſited by Dr. Chandler, who gives the following account of it: "It has been often attacked by enemies, taken, and pillaged. It is a conſiderable town, at a diſtance from the ſea, ſituated on the ſide of a hill, which has its ſummit crowned with a ruinous caſtle. This made a brave defence in 1447 againſt Sultan Morat, and held out until the peace was concluded, which firſt rendered the Morea tributary to the Turks. A dry flat before it was once the port, which has been choked with mud. It has now, as in the time of Strabo, only an indifferent road for veſſels. The houſe of Nicholas Paul, Eſq. the Engliſh conſul, ſtood on part of the wall either of the theatre or the odeum. By a fountain was a fragment of a Latin inſcription. We ſaw alſo a large marble buſt much defaced; and the French conſul ſhowed us a collection of medals. We found nothing remarkable in the citadel. It is a place of ſome trade, and is inhabited by Jews as well as by Turks and Greeks. The latter have ſeveral churches. One is dedicated to St. Andrew the apoſtle, who ſuffered martyrdom there, and is of great ſanctity. It had been recently repaired. The ſite by the ſea is ſuppoſed that of the temple of Ceres. By it is a fountain. The air is bad, and the country round about overrun with the low ſhrub called *glycyrrhiza* or liquorice."

Of its ancient ſtate, the ſame author ſpeaks thus: "Patræ aſſiſted the Ætolians when invaded by the Gauls under Brennus; but afterwards was unfortunate, reduced to extreme poverty, and almoſt abandoned. Auguſtus Cæſar reunited the ſcattered citizens, and made it a Roman colony, ſettling a portion of the troops which obtained the victory of Actium, with other inhabitants from the adjacent places. Patræ reflouriſhed and enjoyed dominion over Naupactus, Œanthea, and ſeveral cities of Achaia. In the time of Pauſanias, Patræ was adorned with temples and porticoes, a theatre, and an odéum which was ſuperior to any in Greece but that of Atticus Herodes at Athens. In the lower part of the city was a temple of Bacchus Æſymnetes, in which was an image preſerved in a cheſt, and conveyed, it was ſaid, from Troy by Eurypylus; who, on opening it, became diſordered in his ſenſes. By the port were temples; and by the ſea, one of Ceres, with a pleaſant grove and a prophetic fountain of unerring veracity in determining the event of any illneſs. After ſupplicating the goddeſs with incenſe, the ſick perſon appeared, dead or living, in a mirror ſuſpended ſo as to touch the ſurface of the water. In the citadel of Patræ was a temple of Diana Laphria, with her ſtatue, in the habit of a huntreſs, of ivory and gold, given by Auguſtus Cæſar when he laid waſte Calydon and the cities of Ætolia to people Nicopolis. The Patrenſians honoured her with a yearly feſtival, which is deſcribed by Pauſanias, who was a ſpectator. They formed a circle round the altar with pieces of green wood, each 16 cubits long, and within heaped dry fuel. The ſolemnity began with a moſt magnificent proceſſion, which was cloſed by the virgin-prieſteſs in a chariot drawn by ſtags. On the following day, the city and private perſons offered at the altar fruits, and birds, and all kinds of victims, wild-boars, ſtags, deer, young wolves, and beaſts full grown; after which the fire was kindled. He relates, that a bear and another animal forced a way through the fence, but were reconducted to the pile. It was not remembered that any wound had ever been received at this ceremony, though the ſpectacle and ſacrifice were as dangerous as ſavage. The number of women at Patræ was double that of the men. They were employed chiefly in a manufacture of flax which grew in Elis, weaving garments, and attire for the head."

PATRANA, or PASTRANA, a town of New Caſtile in Spain, with the title of a duchy. It is ſeated between the rivers Tajo and Tajuna, in W. lon. 2. 45. N. lat. 40. 26.

PATRAS, an ancient and flouriſhing town of European Turkey, in the Morea, capital of a duchy, with a Greek archbiſhop's ſee. It is pretty large and populous; and the Jews, who are one-third part of the inhabitants, have four ſynagogues. There are ſeveral handſome moſques and Greek churches. The Jews carry on a great trade in ſilk, leather, honey, wax, and cheeſe. There are cypreſs trees of a prodigious height, and excellent pomegranates, citrons, and oranges. It has been ſeveral times taken and retaken, and it is juſt now in the hands of the Turks. It is ſeated in E. lon. 21. 45. N. lat. 38. 17.

PATRICA, a town of Italy, in the territory of the church, and in the Campagna of Rome, towards the ſea-coaſt, and eight miles eaſt of Oſtia. About a mile from this place is a hill called *Monte de Livano*, which ſome have thought to be the ancient Lavinium founded by Æneas.

PATRES CONSCRIPTI. See CONSCRIPT and SENATOR.

PATRIARCH, PATRIARCHA, one of thoſe firſt fathers who lived towards the beginning of the world, and who became famous by their long lines of deſcendants. Abraham, Iſaac, and Jacob, and his twelve ſons, are the patriarchs of the Old Teſtament; Seth, Enoch, &c. were antediluvian patriarchs.

The authority of patriarchal government exiſted in the fathers of families, and their firſt-born after them, exerciſing all kinds of eccleſiaſtical and civil authority in their reſpective houſeholds; and to this government, which laſted till the time of the Iſraelites dwelling in Egypt, ſome have aſcribed an abſolute and deſpotic power, extending even to the puniſhment by death. In proof of this, is produced the curſe pronounced by Noah upon Canaan (Gen. ix. 25.); but it muſt be obſerved, that in this affair Noah ſeems to have acted rather as a prophet than as a patriarch. Another inſtance of ſuppoſed deſpotic power is Abraham's turning Hagar and Iſhmael out of his family (Gen. xxi. 9, &c.); but this can hardly be thought to furniſh evidence of any ſingular authority veſted in the patriarchs, as ſuch, and peculiar to thoſe ages. The third inſtance brought forward to the ſame purpoſe is that of Jacob's denouncing a curſe upon Simeon and Levi (Gen. xlix. 7.), which is maintained by others to be an inſtance of prophetic inſpiration more than of patriarchal power. The fourth inſtance is that of Judah, with regard to Tamar (Gen. xxxviii. 24.); with regard to which it is remarked, that Jacob, the father of Judah, was ſtill living; that Tamar was not one of his own family; and that ſhe had been guilty of adultery, the puniſhment of which was death by burning; and that Judah on this occaſion might ſpeak only as a proſecutor.

On the whole, however, it is difficult to ſay which of theſe opinions are moſt agreeable to truth. Men who believe the origin of civil government, and the obligation to obedience, to ariſe from a ſuppoſed original contract, either real or implied, will be naturally led to weaken the authority of the patriarchs: and thoſe again who eſteem government to be a divine inſtitution, will be as apt to raiſe that authority to the higheſt pitch that either reaſon or ſcripture will permit them. It cannot be denied, that authority exiſted in fathers, and deſcended to their firſt-born, in the firſt ages of the world; and it is neither un-

natural nor improbable to imagine, that the idea of hereditary power and hereditary honours was firſt taken from this circumſtance. But whether authority has deſcended through father and ſon in this way to our times, is a circumſtance that cannot in one inſtance be aſſerted, and can be denied in a thouſand. The real ſource of the dignity and of the authority of modern times ſeems to have been, ſkill in the art of war, and ſucceſs in the conduct of conqueſts.

Jewiſh PATRIARCH, a dignity, reſpecting the origin of which there are a variety of opinions. The learned authors of the Univerſal Hiſtory think, that the firſt appearance and inſtitution of thoſe patriarchs happened under Nerva the ſucceſſor of Domitian. It ſeems probable that the patriarchs were of the Aaronic or Levitical race; the tribe of Judah being at that time too much depreſſed, and too obnoxious to the Romans to be able to aſſume any external power. But of whatever tribe they were, their authority came to be very conſiderable. Their principal buſineſs was to inſtruct the people; and for this purpoſe they inſtituted ſchools in ſeveral cities. And having gained great reputation for their extraordinary learning, zeal, and piety, they might, in time, not only bring a great concourſe of other Jews from other parts, as from Egypt and other weſtern provinces of their diſperſion, but likewiſe prove the means of their patriarchal authority's being acknowledged there. From them they ventured at length to levy a kind of tribute, in order to defray the charges of their dignity, and of the officers (called APOSTOLI or LEGATI) under them, whoſe buſineſs it was to carry their orders and deciſions through the other provinces of their diſperſion, and to ſee them punctually executed by all, that ſome ſhadow of union at leaſt might be kept up among the weſtern Jews. They likewiſe nominated the doctors who were to preſide over their ſchools and academies; and theſe were in proceſs of time ſtyled *chiefs* and *princes*, in order to raiſe the credit of that dignity, or to imply the great regard which their diſciples were to pay to them. Theſe chiefs became at length rivals of the patriarchs; and ſome of them poſſeſſed both dignities at once; an uſurpation which cauſed not only great confuſion amongſt them, but oftentimes very violent and bloody conteſts. However, as the Jewiſh Rabbis have trumped up a much older æra for this patriarchal dignity, and have given us a ſucceſſion of them down to the fifth century, in which it was aboliſhed, it will not be amiſs to give our readers the ſubſtance of what they have written of the riſe and progreſs of this order of men; and at the ſame time to ſhew them the abſurdity and falſehood of that pretended ſucceſſion to this imaginary dignity.

According to them, the firſt patriarch was Hillel, ſurnamed the *Babylonian*, becauſe he was ſent for from thence to Jeruſalem about 100 years before the ruin of their capital, or 30 years before the birth of Chriſt, to decide a diſpute about the keeping of Eaſter, which on that year fell out on the Sabbath-day; and it was on account of his wiſe deciſion that he was raiſed to that dignity, which continued in his family till the ſaid fifth century. He was likewiſe looked upon as a ſecond Moſes, becauſe he lived like him 40 years in obſcurity, 40 more in great reputation for learning and ſanctity, and 40 more in poſſeſſion of this patriarchal dignity. They make him little inferior to that law-giver in other of his excellencies, as well as in the great authority he gained over the whole Jewiſh nation. The wonder will be, how Herod the Great, who was ſo jealous of his own power, could ſuffer a ſtranger to be raiſed to ſuch a height of it, barely for having decided a diſpute which muſt in all likelihood have been adjudged by others long before that time.

However, Hillel was ſucceeded by his ſon Simeon, whom many Chriſtians pretend to have been the venerable old perſon of that name, who received the divine infant in his arms. The Jews give him but a very obſcure patriarchate; though the authors above quoted make him, moreover, chief of the ſanhedrim; and Epiphanius ſays, that the prieſtly tribe hated him ſo much for giving ſo ample a teſtimony to the divine child, that they denied him common burial. But it is hardly credible that St. Luke ſhould have ſo careleſsly paſſed over his two-fold dignity, if he had been really poſſeſſed of them, and have given him no higher title than that of a juſt and devout man.

He was ſucceeded by Jochanan, not in right of deſcent, but of his extraordinary merit, which the Rabbis, according to cuſtom, have raiſed to ſo ſurpriſing a height, that, according to them, if the whole heavens were paper, all the trees in the world pens, and all the men writers, they would not ſuffice to pen down all his leſſons. He enjoyed his dignity but two years, according to ſome, or five according to others; and was the perſon who, obſerving the gates of the temple to open of their own accord, cried out, "O temple, temple! why art thou thus moved? We know that thou art to be deſtroyed, ſeeing Zechariah hath foretold it, ſaying, Open thy gates, O Lebanus, and let the flames conſume thy cedars." Upon this he is further reported to have complimented Veſpaſian, or rather, as ſome have corrected the ſtory, Titus, with the title of *king*, aſſuring him that it was a royal perſon who was to deſtroy that edifice; on which account they pretend that general gave him leave to remove the ſanhedrim to Japhne.

The Jewiſh writers add, that he likewiſe erected an academy there, which ſubſiſted till the death of Akiba; and was likewiſe the ſeat of the patriarch; that it conſiſted of 300 ſchools, or claſſes of ſcholars. Another he erected at Lydda, not far from Japhne, and where the Chriſtians have buried their famed St. George. He lived 120 years, and being aſked, what he had done to prolong his life? he gave this wiſe anſwer: I never made water nearer a houſe of prayer than four cubits: I never diſguiſed my name: I have taken care to celebrate all feſtivals: and my mother hath even ſold my head ornaments to buy wine enough to make me merry on ſuch days; and left me at her death 300 hogſheads of it, to ſanctify the Sabbath.—The doctors that flouriſhed in his time were no leſs conſiderable both for their number and character; particularly the famed Rabbi Chanina, of whom the Bath Col was heard to ſay, that the world was preſerved for the ſake of him; and R. Nicodemus, whom they pretend to have ſtopped the courſe of the ſun, like another Joſhua.

He was ſucceeded by Gamaliel, a man, according to them, of unſufferable pride; and yet of ſo univerſal authority over all the Jews, not only in the weſt, but over the whole world, that the very monarchs ſuffered his laws to be obeyed in their dominions, not one of them offering to obſtruct the execution of them. In his days flouriſhed Samuel the Leſs, who compoſed a prayer full of the bittereſt curſes againſt heretics, by which they mean the Chriſtians; and which are ſtill in uſe to this day. Gamaliel was no leſs an enemy to them; and yet both have been challenged, the former as the celebrated maſter of our great apoſtle, the other as his diſciple in his unconverted ſtate.

Simon II. his ſon and ſucceſſor, was the firſt martyr who died during the ſiege of Jeruſalem. The people ſo regretted his death, that an order was given, inſtead of 10 bumpers of wine, which were uſually drank at the funeral of a ſaint, to drink 13 at his, on account of his martyrdom. Theſe bumpers were in time multiplied, they tell us, to ſuch ſhameful height, that the ſanhedrim was forced to make ſome new regulations to prevent that abuſe.

Theſe are the patriarchs which, the Rabbis tell us, preceded the deſtruction of the temple; and we need no farther confutation of this pretended dignity, than the ſilence of the ſacred hiſtorians, who not only make not the leaſt mention of it, but aſſure us all along that they were the high-prieſts who preſided in the ſanhedrim; and before whom all caſes relating to the

Jewiſh religion were brought and decided. It was the high-prieſt who examined and condemned our Saviour; that condemned St. Stephen; that forbad the apoſtles to preach in Chriſt's name; and who ſat as judge on the great apoſtle at the head of that ſupreme court. The ſame may be urged from Joſephus, who muſt needs have known and mentioned this pretended dignity, if any ſuch there had been; and yet is ſo far from taking the leaſt notice of it, that, like the evangeliſts, he places the pontiffs alone at the head of all the Jewiſh affairs; and names the high-prieſt Ananus as having the care and direction of the war againſt the Romans; which is an evident proof that there were then no ſuch patriarchs in being.

To all this let us add, that if there had been any ſuch remarkable ſucceſſion, the Talmudiſts would have preſerved it to future ages; whereas, neither they, nor any of the ancient authors of the Jewiſh church, make any mention of it; but only ſome of their doctors, who have written a conſiderable time after them, as of writers to whom little credit can be given in points of this nature; eſpecially as there are ſuch unſurmountable contradictions between them, as no authors either Jewiſh or Chriſtian have, with all their pains, been hitherto able to reconcile.

Their ſucceſſion, according to the generality of thoſe Rabbis, ſtands as follows: 1. Hillel the Babylonian. 2. Simeon the ſon of Hillel. 3. Gamaliel the ſon of Simeon. 4. Simeon II. the ſon of Gamaliel. 5. Gamaliel II. the ſon of Simeon II. 6. Simeon III. the ſon of Gamaliel II. 7. Judah the ſon of Simeon III. 8. Gamaliel III. the ſon of Judah. 9. Judah II. the ſon of Gamaliel III. 10. Hillel II. ſon of Judah II. 11. Judah III. ſon of Hillel II. 12. Hillel III. ſon of Judah III. 13. Gamaliel IV. ſon of Hillel III.

According to Gants Tzemach David, who hath reduced them to 10, they are, 1. Hillel the Babylonian. 2. Simeon the ſon of Hillel. 3. Rabb. Gamaliel Rebona. 4. R. Simeon the ſon of Gamaliel. 5. Rabban Gamaliel his ſon. 6. R. Jehudah the prince. 7. Hillel the prince, his ſon. 8. Rabban Gamaliel the Old. 9. Simeon III. 10. R. Judah, Naſſi or prince.

On the whole, it cannot be doubted but that their firſt riſe was in Nerva's time, however much Jewiſh pride may have prompted them to falſify, and to aſſert their origin to have been more ancient than it really was. Nor have the Jews been faithful in giving an account of the authority of theſe men. They have exaggerated their power beyond all bounds, for the purpoſe of repelling the arguments of Chriſtians: for their power was certainly more ſhowy than ſubſtantial. In time, however, they certainly impoſed upon the people; and what power they did poſſeſs (which the Romans only allowed to be in religious matters, or in ſuch as were connected with religion) they exerciſed with great rigour. Their pecuniary demands, in particular, became very exorbitant; and was the cauſe of their ſuppreſſion in the year 429.

PATRIARCHS, among Chriſtians, are eccleſiaſtical dignitaries, or biſhops, ſo called from their paternal authority in the church. The power of patriarchs was not the ſame in all, but differed according to the different cuſtoms of countries, or the pleaſures of kings and councils. Thus the patriarch of Conſtantinople grew to be a patriarch over the patriarchs of Epheſus and Cæſarea, and was called the *œcumenical and univerſal patriarch*; and the patriarch of Alexandria had ſome prerogatives which no other patriarch but himſelf enjoyed, ſuch as the right of conſecrating and approving every ſingle biſhop under his juriſdiction.

The patriarchate has been ever eſteemed the ſupreme dignity in the church: the biſhop had under him only the territory of the city of which he was biſhop; the metropolitan ſuperintended a province, and had for ſuffragans the biſhops of his province; the primate was the chief of what was then called a DIOCESE *, and had ſeveral metropolitans under him; and the patriarch had under him ſeveral dioceſes, compoſing one exarchate, and the primates themſelves were under him.

Uſher, Pagi, De Marca, and Morinus, attribute the eſtabliſhment of the grand patriarchates to the apoſtles themſelves; who, in their opinion, according to the deſcription of the world then given by geographers, pitched on the three principal cities in the three parts of the known world; viz. Rome in Europe, Antioch in Aſia, and Alexandria in Africa; and thus formed a trinity of patriarchs. Others maintain that the name patriarch was unknown at the time of the council of Nice; and that for a long time afterwards patriarchs and primates were confounded together, as being all equally chiefs of dioceſes, and equally ſuperior to metropolitans, who were only chiefs of provinces. Hence Socrates gives the title patriarch to all the chiefs of dioceſes, and reckons ten of them. Indeed, it does not appear that the dignity of patriarch was appropriated to the five grand ſees of Rome, Conſtantinople, Alexandria, Antioch, and Jeruſalem, till after the council of Chalcedon, in 451; for, when the council of Nice regulated the limits and prerogatives of the three patriarchs of Rome, Antioch, and Alexandria, it did not give them the title of patriarchs, though it allowed them the pre-eminence and privileges thereof: thus, when the council of Conſtantinople adjudged the ſecond place to the biſhop of Conſtantinople, who till then was only a ſuffragan of Heraclea, it ſaid nothing of the patriarchate. Nor is the term *patriarch* found in the decree of the council of Chalcedon, whereby the fifth place is aſſigned to the biſhop of Jeruſalem; nor did theſe five patriarchs govern all the churches.

There were beſides many independent chiefs of dioceſes, who, far from owning the juriſdiction of the grand patriarchs, called themſelves *patriarchs*; ſuch as that of Aquileia; nor was Carthage ever ſubject to the patriarch of Alexandria. Moſheim imagines that the biſhops, who enjoyed a certain degree of pre-eminence over the reſt of their order, were diſtin-

* The word *dioceſe* was then of very different import from what it bears now. Under the article EPISCOPACY, it was obſerved, that the firſt founders of churches regulated their extent and the juriſdiction of their biſhops by the diviſions of the Roman empire into civil juriſdictions. One of theſe diviſions was into provinces and dioceſes. A province compriſed the cities of a whole region ſubjected to the authority of one chief magiſtrate, who reſided in the metropolis or chief city of the province. A dioceſe was a ſtill larger diſtrict, comprehending within it ſeveral provinces, ſubject to the controul of a chief magiſtrate, whoſe reſidence was in the metropolis of the dioceſe. The juriſdiction of the biſhops of the Chriſtian church was eſtabliſhed upon this model. The authority of a private biſhop extended only over the city in which he reſided, together with the adjacent villages and ſurrounding tract of country. This diſtrict was called παροικια, though it comprehended many pariſhes in the modern ſenſe of that word. Under Arcadius and Honorius the empire was divided into thirteen dioceſes: 1. The Oriental dioceſe, containing fifteen provinces; 2. The dioceſe of Egypt, ſix provinces; 3. The Aſiatic dioceſe, ten provinces; 4. The Pontic dioceſe, ten provinces; 5. The dioceſe of Thrace, ſix provinces; 6. The dioceſe of Macedonia, ſix provinces; 7. The dioceſe of Decia, five provinces; 8. The Italic dioceſe, ſeventeen provinces; 9. The dioceſe of Illyricum, ſix provinces; 10. The dioceſe of Africa, ſix provinces; 11. The Spaniſh dioceſe, ſeven provinces; 12. The Gallican dioceſe, ſeventeen provinces; 13. The Britannic dioceſe, five provinces. Each of theſe provinces comprehended many παροικιαι, and each παροικια many modern pariſhes. See *Bingham's Origines Sacræ*, Book ix.

guiſhed by the Jewiſh title of patriarchs in the fourth century. The authority of the patriarchs gradually increaſed, till, about the cloſe of the fifth century, all affairs of moment within the compaſs of their patriarchate came before them, either at firſt hand or by appeals from the metropolitans. They conſecrated biſhops; aſſembled yearly in council the clergy of their reſpective diſtricts; pronounced a deciſive judgment in thoſe caſes where accuſations were brought againſt biſhops; and appointed vicars or deputies, clothed with their authority, for the preſervation of order and tranquillity in the remoter provinces. In ſhort, nothing was done without conſulting them; and their decrees were executed with the ſame regularity and reſpect as thoſe of the princes.

It deſerves to be remarked, however, that the authority of the patriarchs was not acknowledged through all the provinces without exception. Several diſtricts, both in the eaſtern and weſtern empires, were exempted from their juriſdiction. The Latin church had no patriarchs till the ſixth century; and the churches of Gaul, Britain, &c. were never ſubject to the authority of the patriarch of Rome, whoſe authority only extended to the ſuburbicary provinces. There was no primacy, no exarchate nor patriarchate, owned here; but the biſhops, with the metropolitans, governed the church in common. Indeed, after the name patriarch became frequent in the weſt, it was attributed to the biſhops of Bourges and Lyons; but it was only in the firſt ſignification, viz. as heads of dioceſes. Du Cange ſays, that there have been ſome abbots who have borne the title of patriarchs.

PATRIARCHAL CROSS, in heraldry, is that where the ſhaft is twice croſſed; the lower arms being longer than the upper ones.

PATRICIAN, a title given, among the ancient Romans, to the deſcendants of the hundred, or, as ſome will have it, of the two hundred firſt ſenators choſen by Romulus; and by him called *patres*, "fathers." Romulus eſtabliſhed this order after the example of the Athenians; who were divided into two claſſes, viz. the *ευπατριδας patricios*, and *δημοτικους populares*. Patricians, therefore, were originally the nobility; in oppoſition to the plebeians. They were the only perſons whom Romulus allowed to aſpire to the magiſtracy; and they exerciſed all the functions of the prieſthood till the year of Rome 495. But the cognizance and character of theſe ancient families being almoſt loſt and extinguiſhed by a long courſe of years, and frequent changes in the empire, a new kind of patricians were afterwards ſet on foot, who had no pretenſions from birth, but whoſe title depended entirely on the emperor's favour. This new patriciate, Zoſimus tells us, was erected by Conſtantine, who conferred the quality on his counſellors, not becauſe they were deſcended from the ancient fathers of the ſenate, but becauſe they were the fathers of the republic or of the empire. This dignity in time became the higheſt of the empire. Juſtinian calls it *ſummam dignitatem*. In effect, the patricians ſeem to have had the precedence of the *conſulares*, and to have taken place before them in the ſenate; though F. Faber aſſerts the contrary. What confounds the queſtion is, that the two dignities often met in the ſame perſon; becauſe the patriciate was only conferred on thoſe who had gone through the firſt offices of the empire, or had been conſuls. Pope Adrian made Charlemagne take the title of patrician before he aſſumed the quality of emperor; and other popes have given the title to other kings and princes by reaſon of its eminence.

PATRICIAN is alſo a title of honour often conferred on men of the firſt quality in the time of our Anglo-Saxon kings. See THANE.

PATRICIAN *Deities*, *Patricii Dii*, in mythology, were Janus, Saturn, the Genius, Pluto, Bacchus, the Sun, the Moon, and the Earth.

PATRICIANS, in eccleſiaſtical writers, were ancient ſectaries, who diſturbed the peace of the church in the beginning of the third century: thus called from their founder *Patricius*, preceptor of a Marcionite called *Symmachus*. His diſtinguiſhing tenet was, that the ſubſtance of the fleſh is not the work of God, but that of the devil: on which account his adherents bore an implacable hatred to their own fleſh; which ſometimes carried them ſo far as to kill themſelves. They were alſo called TATIANITES, and made a branch of the ENCRATITÆ.

PATRICK (St.), the apoſtle of Ireland, and ſecond biſhop of that country. He was born April 5th A. D. 373, of a good family, at Kirk Patrick near Dumbarton, in what is now called Scotland, but then comprehended under the general name of Britain. His baptiſmal name, *Succath*, ſignifies, in the Britiſh language, "valiant in war." On ſome inroad of certain exiles from Ireland he was taken priſoner, and carried into that kingdom, where he continued ſix years in the ſervice of Milcho, who had bought him of three others, when Patrick acquired the new name of *Cothraig*, or *Ceathar-Tigh*, i. e. *four families*. In this time he made himſelf maſter of the Iriſh language, and at laſt made his eſcape, and returned home on board a ſhip. About two years after, he formed a deſign of converting the Iriſh, either in conſequence of a dream, or on reflection of what he had obſerved during his acquaintance with them. The better to qualify himſelf for this undertaking, he travelled to the continent, where he continued 35 years, purſuing his ſtudies under the direction of his mother's uncle, St. Martin, biſhop of Tours, who had ordained him deacon; and after his death with St. German, biſhop of Auxerre, who ordained him prieſt, and gave him his third name *Mawn* or *Maginim*.

An ancient author, Henricus Antiſioderenſis, who wrote a book concerning the Miracles of St. German, conſiders it as the higheſt honour of that prelate to have been the inſtructor of St. Patrick: "As the glory of a father ſhines in the government of his ſons, out of the many diſciples in religion who are reported to have been his ſons in Chriſt; ſuffice it briefly to mention one by far the moſt famous, as the ſeries of his actions ſhows, Patrick the particular apoſtle of Ireland, who being under his holy diſcipline 18 years, derived no little knowledge in the inſpired writings from ſuch a ſource. The moſt godly divine pontiff, conſidering him alike diſtinguiſhed in religion, eminent for virtue, and ſtedfaſt in doctrine; and thinking it abſurd to let one of the beſt labourers remain inactive in the Lord's vineyard, recommended him to Celeſtine, Pope of Rome, by his preſbyter Segetius, who was to carry to the apoſtolic ſee a teſtimonial of eccleſiaſtical merit of this excellent man. Approved by his judgment, ſupported by his authority, and confirmed by his bleſſing, he ſet out for Ireland; and being peculiarly deſtined to that people as their apoſtle, inſtructed them at that time by his doctrine and miracles; and now does and will for ever diſplay the wonderful power of his apoſtleſhip." Laſtly, Pope Celeſtine conſecrated him biſhop, and gave him his moſt familiar name *Patricius*, expreſſive of his honourable deſcent, and to give luſtre and weight to the commiſſion which he now charged him with to convert the Iriſh. Palladius had been here a year before him on the ſame deſign, but with little ſucceſs: the ſaints Kieran, Ailbe, Declan, and Ibar, were precurſors both to Palladius and Patrick. But the great office of apoſtle of Ireland was reſerved for our prelate, who landed in the country of the Evolein, or at Wicklow, A. D. 441. His firſt convert was Sinell, eighth in deſcent from Cormac king of Leinſter: but not meeting with encouragement, he proceeded to Dublin, and thence to Ulſter, where he founded a church (afterwards the famous abbey of Saul, in the county of Down), remarkable for its poſition, being made out of a barn, and its greateſt length reaching from north to ſouth. After labouring ſeven years indefatigably in his great work, he returned to Bri-

tain, which he delivered from the hereſies of Pelagius and Arius; engaged ſeveral eminent perſons to aſſiſt him; viſited the Iſle of Man, which he converted in 440, when the biſhopric was founded; and, A. D. 448, returned to the ſee of Armagh *, which he had founded three years before; and in 13 years more completed the converſion of the whole iſland †. After giving an account of his commiſſion at Rome, he once more returned hither, and ſpent the remainder of his life between the monaſteries of Armagh and Saul, ſuperintending and enforcing the great plan of doctrine and diſcipline which he had eſtabliſhed. After having eſtabliſhed ſchools or an academy here, he cloſed his life and miniſtry at Saul abbey, in the 120th year of his age, March 17, A. D. 493, and was buried at Down afterwards, in the ſame grave with St. Briget and St. Columb, in the ſame place. Reſpecting his burial-place, however, there have been great diſputes; and it has been as great a ſubject of debate with the religious, as Homer's birth-place was formerly among the cities of Greece. Thoſe of Down lay claim to it, on the authority of the following verſes:

Theſe three in Down lie in tomb one,
Briget, Patricius, and Columba pious.

Thoſe of Glaſtenbury in England, from the old monuments of their church: And ſome Scots affirm him to have been both born and buried among them at Glaſgow. His genuine works were collected and printed by Sir James Ware, 1656. His immediate ſucceſſor in this ſee was St. Binen or Begnus.

Order of St. PATRICK, an inſtitution which took place in Ireland in the year 1783. On the fifth of February, in that year, the king ordered letters-patent to be paſſed under the great ſeal of the kingdom of Ireland, for creating a ſociety or brotherhood, to be called *knights of the illuſtrious order of St. Patrick*, of which his majeſty, his heirs, and ſucceſſors, ſhall perpetually be ſovereigns, and his majeſty's lieutenant-general and general-governor of Ireland, &c. for the time being, ſhall officiate as grand-maſters; and alſo for appointing Prince Edward, and ſeveral of the prime nobility of Ireland, knights companions of the ſaid illuſtrious order.

PATRICK (Simon,) a very learned Engliſh biſhop, was born at Gainſborough in Lincolnſhire in 1626. In 1644 he was admitted into Queen's college, Cambridge, and entered into holy orders. After being for ſome time chaplain to Sir Walter St. John, and vicar of the church at Batterſea in Surry, he was preferred to the rectory of St. Paul's, Covent-garden, in London, where he continued all the time of the plague in 1665 among his pariſhioners, to their great comfort. In 1668 he publiſhed his *Friendly Debate* between a Conformiſt and a Nonconformiſt. This was anſwered by the Diſſenters, whom he had much exaſperated by it; but by his moderation and candour towards them afterwards, they were perfectly reconciled to him, and he brought over many of them to the communion of the eſtabliſhed church. In 1673 he was made dean of Peterborough, where he was much beloved. In 1682, Dr. Lewis de Moulin, who had been a hiſtory-profeſſor at Oxford, and written many bitter books againſt the church of England, ſent for Dr. Patrick upon his ſick-bed, and made a ſolemn declaration of his regret on that account, which he ſigned, and it was publiſhed after his death. During the reign of King James, the dean's behaviour ſhowed that he had nothing more at heart than the Proteſtant religion; for which he ventured all that was dear to him, by preaching and writing againſt the errors of the church of Rome. In 1687 he publiſhed a prayer compoſed for that difficult time, when perſecution was expected by all who ſtood firm to their religion. The year after the Revolution, the dean was appointed biſhop of Chicheſter, and was employed with others of the new biſhops to ſettle the affairs of the church in Ireland. In 1691 he was tranſlated to the ſee of Ely, in the room of the deprived Biſhop Turner. He died in 1707, after having publiſhed various works; among which the moſt diſtinguiſhed are his Paraphraſes and Commentaries on the Holy Scriptures, three volumes folio. Theſe, with Lowth on the Proverbs, Arnold on the Apocrypha, and Whitby on the New Teſtament, make a regular continued commentary in Engliſh on all the ſacred books.

PATRIMONY, a right or eſtate inherited by a perſon from his anceſtors. The term *patrimony* has been alſo given to church-eſtates or revenues; in which ſenſe authors ſtill ſay, the patrimony of the church of Rimini, Milan, &c. The church of Rome hath patrimonies in France, Africa, Sicily, and many other countries. To create the greater reſpect to the eſtates belonging to the church, it was uſual to give their patrimonies the names of the ſaints they held in the higheſt veneration: thus, the eſtate of the church of Ravenna was called the *patrimony of St. Apollinarius*; that of Milan, the *patrimony of St. Ambroſe*; and the eſtates of the Roman church were called the *patrimony of St. Peter in Abruzzo*, the *patrimony of St. Peter in Sicily*, and the like. What is now called *St. Peter's patrimony* is only the duchy of Caſtro, and the territory of Orvietto. See CASTRO, &c.

PATRIOTISM, a love of one's country, which is one of the nobleſt paſſions that can warm and animate the human breaſt. It includes all the limited and particular affections to our parents, children, friends, neighbours, fellow-citizens, and countrymen. It ought to direct and limit their more confined and partial actions within their proper and natural bounds, and never let them encroach on thoſe ſacred and firſt regards we owe to the great public to which we belong. Were we ſolitary creatures, detached from the reſt of mankind, and without any capacity of comprehending a public intereſt, or without affections leading us to deſire and purſue it, it would not be our duty to mind it, nor criminal to neglect it. But as we are parts of the public ſyſtem, and are not only capable of taking in large views of its intereſts, but by the ſtrongeſt affections connected with it, and prompted to take a ſhare of its concerns, we are under the moſt ſacred ties to proſecute its ſecurity and welfare with the utmoſt ardour, eſpecially in times of public trial.

"Zeal for the public good (ſays Mr. Addiſon) is the characteriſtic of a man of honour and a gentleman, and muſt

* At Armagh St. Patrick founded, A. D. 445 or 447, a priory of Auguſtine canons, dedicated to St. Peter and St. Paul, much enriched by the archbiſhops; reſtored by Imar O Hedegan in the 12th century. It was granted, A. D. 1611, to Sir Toby Caulfield, knight. St. Patrick alſo founded there a houſe of canoneſſes of the ſame order, under his ſiſter Lupita, called *Templena firta*, or the "houſe of miracles."

We are told, that Armagh was made a metropolitical ſee in honour of St. Patrick; in conſequence of which it was held in the higheſt veneration not only by biſhops and prieſts, but alſo by kings and biſhops, as the venerable Bede informs us.

† There is a cave in the county of Donegal or Tir-connel, near the ſource of the Liffey, which, it is pretended, was dug by Ulyſſes, in order to hold converſations with infernals. The preſent inhabitants call it *Ellan n' Fradatory*, or the "Iſland of Purgatory, and Patrick's Purgatory." They affirm, with a pious credulity, that St. Patrick the apoſtle of Ireland, or ſome abbot of that name, obtained of God by his earneſt prayers, that the pains and torments which await the wicked after this life might be here ſet forth to view, in order the more eaſily to recover the Iriſh from their ſinful ſtate and heatheniſh errors.

take place of pleaſures, profits, and all other private gratifications: that whoſoever wants this motive, is an open enemy, or an inglorious neuter to mankind, in proportion to the miſapplied advantages with which nature and fortune have bleſſed him." This love of our country does not import an attachment to any particular ſoil, climate, or ſpot of earth, where perhaps we firſt drew our breath, though thoſe natural ideas are often aſſociated with the moral ones; and, like external ſigns or ſymbols, help to aſcertain and bind them; but it imports an affection to that moral ſyſtem or community, which is governed by the ſame laws and magiſtrates, and whoſe ſeveral parts are variouſly connected one with the other, and all united upon the bottom of a common intereſt. Wherever this love of our country prevails in its genuine vigour and extent, it ſwallows up all ſordid and ſelfiſh regards; it conquers the love of eaſe, power, pleaſure, and wealth; nay, when the amiable partialities of friendſhip, gratitude, private affection, or regards to a family, come in competition with it, it will teach us to ſacrifice all, in order to maintain the rights, and promote and defend the honour and happineſs of our country. To purſue therefore our private intereſts in ſubordination to the good of our country; to be examples in it of virtue, and obedient to the laws; to chooſe ſuch repreſentatives as we apprehend to be the beſt friends to its conſtitution and liberties; and, if we have the power, to promote ſuch laws as may improve and perfect it; readily to embrace every opportunity for advancing its proſperity; cheerfully to contribute to its defence and ſupport; and, if need be, to die for it:—theſe are among the duties which every man, who has the happineſs to be a member of our free and Proteſtant conſtitution, owes to his country.

The conſtitution of man is ſuch, that the moſt ſelfiſh paſſions, if kept within their proper bounds, have a tendency to promote the public good. There is no paſſion of more general utility than patriotiſm; but its origin may unqueſtionably be termed *ſelfiſh*. The love of one's relations and friends is the moſt natural expanſion of ſelf-love: this affection connects itſelf too with local circumſtances, and ſometimes cannot eaſily be ſeparated from them. It often varies, as relationſhip or place varies; but acquires new power when the whole community becomes its object. It was therefore with ſingular propriety that the poet ſaid, "*Self-love and ſocial are the ſame.*" Hiſtory furniſhes a variety of inſtances of this exalted virtue, to which individuals of every civilized nation have occaſionally aſpired. The love of their country, and of the public good, ſeems to have been the predominant paſſion of the Spartans. Pedaretus having miſſed the honour of being choſen one of the three hundred who had a certain rank of diſtinction in the city, went home extremely pleaſed and ſatisfied; ſaying, "He was overjoyed there were three hundred men in Sparta more honourable than himſelf."

PATRIPASSIANS, PATRIPASSIANI, in church-hiſtory, a Chriſtian ſect, who appeared about the latter end of the ſecond century; ſo called, from their aſcribing the paſſion to the Father; for they aſſerted the unity of God in ſuch a manner as to deſtroy all diſtinctions of perſons, and to make the Father and Son preciſely the ſame; in which they were followed by the Sabellians and others. The author and head of the Patripaſſians was Praxeas, a philoſopher of Phrygia in Aſia. Swedenborg and his followers ſeem to hold the ſame faith.

PATROCLUS, a Grecian chief at the Trojan war. He was the ſon of Menœtius, by Sthenele, whom ſome call *Philomela* or *Polymela*. The murder of Clyſonymus, the ſon of Amphidamas, by accident, in the time of his youth, made him fly from Opus, where his father reigned. He went to the court of Peleus king of Phthia. He was cordially received, and contracted the moſt intimate friendſhip with Achilles the king's ſon. When the Greeks went to the Trojan war, Patroclus went with them at the expreſs deſire of his father, who had viſited the court of Peleus; and he accordingly embarked with ten ſhips from Phthia. He was the conſtant companion of Achilles; lodged in the ſame tent; and when he refuſed to appear in the field of battle, becauſe he had been offended by Agamemnon, Patroclus imitated his example, and by his abſence was the cauſe of much evil to the Greeks. At laſt, however, Neſtor prevailed upon him to return to the war, and Achilles permitted him to appear in his armour. The bravery of Patroclus, together with the terror which the ſight of the arms of Achilles inſpired, ſoon routed the victorious armies of the Trojans, and obliged them to fly to the city for ſafety. He would have broken down the walls; but Apollo, who intereſted himſelf for the Trojans, oppoſed him; and Hector, at the inſtigation of that god, diſmounted from his chariot to attack him as he attempted to ſtrip one of the Trojans whom he had ſlain. This engagement was obſtinate; but Patroclus was at length overpowered by the valour of Hector, and the interpoſition of Apollo. His arms became the property of the conqueror; and Hector would have ſevered his head from his body, had not Ajax and Menelaus prevented it. His body was at laſt recovered, and carried to the Grecian camp, where Achilles received it with the loudeſt lamentations. His funerals were obſerved with the greateſt ſolemnity. Achilles ſacrificed near the burning pile twelve young Trojans, four of his horſes, and two of his dogs; and the whole was concluded by the exhibition of funeral games, in which the conquerors were liberally rewarded by Achilles. The death of Patroclus, as deſcribed by Homer, gave riſe to new events. Achilles forgot his reſentment againſt Agamemnon, and entered the field to avenge the fall of his friend; and his anger was gratified only by the ſlaughter of Hector, who had more powerfully kindled his wrath by appearing at the head of the Trojan armies in the armour which had been taken from the body of Patroclus. The patronymic of Actorides is often applied to Patroclus, becauſe Actor was father to Menœtius.

PATROL, in war, a round or march made by the guards or watch in the night-time, to obſerve what paſſes in the ſtreets, and to ſecure the peace and tranquillity of a city or camp. The patrol generally conſiſts of a body of five or ſix men, detached from a body on guard, and commanded by a ſerjeant. They go every hour of the night, from the beating of the tattoo until the reveille: they are to walk in the ſtreets in garriſons, and all over the camp in the field, to prevent diſorders, or any number of people from aſſembling together: they are to ſee the lights in the ſoldiers' barracks put out, and to take up all the ſoldiers they find out of their quarters. Sometimes patrols conſiſt of an officer and 30 or 40 men, as well infantry as cavalry; but then the enemy is generally near at hand, and conſequently the danger greater.

PATRON, among the Romans, was an appellation given to a maſter who had freed his ſlave. As ſoon as the relation of maſter expired, that of patron began: for the Romans, in giving their ſlaves their freedom, did not deſpoil themſelves of all rights and privileges in them; the law ſtill ſubjected them to conſiderable ſervices and duties towards their patrons, the neglect of which was very ſeverely puniſhed.

Patron was alſo a name which the people of Rome gave to ſome great man, under whoſe protection they uſually put themſelves; paying him all kinds of honour and reſpect, and denominating themſelves his clients; while the patron, on his ſide, granted them his credit and protection. They were therefore mutually attached and mutually obliged to each other; and by this means, in conſequence of reciprocal ties, all thoſe ſeditions, jealouſies, and animoſities, which are ſometimes the effect of a difference of rank, were prudently avoided: for it was the duty of the patron to adviſe his clients in points of law, to manage

their ſuits, to take care of them as of his own children, and ſecure their peace and happineſs. The clients were to aſſiſt their patrons with money on ſeveral occaſions; to ranſom them or their children when taken in war; to contribute to the portions of their daughters; and to defray, in part, the charges of their public employments. They were never to accuſe each other, or take contrary ſides; and if either of them was convicted of having violated this law, the crime was equal to that of treaſon, and any one was allowed to kill the offender with impunity. This patronage was a tie as effectual as any conſanguinity or alliance, and had a wonderful effect towards maintaining union and concord among the people for the ſpace of 600 years; during which time we find no diſſenſions nor jealouſies between the patrons and their clients, even in the times of the republic, when the populace frequently mutinied againſt thoſe who were moſt powerful in the city.

PATRON, in the church of Rome, a ſaint whoſe name a perſon bears, or under whoſe protection he is put, and whom he takes particular care to invoke; or a ſaint in whoſe name a church or order is founded.

PATRON, in the canon or common law, is a perſon who, having the advowſon of a parſonage, vicarage, or the like ſpiritual promotion, belonging to his manor, hath on that account the gift and diſpoſition of the benefice, and may preſent to it whenever it becomes vacant. The patron's right of diſpoſing of a benefice originally ariſes either from the patron or his anceſtors, &c. being the founders or builders of the church; from their having given lands for the maintenance thereof; or from the church's being built on their ground; and frequently from all three together

PATRONAGE, or ADVOWSON, a ſort of incorporeal hereditament, conſiſting in the right of preſentation to a church or eccleſiaſtical benefice. Advowſon, *advocatio*, ſignifies *in clientelam recipere*, the taking into protection; and therefore is ſynonymous with patronage, *patronatus*: and he who has the right of advowſon is called the *patron of the church*. For when lords of manors firſt built churches on their own demeſnes, and appointed the tithes of thoſe manors to be paid to the officiating miniſters, which before were given to the clergy in common (from whence aroſe the diviſion of pariſhes), the lord who thus built a church, and endowed it with glebe or land, had of common right a power annexed of nominating ſuch miniſter as he pleaſed (provided he were canonically qualified) to officiate in that church, of which he was the founder, endower, maintainer, or, in one word, the patron.

Advowſons are either advowſons *appendant*, or advowſons *in groſs*. Lords of manors being originally the only founders, and of courſe the only patrons, of churches, the right of patronage or preſentation, ſo long as it continues annexed to the poſſeſſion of the manor, as ſome have done from the foundation of the church to this day, is called an *advowſon appendant*: and it will paſs, or be conveyed, together with the manor, as incident and appendant thereto, by a grant of the manor only, without adding any other words. But where the property of the advowſon has been once ſeparated from the property of the manor by legal conveyance, it is called an *advowſon in groſs*, or at large, and never can be appendant any more; but it is for the future annexed to the perſon of its owner, and not to his manor or lands.

Advowſons are alſo either *preſentative*, *collative*, or *donative*. An advowſon preſentative, is where the patron hath a right of preſentation to the biſhop or ordinary, and moreover to demand of him to inſtitute his clerk if he finds him canonically qualified; and this is the moſt uſual advowſon An advowſon collative, is where the biſhop and patron are one and the ſame perſon in which caſe the biſhop cannot preſent to himſelf; but he does, by the one act of collation, or conferring the benefice, the whole that is done in common caſes by both preſentation and inſtitution. An advowſon donative, is when the king, or any ſubject by his licence, doth found a church or chapel, and ordains that it ſhall be merely in the gift or diſpoſal of the patron; ſubject to his viſitation only, and not to that of the ordinary; and veſted abſolutely in the clerk by the patron's deed of donation, without preſentation, inſtitution, or induction. This is ſaid to have been anciently the only way of conferring eccleſiaſtical benefices in England; the method of inſtitution by the biſhop not being eſtabliſhed more early than the time of archbiſhop Becket in the reign of Henry II. and therefore, though pope Alexander III. in a letter to Becket, ſeverely inveighs againſt the *prava conſuetudo*, as he calls it, of inveſtiture conferred by the patron only, this however ſhows what was then the common uſage. Others contend, that the claim of the biſhops to inſtitution is as old as the firſt planting of Chriſtianity in this iſland; and in proof of it they allege a letter from the Engliſh nobility to the pope in the reign of Henry the third, recorded by Matthew Paris, which ſpeaks of preſentation to the biſhop as a thing immemorial. The truth ſeems to be, that, where the benefice was to be conferred on a mere layman, he was firſt preſented to the biſhop in order to receive ordination. who was at liberty to examine and refuſe him: but where the clerk was already in orders, the living was uſually veſted in him by the ſole donation of the patron; till about the middle of the 12th century, when the pope and his biſhops endeavoured to introduce a kind of feodal dominion over eccleſiaſtical benefices, and, in conſequence of that, began to claim and exercife the right of inſtitution univerſally, as a ſpecies of ſpiritual inveſtiture.

However this may be, if, as the law now ſtands, the true patron once waves this privilege of donation, and preſents to the biſhop, and his clerk is admitted and inſtituted, the advowſon is now become for ever preſentative, and ſhall never be donative any more. For theſe exceptions to general rules and common right are ever looked upon by the law in an unfavourable view, and conſtrued as ſtrictly as poſſible. If therefore the patron, in whom ſuch peculiar right reſides, does once give up that right, the law, which loves uniformity, will interpret it to be done with an intention of giving it up for ever; and will therefore reduce it to the ſtandard of other eccleſiaſtical livings.

Arms of PATRONAGE, in heraldry, are thoſe on the top of which are ſome marks of ſubjection and dependence: thus the city of Paris lately bore the fleurs-de-lis in chief, to ſhow her ſubjection to the king; and the cardinals, on the top of their arms, bear thoſe of the pope, who gave them the hat, to ſhow that they are his creatures.

PATRONYMIC, among grammarians, is applied to ſuch names of men or women as are derived from thoſe of parents or anceſtors. Patronymics are derived, 1. From the father: as Pelides, *i. e.* Achilles the ſon of Peleus. 2. From the mother; as Philyrides, *i. e.* Chiron the ſon of Philyra. 3. From the grandfather on the father's ſide; as Æacides, *i. e.* Achilles the grandſon of Æacus. 4. From the grandfather by the mother's ſide; as Atlantiades, *i. e.* Mercury the grandſon of Atlas. And, 5. From the kings and founders of nations; as Romulidæ, *i. e.* the Romans, from their founder king Romulus. The terminations of Greek and Latin patronymics are chiefly four, viz. *des*, of which we have examples above; *as*, as Thaumantias, *i. e.* Iris the daughter of Thaumas; *is*, as Atlantis, *i. e.* Electra the daughter of Atlas; and *ne*, as Nerine, the daughter of Nereus. Of theſe terminations *des* is maſculine; and *as*, *is*, and *ne*, feminine: *des* and *ne* are of the firſt declenſion, *as* and *is* of the third.

The Ruſſians, in their uſual mode of addreſs, never prefix any title or appellation of reſpect to their names; but perſons of all ranks, even thoſe of the firſt diſtinction, call each other

by their Chriſtian names, to which they add a patronymic. Theſe patronymies are formed in ſome caſes by adding Vitch (the ſame as our Fitz, as Fitzherbert, or the ſon of Herbert) to the Chriſtian name of the father; in others by Of or Ef; the former is applied only to perſons of condition, the latter to thoſe of inferior rank. Thus, Ivan Ivanovitch, Ivan Ivanof, is Ivan the ſon of Ivan: Peter Alexievitch, Peter Alexeof, Peter the ſon of Alexey. The female patronymic is Eſna or Ofna, as Sophia Alexeeſna, or Sophia the daughter of Alexey; Maria Ivanofna, or Maria the daughter of Ivan.

Great families are alſo in general diſtinguiſhed by a ſurname, as thoſe of Romanof, Galitzin, Sheremetof, &c.

PATROS, mentioned by Jeremiah and Ezekiel, appears from the context to be meant of a part of Egypt. Bochart thinks it denotes the Higher Egypt: the Septuagint tranſlate it the country of *Pathure*: in Pliny we have the *Nomos Phaturites* in the Thebais; in Ptolemy, *Pathyris*, probably the metropolis. From the Hebrew appellation *Patros* comes the gentilitious name *Pathruſim*, Moſes.

PATRU (Oliver), a counſellor in parliament, and dean of the French academy, was born at Paris in 1604. He had an excellent faculty both of ſpeaking and writing. Upon his admiſſion into the French academy in 1640, he made an oration of thanks, that gave riſe to the cuſtom of admiſſory ſpeeches, which are ſtill in uſe in that ſociety. Mr. de Vaugelas owns himſelf much indebted to him for his aſſiſtance in compoſing his remarks on the French tongue, of which he was by far the greateſt maſter in France; ſo that he was conſulted as an oracle by all the beſt writers of that nation.

Patru was eſtimable for the qualities of his heart, as well as for thoſe of the head: was honeſt, generous, ſincere, and preſerved a gayneſs of character which no ill fortune could alter or affect. For this famous advocate, in ſpite of all his great talents, lived almoſt in a ſtate of indigence. The love of the belles lettres made him neglect the law; and the barren glory of being an oracle to the beſt French writers had more charms for him than all the profits of the bar. Hence he became ſo poor, as to be reduced to the neceſſity of ſelling his books, which ſeemed dearer to him than his life; and would actually have ſold them for an under price, if Boileau had not generouſly advanced him a larger ſum, with this further privilege, that he ſhould have the uſe of them as long as he lived. His death was preceded by a tedious illneſs, during which he received a preſent of 500 crowns from Colbert, as a mark of the eſteem which the king had for him. He died the 16th of January 1681. The prodigious care and exactneſs with which he retouched and finiſhed every thing he wrote, did not permit him to publiſh much. His miſcellaneous works were printed at Paris in 1670, 4to; the third edition of which, in 1714, 4to, was augmented with ſeveral pieces. They conſiſt of Pleadings, Orations, Letters, Lives of ſome of his Friends, Remarks upon the French Language, &c.

PATTANS, Patans, or Afghans, a very warlike race of men, who had been ſubjects of the vaſt empire of Bochara. They revolted under their governor Abſtagi, in the 10th century, and laid the foundation of the empire of Ghizni or Gazna. In the Diſſertation prefixed to vol. iii. of Dow's Hiſtory, we have this account of the Pattans.

"They are divided into diſtinct communities, each of which is governed by a prince, who is conſidered by his ſubjects as the chief of their blood, as well as their ſovereign. They obey him without reluctance, as they derive credit to their family by his greatneſs. They attend him in his wars with the attachment which children have to a parent; and his government, though ſevere, partakes more of the rigid diſcipline of a general than the caprice of a deſpot. Rude, like the face of their country, and fierce and wild as the ſtorms which cover their mountains, they are addicted to incurſions and depredations, and delight in battle and plunder. United firmly to their friends in war, to their enemies faithleſs and cruel, they place juſtice in force, and conceal treachery under the name of addreſs."

The empire, which took its riſe from the revolt of the Pattans, under a ſucceſſion of warlike princes roſe to a ſurpriſing magnitude. In the beginning of the 11th century, it extended from Iſpahan to Bengal, and from the mouths of the Indus to the banks of the Jaxertes, which comprehends at leaſt half of the continent of Aſia. They had fled to the mountains on the borders of Perſia, that they might eſcape the ſword, or avoid ſubmitting to the conquerors of India; and there they formed their ſtate, which the Moguls were never able thoroughly to ſubdue. Indeed they ſometimes exerciſed depredations on the adjacent countries; nor was it poſſible for the Moguls either to prevent it or to extirpate them. They were ſenſible that the climate and ſoil of the delicious plains would only ſerve to rob them of that hardineſs they contracted in the hills to which they were confined; they, therefore, for a long time gave no indications of a deſire to exchange them for more pleaſing abodes, or a more acceſſible ſituation. This enabled them to brave the victorious army of Nadir Shah, whoſe troops they quietly ſuffered to penetrate into Hindoſtan, and waited his return with the ſpoils of that country. They then haraſſed his army in the ſtraits and defiles of the mountains, and proved themſelves ſuch abſolute maſters of the paſſes, that they forced him to purchaſe from them his paſſage into Perſia.

In the beginning of the preſent century, they had ſpread themſelves over the adjoining province of Kandahar; and ſuch was the imbecility of the Perſian empire at that time, that many other provinces and tributary ſtates were alſo induced to revolt. When the king or ſhah of that time, whoſe name was *Huſſein*, oppoſed the growing power of this warlike people, he was totally defeated, and Iſpahan was beſieged and obliged to ſurrender, after having ſuffered dreadful calamities, to an army conſiſting of only 30,000 men. In conſequence of this, they brought about a revolution in Perſia, and ſubjected it to themſelves. This ſovereignty, however, they only held for ſeven years and 21 days, having fallen a ſacrifice to the enterpriſing ſpirit of Kouli Khan, or Nadir Shah.

PAU, a town of France, in the department of the Lower Pyrenees and late province of Bearn, with a caſtle where Henry IV. was born. It is ſeated on an eminence, at the foot of which runs the Gave, 97 miles S. of Bourdeaux. W. lon. 0. 4. N. lat. 43. 15.

PAVAN, or Pavane, a grave dance uſed among the Spaniards, and borrowed from them; wherein the performers made a kind of wheel or tail before each other, like that of *pavo*, "a peacock;" from whence the name is derived. The pavane was formerly in great repute, and was danced by gentlemen with cap and ſword; by thoſe of the long robe in their gowns, by princes with their mantles, and by the ladies with their gown-tails trailing on the ground. It was called the *grand ball*, from the ſolemnity with which it was performed. To moderate its gravity, it was uſual to introduce ſeveral flouriſhes, paſſades, capers, &c. by way of epiſodes. Its tablature or ſcore is given at large by Thoinot Arbeau in his Orcheſographia.

PAVETTA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 47th order, *Stellatæ*. The corolla is monopetalous and funnel-ſhaped above; the ſtigma carved; the berry diſpermous.

PAVIA, an ancient and celebrated town of Italy, in the duchy of Milan, and capital of the Paveſan, with an univerſity and biſhop's ſee. It was anciently called *Ticinum*, from its ſitua-

tion on that river, and lies 20 miles to the ſouthward of Milan. It was formerly the capital of the Longobardic kingdom, and is ſtill remarkable for the broadneſs of its ſtreets, the beauty and richneſs of ſome of its churches, and for its univerſity, founded by Charlemagne, and for ſeveral other literary inſtitutions. Here is a biſhop's ſee, which was once the richeſt in Italy, but is now dependent on the pope; and upon the whole the city is gone to decay, its trade being ruined through the exactions of the government. The few objects within it worth the public attention belong to the clergy or monks; and the church and convent of the Carthuſians are inexpreſſibly noble, the court of the convent being one of the fineſt in the world, and ſurrounded by a portico ſupported by pillars, the whole a mile in circumference. It is defended by ſtrong walls, large ditches, good ramparts, excellent baſtions, and a bridge over the river Taſin. In the centre of the town is a ſtrong caſtle, where the duke of Milan was wont to reſide. There are a great number of magnificent caſtles, and ſome colleges. It was taken by the duke of Savoy in 1700; by the French in 1733; by the French and Spaniards in 1745; but retaken by the Auſtrians in 1746. E. lon. 9. 5. N. lat. 45. 10.

PAVILION, in architecture, ſignifies a kind of turret or building, uſually inſulated, and contained under a ſingle roof; ſometimes ſquare, and ſometimes in form of a dome: thus called from the reſemblance of its roof to a tent. Pavilions are ſometimes alſo projecting pieces, in the front of a building, marking the middle thereof; ſometimes the pavilion flanks a corner, in which caſe it is called *an angular pavilion*. The Louvre is flanked with four pavilions; the pavilions are uſually higher than the reſt of the building. There are pavilions built in gardens, commonly called *ſummer-houſes*, *pleaſure-houſes*, &c. Some caſtles or forts conſiſt only of a ſingle pavilion.

PAVILION, in military affairs, ſignifies a tent raiſed on poſts, to lodge under in the ſummer-time.

PAVILION, is alſo ſometimes applied to flags, colours, enſigns, ſtandards, banners, &c.

PAVILION, in heraldry, denotes a covering in form of a tent, which inveſts or wraps up the armories of divers kings and ſovereigns, depending only on God and their ſword. The pavilion conſiſts of two parts; the top, which is the chapeau, or coronet; and the curtain, which makes the mantle. None but ſovereign monarchs, according to the French heralds, may bear the pavilion entire, and in all its parts. Thoſe who are elective, or have any dependence, ſay the heralds, muſt take off the head, and retain nothing but the curtains.

PAVILIONS, among jewellers, the underſides and corners of the brilliants, lying between the girdle and the collet.

PAVING, the conſtruction of ground-floors, ſtreets, or highways, in ſuch a manner that they may be conveniently walked upon. In Britain, the pavement of the grand ſtreets, &c. is uſually of flint, or rubble ſtone; courts, ſtables, kitchens, halls, churches, &c. are paved with tiles, bricks, flags, or fire-ſtone; ſometimes with a kind of free-ſtone and rag-ſtone. In ſome ſtreets, *e. g.* of Venice, the pavement is of brick: churches ſometimes are paved with marble, and ſometimes with moſaic-work, as the church of St. Mark at Venice. In France, the public roads, ſtreets, courts, &c. are all paved with gres or gritt, a kind of free-ſtone. In Amſterdam and the chief cities of Holland, they call their brick pavement the *burgher-maſters pavement*, to diſtinguiſh it from the ſtone or flint pavement, which uſually takes up the middle of the ſtreet, and which ſerves for carriages; the brick which borders it being deſtined for the paſſage of people on foot.

Pavements of free-ſtone, flint, and flags, in ſtreets, &c. are laid dry, *i. e.* in a bed of ſand; thoſe of courts, ſtables, ground-rooms, &c. are laid in a mortar of lime and ſand; or in lime and cement, eſpecially if there be vaults or cellars underneath. Stone maſons, after laying a floor dry, eſpecially of brick, ſpread a thin mortar over it; ſweeping it backwards and forwards to fill up the joints. The ſeveral kinds of pavement are as various as the materials of which they are compoſed, and whence they derive the name by which they are diſtinguiſhed; as,

1. *Pebble-paving*, which is done with ſtones collected from the ſea-beach, moſtly brought from the iſlands of Guernſey and Jerſey: they are very durable, indeed the moſt ſo of any ſtone uſed for this purpoſe. They are uſed of various ſizes, but thoſe which are from ſix to nine inches deep are eſteemed the moſt ſerviceable. When they are about three inches deep, they are denominated *bolders* or *bowlers*; theſe are uſed for paving court-yards, and other places not accuſtomed to receive carriages with heavy weights; and when laid in geometrical figures, they have a very pleaſing appearance.

2. *Rag-paving* was much uſed in London, but is very inferior to the pebbles; it is dug in the vicinity of Maidſtone in Kent, from which it has the name of *Kentiſh rag-ſtone*; there are ſquared ſtones of this material for paving coach-tracks and footways.

3. *Purbeck pitchens*; ſquare ſtones uſed in footways; they are brought from the iſland of Purbeck, and alſo frequently uſed in court-yards; they are in general from ſix to ten inches ſquare, and about five inches deep.

4. *Squared paving*, for diſtinction by ſome called *Scotch paving*, becauſe the firſt of the kind paved in the manner that has been and continues to be paved, came from Scotland; the firſt was a clear cloſe ſtone, called *blue whynn*, which is now diſuſed, becauſe it has been found inferior to others ſince introduced in the order they are hereafter placed.

5. *Granite*, a hard material, brought alſo from Scotland, of a reddiſh colour, very ſuperior to the blue whynn quarry, and at preſent very commonly uſed in London.

6. *Guernſey*, which is the beſt, and very much in uſe; it is the ſame ſtone with the pebble before ſpoken of, but broken with iron hammers, and ſquared to any dimenſions required of a priſmoidal figure, ſet with its ſmalleſt baſe downwards. The whole of the foregoing paving ſhould be bedded and paved in ſmall gravel.

7. *Purbeck paving*, for footways, is in general got in large ſurfaces about $2\frac{1}{2}$ inches thick; the blue ſort is the hardeſt and the beſt of this kind of paving.

8. *Yorkſhire paving*, is an exceeding good material for the ſame purpoſe, and is got of almoſt any dimenſions of the ſame thickneſs as the Purbeck. This ſtone will not admit wet to paſs through it, nor is it affected by the froſt.

9. *Ryegate*, or *fire-ſtone paving*, is uſed for hearths, ſtoves, ovens, and ſuch places as are liable to great heat, which does not affect the ſtone if kept dry.

10. *Newcaſtle flags*, are ſtones about two feet ſquare, and $1\frac{1}{2}$ or two inches thick; they anſwer very well for paving out-offices: they are ſomewhat like the Yorkſhire.

11. *Portland paving*, with ſtone from the iſland of Portland; this is ſometimes ornamented with black marble dots.

12. *Swedland paving*, is a black ſlate dug in Leiceſterſhire, and looks well for paving halls, or in party-coloured paving.

13. *Marble paving*, is moſtly variegated with different marbles, ſometimes inlaid in moſaic.

14. *Flat brick paving*, done with brick laid in ſand, mortar, or groute, as when liquid lime is poured into the joints.

15. *Brick-on-edge paving*, done with brick laid edgewiſe in the ſame manner. Bricks are alſo laid flat or edgewiſe in herring-bone. Bricks are alſo ſometimes ſet endwiſe in ſand, mortar, or groute. Paving is alſo performed with paving bricks; ten inch tiles; foot tiles; clinkers for ſtables and outer offices; and even with the bones of animals, for gardens, &c.

Pavements of churches, &c. frequently conſiſt of ſtones of ſeveral colours; chiefly black and white, and of ſeveral forms, but chiefly ſquares and lozenges, artfully diſpoſed. Indeed, there needs no great variety of colours to make a ſurpriſing diverſity of figures and arrangements. M. Truchet, in the Memoirs of the French Academy, has ſhown by the rules of combination, that two ſquare-ſtones, divided diagonally into two colours, may be joined together chequerwiſe 64 different ways: which appears ſurpriſing enough; ſince two letters or figures can only be combined two ways.

The reaſon is, that letters only change their ſituation with regard to the firſt and ſecond, the top and bottom remaining the ſame; but in the arrangement of theſe ſtones, each admits of four ſeveral ſituations, in each whereof the other ſquare may be changed 16 times, which gives 64 combinations.

Indeed, from a farther examination of theſe 64 combinations, he found there were only 32 different figures, each figure being repeated twice in the ſame ſituation, though in a different combination; ſo that the two differed from each other only by the tranſpoſition of the dark and light parts.

PAUL, formerly named SAUL, was of the tribe of Benjamin, a native of Tarſus in Cilicia, a Phariſee by profeſſion: firſt a perſecutor of the church, and afterwards a diſciple of Jeſus Chriſt, and apoſtle of the Gentiles. It is thought he was born about two years before our Saviour, ſuppoſing that he lived 68 years, as we read in a homily which is in the ſixth volume of St. Chryſoſtom's works. He was a Roman citizen (Acts xxii. 27, 28.), becauſe Auguſtus had given the freedom of the city to all the freemen of Tarſus, in conſideration of their firm adherence to his intereſts. His parents ſent him early to Jeruſalem, where he ſtudied the law at the feet of Gamaliel, a famous doctor (*id.* xxii. 3.). He made very great progreſs in his ſtudies, and his life was always blameleſs before men; being very zealous for the whole obſervation of the law of Moſes (*id.* xxvi. 4, 5.). But his zeal carried him too far; he perſecuted the church, and inſulted Jeſus Chriſt in his members (1 Tim. i. 13.); and when the protomartyr St. Stephen was ſtoned, Saul was not only conſenting to his death, but he even ſtood by and took care of the clothes of thoſe that ſtoned him (Acts vii. 58, 59.) This happened in the 33d year of the common era, ſome time after our Saviour's death. The holy ſcriptures give the detail of St. Paul's converſion and ſubſequent proceedings very fully.

PAUL, (Father,) whoſe name, before he entered into the monaſtic life, was Peter Sarpi, was born at Venice, Auguſt 14, 1552. His father followed merchandize, but with ſo little ſucceſs, that at his death he left his family very ill provided for, but under the care of a mother whoſe piety was likely to bring the bleſſing of providence upon them, and whoſe wiſe conduct ſupplied the want of fortune by advantages of greater value. Happily for young Sarpi, ſhe had a brother, maſter of a celebrated ſchool, under whoſe direction he was placed by her. Here he loſt no time, but cultivated his abilities, naturally of the firſt rate, with unwearied application. He was born for ſtudy, having a natural averſion to pleaſure and gaiety, and a memory ſo tenacious that he could repeat 30 verſes upon once hearing them. Proportionable to his capacity was his progreſs in literature: at 13, having made himſelf maſter of ſchool learning, he turned his ſtudies to philoſophy and the mathematics, and entered upon logic under Capella of Cremona, who, though a celebrated maſter of that ſcience, confeſſed himſelf in a very little time unable to give his pupil any farther inſtructions.

As Capella was of the order of the Servites, his ſcholar was induced by his acquaintance with him to engage in the ſame profeſſion, though his uncle and his mother repreſented to him the hardſhips and auſterities of that kind of life, and adviſed him with great zeal againſt it. But he was ſteady in his reſolutions, and in 1566 took the habit of the order, being then only in his 14th year, a time of life in moſt perſons very improper for ſuch engagements, but in him attended with ſuch maturity of thought, and ſuch a ſettled temper, that he never ſeemed to regret the choice he then made, and which he confirmed by a ſolemn public profeſſion in 1572.

At a general chapter of the Servites held at Mantua, Paul (for ſo we ſhall now call him) being then only 20 years old, diſtinguiſhed himſelf ſo much in a public diſputation by his genius and learning, that William duke of Mantua, a great patron of letters, ſolicited the conſent of his ſuperiors to retain him at his court, and not only made him public profeſſor of divinity in the cathedral, and reader of caſuiſtical divinity and canon law in that city, but honoured him with many proofs of his eſteem. But father Paul, finding a court life not agreeable to his temper, quitted it two years afterwards, and retired to his beloved privacies, being then not only acquainted with the Latin, Greek, Hebrew, and Chaldee languages, but with philoſophy, the mathematics, canon and civil law, all parts of natural philoſophy, and chemiſtry itſelf; for his application was unintermitted, his head clear, his apprehenſion quick, and his memory retentive.

Being made a prieſt at 22, he was diſtinguiſhed by the illuſtrious Cardinal Borromeo with his confidence, and employed by him on many occaſions, not without the envy of perſons of leſs merit, who were ſo far exaſperated as to lay a charge againſt him before the Inquiſition, for denying that the Trinity could be proved from the firſt chapter of Geneſis; but the accuſation was too ridiculous to be taken notice of. After this he paſſed ſucceſſively through the dignities of his order, of which he was choſen provincial for the province of Venice at 26 years of age; and diſcharged this poſt with ſuch honour, that in 1579 he was appointed, with two others, to draw up new regulations and ſtatutes for his order. This he executed with great ſucceſs; and when his office of provincial was expired, he retired for three years to the ſtudy of natural and experimental philoſophy and anatomy, in which he is ſaid to have made ſome uſeful diſcoveries. In the intervals of his employment he applied himſelf to his ſtudies with ſo extenſive a capacity, as left no branch of knowledge untouched. By him Acquapendente, the great anatomiſt, confeſſes that he was informed how viſion is performed; and there are proofs that he was not a ſtranger to the circulation of the blood. He frequently converſed upon aſtronomy with mathematicians, upon anatomy with ſurgeons, upon medicine with phyſicians, and with chemiſts upon the analyſis of metals, not as a ſuperficial inquirer, but as a complete maſter. He was then choſen procurator general of his order; and during his reſidence at Rome was greatly eſteemed by Pope Sixtus V. and contracted an intimate friendſhip with Cardinal Bellarmine and other eminent perſons.

But the hours of repoſe, that he employed ſo well, were interrupted by a new information in the Inquiſition, where a former acquaintance produced a letter written by him in cyphers, in which he ſaid, "that he deteſted the court of Rome, and that no preferment was obtained there but by diſhoneſt means." This accuſation, however dangerous, was paſſed over on account of his great reputation; but made ſuch impreſſions on that court, that he was afterwards denied a biſhopric by Clement VIII. After theſe difficulties were ſurmounted, F. Paul again retired to his ſolitude; where he appears, by ſome writings drawn up by him at that time, to have turned his attention more to improvements in piety than learning. Such was the care with which he read the ſcriptures, that, it being his cuſtom to draw a line under any paſſage which he intended more nicely to conſider, there was not a ſingle word in his New Teſtament but was underlined. The ſame marks of attention appeared in his Old Teſtament, Pſalter, and Breviary.

But the moſt active ſcene of his life began about the year

1615, when Pope Paul V. exaſperated by ſome decrees of the ſenate of Venice that interfered with the pretended rights of the church, laid the whole ſtate under an interdict. The ſenate, filled with indignation at this treatment, forbad the biſhops to receive or publiſh the pope's bull; and, convening the rectors of the churches, commanded them to celebrate divine ſervice in the accuſtomed manner; with which moſt of them readily complied: but the Jeſuits and ſome others refuſing, were by a ſolemn edict expelled the ſtate. Both parties having proceeded to extremities, employed their ableſt writers to defend their meaſures. On the pope's ſide, among others, Cardinal Bellarmine entered the liſts, and, with his confederate authors, defended the papal claims with great ſcurrility of expreſſion, and very ſophiſtical reaſonings; which were confuted by the Venetian apologiſts in much more decent language, and with much greater ſolidity of argument. On this occaſion F. Paul was moſt eminently diſtinguiſhed by his Defence of the Rights of the ſupreme Magiſtrate, his Treatiſe of Excommunication, tranſlated from Gerſon, with an Apology, and other writings; for which he was cited before the Inquiſition at Rome: but it may be eaſily imagined that he did not obey the ſummons.

The Venetian writers, whatever might be the abilities of their adverſaries, were at leaſt ſuperior to them in the juſtice of their cauſe. The propoſitions maintained on the ſide of Rome were theſe: that the pope is inveſted with all the authority of heaven and earth: that all princes are his vaſſals, and that he may annul their laws at pleaſure: that kings may appeal to him, as he is temporal monarch of the whole earth: that he can diſcharge ſubjects from their oaths of allegiance, and make it their duty to take up arms againſt their ſovereign: that he may depoſe kings without any fault committed by them, if the good of the church requires it: that the clergy are exempt from all tribute to kings, and are not accountable to them even in caſes of high-treaſon: that the pope cannot err: that his deciſions are to be received and obeyed on pain of ſin, though all the world ſhould judge them to be falſe: that the pope is God upon earth: that his ſentence and that of God are the ſame: and that to call his power in queſtion is to call in queſtion the power of God: maxims equally ſhocking, weak, pernicious and abſurd; which did not require the abilities or learning of F. Paul to demonſtrate their falſehood and deſtructive tendency. It may be eaſily imagined that ſuch principles were quickly overthrown, and that no court but that of Rome thought it for its intereſt to favour them. The pope, therefore, finding his authors confuted and his cauſe abandoned, was willing to conclude the affair by treaty; which, by the mediation of Henry IV. of France, was accommodated upon terms very much to the honour of the Venetians. But the defenders of the Venetian rights were, though comprehended in the treaty, excluded by the Romans from the benefit of it: ſome, upon different pretences, were impriſoned; ſome ſent to the galleys; and all debarred from preferment. But their malice was chiefly aimed againſt F. Paul, who ſoon found the effects of it; for, as he was going one night to his convent, about ſix months after the accommodation, he was attacked by five ruffians armed with ſtilettoes, who gave him no leſs than fifteen ſtabs, three of which wounded him in ſuch a manner, that he was left for dead. The murderers fled for refuge to the nuncio, and were afterwards received into the pope's dominions; but were purſued by divine juſtice, and all, except one man who died in priſon, periſhed by violent deaths.

This, and other attempts upon his life, obliged him to confine himſelf to his convent, where he engaged in writing the Hiſtory of the Council of Trent; a work unequalled for the judicious diſpoſition of the matter, and artful texture of the narration; commended by Dr. Burnet as the completeſt model of hiſtorical writing; and celebrated by Mr. Wotton as equivalent to any production of antiquity; in which the reader finds "liberty without licentiouſneſs, piety without hypocriſy, freedom of ſpeech without neglect of decency, ſeverity without rigour, and extenſive learning without oſtentation."

In this, and other works of leſs conſequence, he ſpent the remaining part of his life to the beginning of the year 1622, when he was ſeized with a cold and fever, which he neglected till it became incurable. He languiſhed more than twelve months, which he ſpent almoſt wholly in a preparation for his paſſage into eternity; and among his prayers and aſpirations was often heard to repeat, "Lord! now let thy ſervant depart in peace." On Sunday the eighth of January of the next year, he roſe, weak as he was, to maſs, and went to take his repaſt with the reſt; but on Monday was ſeized with a weakneſs that threatened immediate death; and on Thurſday prepared for his change, by receiving the viaticum, with ſuch marks of devotion as equally melted and edified the beholders. Through the whole courſe of his illneſs to the laſt hour of his life he was conſulted by the ſenate in public affairs, and returned anſwers in his greateſt weakneſs with ſuch preſence of mind as could only ariſe from the conſciouſneſs of innocence.

On Saturday, the day of his death, he had the paſſion of our bleſſed Saviour read to him out of St. John's goſpel, as on every other day of that week, and ſpoke of the mercy of his Redeemer, and his confidence in his merits. As his end evidently approached, the brethren of the convent came to pronounce the laſt prayers, with which he could only join in his thoughts, being able to pronounce no more than theſe words, *Eſto perpetua*, "Mayeſt thou laſt for ever;" which was underſtood to be a prayer for the proſperity of his country. Thus died F. Paul, in the 71ſt year of his age; hated by the Romans as their moſt formidable enemy, and honoured by all the learned for his abilities, and by the good for his integrity. His deteſtation of the corruption of the Roman church appears in all his writings, but particularly in this memorable paſſage of one of his letters: "There is nothing more eſſential than to ruin the reputation of the Jeſuits. By the ruin of the Jeſuits, Rome will be ruined; and if Rome is ruined, religion will reform itſelf." He appears, by many paſſages of his life, to have had a high eſteem of the church of England; and his friend F. Fulgentio, who had adopted all his notions, made no ſcruple of adminiſtering to Dr. Duncombe, an Engliſh gentleman that fell ſick at Venice, the communion in both kinds, according to the common prayer, which he had with him in Italian. He was buried with great pomp at the public charge, and a magnificent monument was erected to his memorial.

PAUL, in ſea language, is a ſhort bar of wood or iron, fixed cloſe to the capſtern or windlaſs of a ſhip, to prevent thoſe engines from rolling back or giving way when they are employed to heave in the cable, or otherwiſe charged with any great effort.

PAULIANISTS, PAULIANISTÆ, a ſect of heretics, ſo called from their founder Paulus Samoſatenus, a native of Samoſata, elected biſhop of Antioch in 262. His doctrine ſeems to have amounted to this: that the Son and the Holy Ghoſt exiſt in God in the ſame manner as the faculties of reaſon and activity do in man; that Chriſt was born a mere man; but that the reaſon or wiſdom of the Father deſcended into him, and by him wrought miracles upon earth, and inſtructed the nations; and, finally, that, on account of this union of the Divine word with the man Jeſus, Chriſt might, though improperly, be called God. It is alſo ſaid, that he did not baptize in the name of the Father and the Son, &c.; for which reaſon the council of Nice ordered thoſe baptized by him to be rebaptized.

Being condemned by Dionyſius Alexandrinus in a council,

he abjured his errors, to avoid depoſition; but ſoon after he reſumed them, and was actually depoſed by another council in 269.——He may be conſidered as the father of the modern Socinians; and his errors are ſeverely condemned by the council of Nice, whoſe creed differs a little from that now uſed, under the ſame name, in the church of England. The creed agreed upon by the Nicene fathers, with a view to the errors of Paulus Samoſatenus, concludes thus: τους δε λεγοντας ην ποτε ουκην, και πριν γεννηθηναι, ουκ ην, &c. τουτους αναθεματιζει η καθολικη και αποστολικη εκκλησια.—"But thoſe who ſay he was when he was not, and was not before he was born, the catholic and apoſtolic church anathematizes." To thoſe who have any veneration for the council of Nice this muſt appear a very ſevere, and perhaps not unjuſt, cenſure of the modern Hutchinſonians as well as of the Socinians.

PAULICIANS, a branch of the ancient Manichees, ſo called from their founder, one Paulus, an Armenian, in the ſeventh century; who, with his brother John, both of Samoſata, formed this ſect: though others are of opinion, that they were thus called from another Paul, an Armenian by birth, who lived under the reign of Juſtinian II. In the ſeventh century a zealot called Conſtantine revived this drooping ſect, which had ſuffered much from the violence of its adverſaries, and was ready to expire under the ſeverity of the imperial edicts, and the zeal with which they were carried into execution. The Paulicians, however, by their number, and the countenance of the emperor Nicephorus, became formidable to all the eaſt.

But the cruel rage of perſecution, which had for ſome years been ſuſpended, broke forth with redoubled violence under the reigns of Michael Curopalates and Leo the Armenian, who inflicted capital puniſhment on ſuch of the Paulicians as refuſed to return into the boſom of the church. The empreſs Theodora, tutoreſs of the emperor Michael, in 845, would oblige them either to be converted or to quit the empire: upon which ſeveral of them were put to death, and more retired among the Saracens; but they were neither all exterminated nor baniſhed.

Upon this they entered into a league with the Saracens; and chooſing for their chief an officer of the greateſt reſolution and valour, whoſe name was Carbeas, they declared againſt the Greeks a war which was carried on for fifty years with the greateſt vehemence and fury. During theſe commotions, ſome Paulicians, towards the concluſion of this century, ſpread abroad their doctrines among the Bulgarians; many of them, either from a principle of zeal for the propagation of their opinions, or from a natural deſire of flying from the perſecution which they ſuffered under the Grecian yoke, retired, about the cloſe of the eleventh century, from Bulgaria and Thrace, and formed ſettlements in other countries. Their firſt migration was into Italy; whence, in proceſs of time, they ſent colonies into almoſt all the other provinces of Europe, and formed gradually a conſiderable number of religious aſſemblies, who adhered to their doctrine, and who were afterwards perſecuted with the utmoſt vehemence by the Roman pontiffs. In Italy they were called *Patarini*, from a certain place called Pataria, being a part of the city of Milan, where they held their aſſemblies; and *Catbari* or *Gazari*, from Gazaria, or the Leſſer Tartary. In France they were called *Albigenſes*, though their faith differed widely from that of the Albigenſes whom Proteſtant writers generally vindicate. (See ALBIGENSES.) The firſt religious aſſembly the Paulicians had formed in Europe is ſaid to have been diſcovered at Orleans in 1017, under the reign of Robert, when many of them were condemned to be burnt alive. The ancient Paulicians, according to Photius, expreſſed the utmoſt abhorrence of Manes and his doctrine. The Greek writers compriſe their errors under the ſix following particulars: 1. They denied that this inferior and viſible world is the production of the ſupreme Being; and they diſtinguiſh the Creator of the world and of human bodies from the moſt high God who dwells in the heavens: and hence ſome have been led to conceive that they were a branch of the Gnoſtics rather than of the Manichæans. 2. They treated contemptuouſly the Virgin Mary; or, according to the uſual manner of ſpeaking among the Greeks, they refuſed to adore and worſhip her. 3. They refuſed to celebrate the inſtitution of the Lord's ſupper. 4. They loaded the croſs of Chriſt with contempt and reproach; by which we are only to underſtand, that they refuſed to follow the abſurd and ſuperſtitious practice of the Greeks, who paid to the pretended wood of the croſs a certain ſort of religious homage. 5. They rejected, after the example of the greateſt part of the Gnoſtics, the books of the Old Teſtament; and looked upon the writers of that ſacred hiſtory as inſpired by the Creator of this world, and not by the ſupreme God. 6. They excluded preſbyters and elders from all part in the adminiſtration of the church.

PAULINA, a Roman lady, wife of Saturninus governor of Syria, in the reign of the emperor Tiberius. Her conjugal peace was diſturbed, and violence was offered to her virtue, by a young man named Mundus, who fell in love with her, and had cauſed her to come to the temple of Iſis by means of the prieſts of that goddeſs, who declared that Anubis wiſhed to communicate to her ſomething of moment. Saturninus complained to the emperor of the violence which had been offered to his wife; and the temple of Iſis was overturned, and Mundus baniſhed, &c.—There was beſides a *Paulina*, wife of the philoſopher Seneca. She attempted to kill herſelf when Nero had ordered her huſband to die. The emperor, however, prevented her; and ſhe lived ſome few years after in the greateſt melancholy.

PAULINIA, in botany: A genus of the trigynia order, belonging to the octandria claſs of plants; and in the natural method ranking under the 23d order, *Tribilatæ*. Its characters are theſe: the flower has a permanent empalement, compoſed of four ſmall oval leaves; it has four oblong oval petals, twice the ſize of the empalement; and eight ſhort ſtamina with a turbinated germen, having three ſhort ſlender ſtyles, crowned by ſpreading ſtigmas; the germen turns to a large three-cornered capſule with three cells, each containing one almoſt oval ſeed. Linnæus reckons ſeven, and Miller nine, ſpecies, natives of the Weſt-Indies.

PAULINUS, a biſhop who flouriſhed in the early part of the 7th century. He was the apoſtle of Yorkſhire, having been the firſt archbiſhop of York. This dignity ſeems to have been conferred on him about the year 626. He built a church at Almonbury, and dedicated it to St. Alban, where he preached to and converted the Brigantes. Camden mentions a croſs at Dewſborough, which had been erected to him with this inſcription, *Paulinus hic prædicavit et celebravit.* York was ſo ſmall about this time, that there was not ſo much as a ſmall church in it in which king Edwin could be baptized. Conſtantius is ſaid to have made it a biſhopric. Pope Honorius made it a metropolitan ſee. We are told that Paulinus baptized in the river Swale, in one day, 10,000 men, beſides women and children, on the firſt converſion of the Saxons to Chriſtianity, beſides many at Halyſtone. At Walſtone in Northumberland, he baptized Segbert king of the Eaſt Saxons. Bede ſays, "Paulinus coming with the king and queen to the royal manor called *Ad-Gebrin* (now Yeverin), ſtaid there 36 days with them, employed in the duties of catechizing and baptizing. In all this time he did nothing from morning to night but inſtruct the people, who flocked to him from all the villages and places, in the doctrine of Chriſt and ſalvation; and, after they were inſtructed, baptizing them in the neighbouring river Glen." According

to the ſame Bede, "he preached the word in the province of Lindiſi; and firſt converted the governor of the city of Lindocollina, whoſe name was Blecca, with all his family. In this city he built a ſtone church of exquiſite workmanſhip, whoſe roof being ruined by long neglect or the violence of the enemy, only the walls are now ſtanding." He is alſo ſaid to have founded a collegiate church of prebends near Southwell, in Nottinghamſhire, dedicated to the Virgin Mary. This church he is ſaid to have built when he baptized the Coritani in the Trent.

PAULO (Marco), a celebrated traveller, was ſon to Nicholas Paulo, a Venetian, who went with his brother Matthew, about the year 1255, to Conſtantinople, in the reign of Baudoin II. Nicholas, at his departure, left his wife big with child; and ſhe brought to the world the famous Marco Paulo, the ſubject of this memoir. The two Venetians, having taken leave of the emperor, croſſed the Black Sea, and travelled into Armenia; whence they paſſed over land to the court of Barka, one of the greateſt lords of Tartary, who loaded them with honours. This prince having been defeated by one of his neighbours, Nicholas and Matthew made the beſt of their way through the deſerts, and arrived at the city where Kublai, grand khan of the Tartars, reſided. Kublai was entertained with the account which they gave him of the European manners and cuſtoms; and appointed them ambaſſadors to the pope, in order to demand of his holineſs a hundred miſſionaries. They came accordingly to Italy, obtained from the Roman pontiff two Dominicans, the one an Italian the other an Aſiatic, and carried along with them young Marco, for whom Kublai expreſſed a ſingular affection. This young man, having learned the different dialects of Tartary, was employed in embaſſies which gave him the opportunity of traverſing Tartary, China, and other eaſtern countries. At length, after a reſidence of ſeventeen years at the court of the grand khan, the three Venetians returned to their own country, in the year 1295, with immenſe fortunes. A ſhort time after his return, Marco ſerving his country at ſea againſt the Genoeſe, his galley, in a great naval engagement, was ſunk, and himſelf taken priſoner and carried to Genoa. He remained there many years in confinement; and, as well to amuſe his melancholy as to gratify thoſe who deſired it from him, he ſent for his notes from Venice, and compoſed the hiſtory of his own and his father's voyages, in Italian, under this title, *Delle maravi-lie del mondo da lui vidute*, &c.; the firſt edition of which appeared at Venice, in 8vo, 1496. His work was tranſlated into different languages, and inſerted in various collections. The editions moſt eſteemed are the Latin one publiſhed by Andrew Muller at Cologne, in 4to, 1671; and that in French, to be found in the collection of voyages publiſhed by Bergeron, at the Hague, 1735, in 2 vols. 4to. In the writings of Marco Paulo, there are ſome things true and others highly incredible. It is indeed difficult to believe, that as ſoon as the grand khan was informed of the arrival of two Venetian merchants, who were come to ſell theriaca (or treacle) at his court, he ſent before them an eſcort of 40,000 men, and afterwards diſpatched theſe Venetians ambaſſadors to the Pope, to beſeech his holineſs to ſend him a hundred miſſionaries. It is equally difficult to believe that the pope, who doubtleſs had an ardent zeal for the propagation of the faith, inſtead of a hundred, ſhould have ſent him only two miſſionaries. There are therefore ſome errors and exaggerations in Marco Paulo's narrative; but many other things which were afterwards verified, and which have been of ſervice to ſucceeding travellers, prove, that in ſeveral reſpects his relation is valuable. He not only gave better accounts of China than had been before received; but likewiſe furniſhed a deſcription of Japan, of many of the iſlands of the Eaſt Indies, of Madagaſcar, and the coaſts of Africa; ſo that from his work it might be eaſily collected, that a direct paſſage by ſea to the Indies was not only poſſible, but practicable. It may be worth while to add, that, in the opinion of the authors of the Univerſal Hiſtory, what he wrote from his own knowledge is both curious and true, ſo that where he has erred his father and uncle muſt have deceived him.

PAVO, the peacock, in ornithology; a genus belonging to the order of gallinæ. The head is covered with feathers which bend backwards; the feathers of the tail are very long, and beautifully variegated with eyes of different colours. Latham enumerates eight ſpecies:

1. The *criſtatus*, or common peacock of Engliſh authors, has a compreſſed creſt and ſolitary ſpurs.—It is about the ſize of a common turkey; the length from the tip of the bill to the end of the tail being three feet eight inches. The bill is nearly two inches long, and is of a brown colour. The irides are yellow. On the crown there is a ſort of creſt, compoſed of 24 feathers, which are not webbed except at the ends, which are gilded green. The ſhafts are of a whitiſh colour; and the head, neck, and breaſt are of a green gold colour. Over the eye there is a ſtreak of white, and beneath there is the ſame. The back and rump are of a green gold colour, gloſſed over with copper: the feathers are diſtinct, and lie over each other like ſhells. "Above the tail ſprings an inimitable ſet of long beautiful feathers, adorned with a variegated eye at the end of each; theſe reach conſiderably beyond the tail; and the longeſt of them in many birds are four feet and a half in length. This beautiful train, or tail as it is falſely called, may be expanded quite to a perpendicular upwards at the will of the bird. The true tail is hid beneath this group of feathers, and conſiſts of 18 grey brown feathers, one foot and a half long, marked on the ſides with ruſous grey: the ſcapulars and leſſer wing coverts are reddiſh cream-colour, variegated with black: the middle coverts deep blue, gloſſed with green gold: the greateſt and baſtard wing ruſous: the quills are alſo ruſous; ſome of them variegated with ruſous, blackiſh, and green: the belly and vent are greeniſh black: the thighs yellowiſh: the legs ſtout; thoſe of the *male* furniſhed with a ſtrong ſpur three quarters of an inch in length; the colour of them grey brown."

The female is rather leſs than the male. The train is very ſhort, being much ſhorter than the tail, and ſcarcely longer than its coverts; neither are the feathers furniſhed with eyes. The creſt on the head is ſimilar to that on the head of the male: the ſides of the head have a great portion of white: the throat and neck are green: the reſt of the body and wings are cinereous brown: the breaſt is fringed with white: the bill is the ſame: the irides are lead-colour: the legs are as in the male; but the ſpur is generally wanting, though in ſome birds a rudiment of one is ſeen. In ſome male birds all the wing coverts and ſcapulars are of a fine deep blue green, very gloſſy; but the outer edges of the wing and quills are of the common colour.

This bird, now ſo common in Europe, is of eaſtern origin, being a native of India. They are found wild in the iſlands of Ceylon and Java in the Eaſt Indies, and at St. Helena, at Barbuda, and other Weſt India iſlands. They are not natural to China; but they are found in many places of Aſia and Africa. They are, however, no where ſo large or ſo fine as in India, in the neighbourhood of the Ganges, from whence, by degrees, they have ſpread into all parts, increaſing in a wild ſtate in the warmer climes, but wanting ſome care in the colder regions. In ours, this bird does not come to its full plumage till the third year. The female lays five or ſix greyiſh white eggs: in hot climates 20, the ſize of thoſe of a turkey. Theſe, if let alone, ſhe lays in ſome ſecret place, at a diſtance from the uſual reſort, to prevent their being broken by the male, which he is apt to do if he find them. The time of ſitting is from 27 to 30

days. The young may be fed with curd, chopped l s, barley-meal, &c. moiſtened; and are fond of graſhopp nd ſome other inſects. In five or ſix months they will feed old ones, on wheat and barley, with what elſe they can pick up in the circuit of their confinement. They ſeem to prefer the moſt elevated places to rooſt on during night; ſuch as high trees, tops of houſes, and the like. Their cry is loud and inharmonious; a perfect contraſt to their external beauty. They are caught in India, by carrying lights to the trees where they rooſt, and having painted repreſentations of the bird preſented to them at the ſame time; when they put out the neck to look at the figure, the ſportſman ſlips a nooſe over the head, and ſecures his game. In moſt ages they have been eſteemed as a ſalutary food. Hortenſius gave the example at Rome, where it was carried to the higheſt luxury, and ſold dear: and a young peafowl is thought a dainty even in the preſent times.

The life of this bird is reckoned by ſome at about 25 years; by others 100.

2. The *variegated* peacock is nothing elſe but a mixed breed between the common and white peacock; and of courſe varies very conſiderably in colour.

3. The *white* peacock is, as its name imports, entirely white, not excepting even the eyes of the train, which it is nevertheleſs eaſy to trace out. This variety is in Latham's opinion more common in England than elſewhere. We are informed by the ſame author, that two inſtances have occurred to him of the females of this ſpecies having the external marks of the plumage of the male.

4. The *pavo muticus* is about the ſize of the creſted peacock; but the bill is larger and aſh-coloured: the irides are yellow, and round the eyes is red; on the top of the head is an upright creſt four inches long, and ſhaped ſomewhat like an ear of corn. The colour is green mixed with blue. The top of the neck and head are greeniſh, marked with ſpots of blue, which have a ſtreak of white down the middle of each: the back is greeniſh blue: the breaſt is blue and green gold mixed: the belly, ſides, and thighs are aſh colour, marked with black ſpots, ſtreaked with white on the belly: the wing coverts and ſecondaries are not unlike the back: the greater quills are green, tranſverſely barred with black lines, but growing yellowiſh towards the ends, where they are black: the upper tail coverts are fewer than thoſe of the common peacock, but much longer than the tail; they are of a cheſnut brown, with white ſhafts, and have at the end of each a large ſpot gilded in the middle, then blue, and ſurrounded with green: the legs are aſh-coloured, and not furniſhed with ſpurs, or they have been overlooked by thoſe who have ſeen them.

The female is ſmaller than the male; and differs in having the belly quite black, and the upper tail coverts much ſhorter: the tail is green, edged with blue, and white ſhafts. It inhabits Japan, and is only known to Europe by means of a painting, ſent by the emperor of Japan to the pope.

So beautiful a ſpecies of birds as the peacock could not long remain a ſtranger in the more diſtant parts in which they were produced; for, ſo early as the days of Solomon, we find, among the articles imported in his Tarſhiſh navies, apes and peacocks. A monarch ſo converſant in all branches of natural hiſtory, "who ſpoke of trees, from the cedar of Lebanon, even unto the hyſſop that ſpringeth out of the wall; who ſpoke alſo of beaſts and of fowl," would certainly not neglect furniſhing his officers with inſtructions for collecting every curioſity in the countries they voyaged to, which gave him a knowledge that diſtinguiſhed him from all the princes of his time. Ælian relates, that they were brought into Greece from ſome barbarous country; and that they were held in ſuch high eſteem, that a male and female were valued at Athens at 1000 drachmæ, or 32l. 5s. 10d. Their next ſtep might be to Samos; where they were preſerved about the temple of Juno, being the birds ſacred to that goddeſs; and Gellius, in his *Noctes Atticæ*, c. 16. commends the excellency of the Samian peacocks. It is therefore probable, that they were brought there originally for the purpoſes of ſuperſtition, and afterwards cultivated for the uſes of luxury. We are alſo told, when Alexander was in India, he found vaſt numbers of wild ones on the banks of the Hyarotis; and was ſo ſtruck with their beauty, as to appoint a ſevere puniſhment on any perſon that killed them.

Peacocks creſts, in ancient times, were among the ornaments of the kings of England. Ernald de Aclent was fined to king John in 140 palfries, with ſackbuts, lorains, gilt ſpurs, and peacocks creſts, ſuch as would be for his credit. See Plate 30.

5. The *pavo bicalcaratus* is larger than the common pheaſant. The bill is black, but from the noſtrils to the tip of the upper mandible red. The irides are yellow. The feathers on the crown of the head are ſufficiently long to form a creſt, of a dull brown colour. The ſpace between the bill and eyes is naked, with a few ſcattered hairs: the ſides of the head are white: the neck is bright brown, ſtriated acroſs with duſky brown: the upper parts of the back, ſcapulars, and wing-coverts, are dull brown, dotted with paler brown and yellowiſh; beſides which, each feather is marked near the end with a roundiſh large ſpot of a gilded purple colour, changing into blue and green in different lights: the lower part of the back and rump are dotted with white: all the under parts are brown, ſtriated tranſverſely with black: the quills are duſky; the ſecondaries are marked with the ſame ſpot as the reſt of the wing: the upper tail coverts are longer than the tail, and each marked at the end with a ſpot like the wing feathers, each of which is ſurrounded firſt with a circle of black, and ultimately with an orange one: the legs and claws are brown, and on the back part of each leg are two ſpurs, one above the other.

The female is a third ſmaller than the male. The head, neck, and under parts are brown; the head ſmooth: the upper parts are alſo brown, and the feathers marked with a dull blue ſpot, ſurrounded with dirty orange: the feathers which cover the tail are ſimilar; but marked at the end with an obſcure dull oval ſpot of blue: the legs have no ſpurs.

This ſpecies is of Chineſe origin, and ſome of them have been brought from China to England alive, and have been for ſome time in the poſſeſſion of Dr. James Monro. The male is now in the Leverian Muſeum, in the fineſt preſervation.

Sonnerat obſerves, that the bird from whence his deſcription was taken had two ſpurs on one leg, and three on the other. This muſt ſurely be a *luſus naturæ*; eſpecially as he ſays, it is the ſame as that in *Edw.* pl. 67.

6. The *pavo tibetanus* is about the ſize of a pintado, being about two feet and nearly two inches long. The bill is above an inch and a half long, and cinereous: the irides are yellow: the head, neck, and under parts are aſh-coloured, marked with blackiſh lines: the wing coverts, back, and rump, are grey, with ſmall white dots; beſides which, on the wing coverts and back are large round ſpots of a fine blue, changing in different lights to violet and green gold: the quills and upper tail coverts are alſo grey, marked with blackiſh lines; the quills have two round blue ſpots on each, like thoſe of the coverts; on the outer webs, and on each tail feather, there are four of the ſame, two on each ſide the web; the middle coverts are the longeſt, the others ſhorten by degrees: the legs are grey, furniſhed with two ſpurs behind, like the laſt ſpecies: the claws are blackiſh. This ſpecies inhabits the kingdom of Thibet. The Chineſe give it the name of *Chin-tchien Khi*.

PAVO, in ichthyology. See PEACOCK-*fiſh*.

PAVO, in aſtronomy, a conſtellation in the ſouthern hemi-

ſphere, unknown to the ancients, and not viſible in our latitude. It conſiſts of 14 ſtars, of which the names and ſituations are as follow:

	Signs.	Longitud.			Latitude, South.			Magnitude.
		°	′	″	°	′	″	
The eye of the peacock	♍	20	0	3	36	11	18	2
In the breaſt		24	41	51	46	56	21	3
In the right wing		18	41	38	45	52	34	3
In the middle		3	42	28	44	29	8	3
In the root of the tail, firſt		3	53	24	44	6	13	5
5.								
ſecond		2	42	11	41	37	9	5
third		3	55	22	39	3	23	4
fourth		5	11	3	37	10	46	6
fifth		0	49	34	38	54	14	5
ſixth	♎	29	39	17	38	3	36	4
10.								
ſeventh		27	22	54	40	9	28	5
laſt		24	7	44	41	28	2	4
In the right foot	♍	1	22	11	48	6	2	4
In the left foot		9	43	7	50	49	7	4

See ASTRONOMY.

PAVOR, a Roman deity, whoſe worſhip was introduced by Tullus Hoſtilius, who, in a panic, vowed a ſhrine to him, and one to Pallor, *Paleneſs*; and therefore they are found on the coins of that family.

PAURÆDASTYLÆ, in natural hiſtory, the name of a genus of perfect cryſtals with double pyramids, and no intermediate column, compoſed of 12 planes, or two hexangular pyramids joined baſe to baſe.

PAUSANIA, in Grecian antiquity, a feſtival in which were ſolemn games, wherein nobody contended but free-born Spartans; in honour of Pauſanias the Spartan general, under whom the Greeks overcame the Perſians in the famous battle of Platæa.

PAUSANIAS, a Spartan king and general, who ſignalized himſelf at the battle of Platæa againſt the Perſians. The Greeks, very ſenſible of his ſervices, rewarded his merit with a tenth of the ſpoils taken from the Perſians. He was afterwards appointed to command the Spartan armies, and he extended his conqueſts in Aſia; but the haughtineſs of his behaviour created him many enemies; and the Athenians ſoon obtained a ſuperiority in the affairs of Greece.—Pauſanias, diſſatisfied with his countrymen, offered to betray Greece to the Perſians, if he received in marriage as the reward of his perfidy the daughter of their king. His intrigues were diſcovered by means of a young man who was intruſted with his letters to Perſia, and who refuſed to go, on recollecting that ſuch as had been employed in that office before had never returned. The letters were given to the Ephori of Sparta, and the perfidy of Pauſanias was thus diſcovered. He fled for ſafety to a temple of Minerva; and as the ſanctity of the place ſereened him from the violence of his purſuers, the ſacred building was ſurrounded with heaps of ſtones, the firſt of which was carried there by the indignant mother of the unhappy man. He was ſtarved to death in the temple, and died about 474 years before the Chriſtian era. There was a feſtival and ſolemn games inſtituted to his honour, in which only free-born Spartans contended. There was alſo an oration ſpoken in his praiſe, in which his actions were celebrated, particularly the battle of Platæa, and the defeat of Mardonius. See PAUSANIA.

PAUSANIAS, a learned Greek hiſtorian and orator, in the ſecond century, under the reign of Antoninus the philoſopher, was the diſciple of Herodus Atticus. He lived for a long time in Greece; and afterwards went to Rome, where he died at a great age. He wrote an excellent deſcription of Greece, in ten books; in which we find not only the ſituation of places, but the antiquities of Greece, and every thing moſt curious and worthy of knowledge. Abbe Gedoin has given a French tranſlation of it, in 2 vols. 4to.

PAUSE, a ſtop or ceſſation in ſpeaking, ſinging, playing, or the like. One uſe of pointing in grammar is to make proper pauſes, in certain places.—There is a pauſe in the middle of each verſe; in an hemiſtich, it is called a *reſt* or *repoſe*. See POETRY, and READING.

PAW, in the manege. A horſe is ſaid to paw the ground, when, his leg being either tired or painful, he does not reſt it upon the ground, and fears to hurt himſelf as he walks.

PAWN, a pledge or gage for ſurety of payment of money lent. It is ſaid to be derived *a pugno, quia res quæ pignori dantur, pugno vel manu traduntur*. The party that pawns goods hath a general property in them; they cannot be forfeited by the party that hath them in pawn for any offence of his, nor be taken in execution for his debt; neither may they otherwiſe be put in execution till the debt for which they are pawned is ſatisfied. If the pawn is laid up, and the pawnee robbed, he is not anſwerable; though if the pawnee uſe the thing, as a jewel, watch, &c. that will not be the worſe for wearing, which he may do, it is at his peril; and if he is robbed, he is anſwerable to the owner, as the uſing occaſioned the loſs, &c. If the pawn is of ſuch a nature that the keeping is a charge to the pawnee, as a cow or a horſe, &c. he may milk the one and ride the other, and this ſhall go in recompenſe for his keeping. Things which will grow the worſe by uſing, as apparel, &c. he may not uſe.

PEA, in botany. See PISUM.

PEACE *(Temple of)*, a celebrated temple at Rome, which was conſumed by fire A. D. 191; produced, as ſome writers ſuppoſe, by a ſlight earthquake, for no thunder was heard at the time. Dio Caſſius, however, ſuppoſes that it began in the adjoining houſes. Be that as it will, the temple with all the ſurrounding buildings was reduced to aſhes. That magnificent ſtructure had been raiſed by Veſpaſian after the deſtruction of Jeruſalem, and enriched with the ſpoils and ornaments of the temple of the Jews. The ancients ſpeak of it as one of the moſt ſtately buildings in Rome. There men of learning uſed to hold their aſſemblies, and lodge their writings, as many others depoſited their jewels, and whatever elſe they eſteemed of great value. It was likewiſe made uſe of as a kind of magazine for the ſpices that were brought by the Roman merchants out of Egypt and Arabia; ſo that many rich perſons were reduced to beggary, all their valuable effects and treaſures being conſumed in one night, with the temple.

PEACH, in botany. See AMYGDALUS.

PEACOCK, in ornithology. See PAVO.

PEACOCK-*Fiſh*. *Pinna ani radiis* 55, *caudali falcata*. The body of this fiſh is of various colours; the fin of the anus has 55 ſtreaks, and its tail is in the form of a creſcent. The head is without ſcales; it is brown upon the upper part, yellow above the eyes, and of a ſilver colour on the ſides. The back is round, and adorned with beautiful blue ſtreaks in a ſerpentine form; and the belly bright as ſilver. The fins of the breaſt are round, and, like thoſe of the belly, have a yellow ground with a grey border; that of the back is of a violet colour; that of the anus is ſtraw-coloured; and laſtly, that of the tail is yellow on the ſides, red towards the middle, and bordered with a deep blue. We are as yet ignorant of its length.

There is a variety of this fiſh found only in the Indian ſeas, and therefore called the *Indian peacock-fiſh*; which is thus deſcribed in the language of Linnæus: *Pavo pinna caudali forcipata: ſpinis dorſalibus* 14: *ocello cæruleo pone oculos*. It has the

fin of its tail forked; 14 ſharp points or prickles on the back, with a round blue ſtreak behind the eyes.

The body of this fiſh is of an elliptical form; the head is covered with ſcales to the tip of the ſnout; the two jaws are armed with long and ſharp teeth; the ball of the eye is black, and the iris of a white colour, with a mixture of green. At the inſertion of the fins of the belly is found a bony ſubſtance. The head, back, and ſides, are of a yellow colour, more or leſs deep, and covered with lines or ſtreaks of ſky-blue. Theſe colours are ſo agreeably mixed, that they reſemble the elegance of the peacock's tail.

PEAK of Derbyshire, a chain of very high mountains in the county of Derby in England, famous for the mines they contain, and for their remarkable caverns. The moſt remarkable of theſe are Pool's-hole and Elden-hole. The former is a cave at the foot of a high hill called *Coitmoſs*, ſo narrow at the entrance that paſſengers are obliged to creep on all-fours; but it ſoon opens to a conſiderable height, extending to above a quarter of a mile, with a roof ſomewhat reſembling that of an ancient cathedral. By the petrifying water continually dropping in many parts of the cave are formed a variety of curious figures and repreſentations of the works both of nature and art. There is a column here as clear as alabaſter, which is called *The Queen of Scots Pillar*, becauſe Queen Mary is ſaid to have proceeded thus far when ſhe viſited the cavern. It ſeems, the curioſity of that princeſs had led her thus far into the dark abode; and indeed there are few travellers who care to venture farther; but others, determined to ſee the end of all, have gone beyond it. After ſliding down the rock a little way, is found the dreary cavity turned upwards: following its courſe, and climbing from crag to crag, the traveller arrives at a great height, till the rock, cloſing over his head on all ſides, puts an end to any further ſubterraneous journey. Juſt at turning to deſcend, the attention is caught by a chaſm, in which is ſeen a candle glimmering at a vaſt depth underneath. The guides ſay, that the light is at a place near Mary Queen of Scots pillar, and no leſs than 80 yards below. It appears frightfully deep indeed to look down; but perhaps does not meaſure any thing like what it is ſaid to do. If a piſtol is fired by the Queen of Scots pillar, it will make a report as loud as a cannon. Near the extremity there is a hollow in the roof, called the *Needle's Eye*; in which if a candle is placed, it will repreſent a ſtar in the firmament to thoſe who are below. At a little diſtance from this cave is a ſmall clear ſtream conſiſting of hot and cold water, ſo near each other, that the finger and thumb of the ſame hand may be put, the one into the hot water and the other into the cold.

Elden-hole is a dreadful chaſm in the ſide of a mountain; which, before the latter part of the laſt century, was thought to be altogether unfathomable. In the time of queen Elizabeth, a poor man was let down into it for 200 yards; but he was drawn up in a frenzy, and ſoon after died. In 1682, it was examined by captain Collins, and in 1699 by captain Sturmy, who publiſhed their accounts in the Philoſophical Tranſactions. The latter deſcended by ropes fixed at the top of an old lead-ore pit, four fathoms almoſt perpendicular, and from thence three fathoms more obliquely, between two great rocks. At the bottom of this he found an entrance into a very ſpacious cavern, from whence he deſcended along with a miner for 25 fathoms perpendicular. At laſt they came to a great river or water, which he found to be 20 fathoms broad and eight fathoms deep. The miner who accompanied him, inſiſted that this water ebbed and flowed with the ſea; but the captain diſproved this aſſertion, by remaining in the place from three hours flood to two hours ebb, during which time there was no alteration in the height of the water. As they walked by the ſide of this water, they obſerved a hollow in the rock ſome feet above them. The miner went into this place, which was the mouth of another cavern; and walked for about 70 paces in it, till he juſt loſt ſight of the captain. He then called to him, that he had found a rich mine; but immediately after came running out, and crying that he had ſeen an evil ſpirit; neither could any perſuaſions induce him to return. The floor of theſe caverns is a kind of white ſtone enamelled with lead ore, and the roofs are encruſted with ſhining ſpar. On his return from this ſubterraneous journey, captain Sturmy was ſeized with a violent headach, which, after continuing four days, terminated in a fever, of which he died in a ſhort time.

Several years ago this cavern was viſited by the late Mr. James Ferguſon, who tells us, that it conſiſts of two hollows one over another; but that the mouth of the lowermoſt is now ſtopped up by planks of timber laid acroſs it, on which is a heap of ſtones thrown in at the upper mouth with a deſign to fill up the cavern entirely; which, however, will probably be never accompliſhed on account of its vaſt ſize.

Peak *of Tenerife*. See Teneriffe.

PEAN, in heraldry, is when the field of a coat of arms is ſable, and the powderings or.

PEAR, in botany. See Pyrus.

Pear-*Glaſs*. See Vitrea *Lacryma*.

PEARCE (Dr.), lord biſhop of Rocheſter, was the ſon of a diſtiller in High Holborn. He married miſs Adams, the daughter of a diſtiller in the ſame neighbourhood, with a conſiderable fortune, who lived with him 52 years in the higheſt degree of connubial happineſs. He had his education in Weſtminſter ſchool, where he was diſtinguiſhed by his merit, and elected one of the king's ſcholars. In 1710, when he was 20 years old, he was elected to Trinity college, Cambridge. During the firſt years of his reſidence at the univerſity, he ſometimes amuſed himſelf with lighter compoſitions, ſome of which are inſerted in the Guardian and Spectator. In 1716, he publiſhed his edition of *Cicero de Oratore*, and, at the deſire of a friend, luckily dedicated it to lord chief juſtice Parker (afterwards earl of Macclesfield); to whom he was a ſtranger. This incident laid the foundation of his future fortune: for lord Parker ſoon recommended him to Dr. Bentley, maſter of Trinity, to be made one of the fellows; and the doctor conſented to it on this condition, that his lordſhip would promiſe to *unmake* him again as ſoon as it lay in his power to give him a living. In 1717, Mr. Pearce was ordained at the age of 27; having taken time enough, as he thought, to attain a ſufficient knowledge of the ſacred office. In 1718, lord Parker was appointed chancellor, and invited Mr. Pearce to live with him in his houſe as chaplain. In 1719 he was inſtituted into the rectory of Stapleford Abbots, in Eſſex; and in 1720, into that of St. Bartholomew, behind the Royal Exchange, worth 400l. *per annum*. In 1723, the lord chancellor preſented him to St. Martin's in the Fields. His majeſty, who was then at Hanover, was applied to in favour of St. Claget, who was then along with him; and the doctor actually kiſſed hands upon the occaſion: but the chancellor, upon the king's return, diſputed the point, and was permitted to preſent Mr. Pearce. Mr. Pearce ſoon attracted the notice and eſteem of perſons in the higheſt ſtations and of the greateſt abilities. Beſide lord Parker, he could reckon amongſt his patrons or friends, lord Macclesfield, Mr. Pulteney (afterwards earl of Bath), archbiſhop Potter, lord Hardwicke, Sir Iſaac Newton, and other illuſtrious perſonages. In 1724, the degree of doctor of divinity was conferred on him by archbiſhop Wake. The ſame year he dedicated to his patron, the earl of Macclesfield, his edition of *Longinus on the Sublime*, with a new Latin verſion and notes.

When the church of St. Martin's was rebuilt, Dr. Pearce preached a ſermon at the conſecration, which he afterwards printed, and accompanied with an eſſay on the origin and pro-

greſs of temples, traced from the rude ſtones which were firſt uſed for altars, to the noble ſtructure of Solomon, which he conſiders as the firſt temple completely covered. His obſervations on that building which is called the *Temple of Dagon* remove part of the difficulty which preſents itſelf in the narration of the manner in which Samſon deſtroyed it.

The deanery of Wincheſter becoming vacant, Dr. Pearce was appointed dean in 1739; and in the year 1744 he was elected prolocutor of the lower houſe of convocation for the province of Canterbury. His friends now began to think of him for the epiſcopal dignity; but Mr. Dean's language rather declined it. However, after ſeveral difficulties had been ſtarted and removed, he conſented to accept the biſhopric of Bangor, and promiſed lord Hardwicke to do it with a good grace. He accordingly made proper acknowledgments of the royal goodneſs, and was conſecrated Feb. 12, 1748. Upon the declining ſtate of health of Dr. Wilcocks, biſhop of Rocheſter, the biſhop of Bangor was ſeveral times applied to by archbiſhop Herring to accept of Rocheſter, and the deanery of Weſtminſter, in exchange for Bangor; but the biſhop then firſt ſignified his deſire to obtain leave to reſign, and retire to a private life. His lordſhip, however, upon being preſſed, ſuffered himſelf to be prevailed upon. "My lord (ſaid he to the duke of Newcaſtle), your grace offers theſe dignities to me in ſo generous and friendly a manner, that I promiſe you to accept them." Upon the death of biſhop Wilcocks he was accordingly promoted to the ſee of Rocheſter and deanery of Weſtminſter in 1756. Biſhop Sherlock died in 1761, and lord Bath offered his intereſt for getting the biſhop of Rocheſter appointed to ſucceed him in the dioceſe of London; but the biſhop told his lordſhip, that he had determined never to be biſhop of London or archbiſhop of Canterbury.

In the year 1763, his lordſhip being 73 years old, and finding himſelf leſs fit for the buſineſs of his ſtations as biſhop and dean, informed his friend lord Bath of his intention to reſign both, and live in a retired manner upon his private fortune. Lord Bath undertook to acquaint his majeſty; who named a day and hour, when the biſhop was admitted alone into the cloſet. He told the king, that he wiſhed to have ſome interval between the fatigues of buſineſs and eternity; and deſired his majeſty to conſult proper perſons about the propriety and legality of his reſignation. In about two months the king informed him, that lord Mansfield ſaw no objection; and that lord Northington, who had been doubtful, on farther conſideration thought that the requeſt might be complied with. Unfortunately for the biſhop, lord Bath applied for biſhop Newton to ſucceed. This alarmed the miniſtry, who thought that no dignities ſhould be obtained but through their hands. They therefore oppoſed the reſignation; and his majeſty was informed that the biſhops diſliked the deſign. His majeſty ſent to him again; and at a third audience told him, that he muſt think no more of reſigning. The biſhop replied, "Sir, I am all duty and ſubmiſſion;" and then retired.

In 1768 he obtained leave to reſign the deanery; in 1773, he loſt his lady; and after ſome months of lingering decay, he died at Little Ealing, June 29, 1774.

This eminent prelate diſtinguiſhed himſelf in every part of his life by the virtues proper to his ſtation. His literary abilities, and application to ſacred and philological learning, appear by his works; the principal of which are, A letter to the clergy of the church of England, on occaſion of the biſhop of Rocheſter's commitment to the Tower, 2d edit. 1722. Miracles of Jeſus vindicated, 1727 and 1728. A review of the text of Milton, 1733. Two letters againſt Dr. Middleton, occaſioned by the doctor's letter to Waterland, on the publication of his treatiſe, entitled, *Scripture Vindicated*, 3d edit. 1752. And ſince his death, a commentary with notes on the four Evangeliſts and the Acts of the Apoſtles, together with a new tranſlation of St. Paul's firſt Epiſtle to the Corinthians, with a paraphraſe and notes, have been publiſhed, with his life prefixed, from original MSS. in 2 vols. 4to.

PEARCH, in ichthyology. See PERCA. The pearch affords good ſport for the angler. The beſt time for their biting is when the ſpring is over, and before the heats of ſummer come on. At this time they are very greedy; and the angler, with good management, may take at one ſtanding all that are in the hole, be they ever ſo many.

The proper baits are a minow or young frog; but the worm called the *brandling*, well ſcoured, is alſo excellent at all times of the year. When the pearch bites, he ſhould always have a great deal of time allowed him to ſwallow the bait.

The pearch will bite all day long, if the weather be cloudy; but the beſt time is from eight to ten in the morning, and from three till ſix in the afternoon. The pearch is very abſtemious in winter, and will ſeldom bite in this ſeaſon of the year: if he does at all, it is in the middle of the day; at which time indeed all fiſh bite beſt at that ſeaſon. If the bait be a minow, which is the bait that affords moſt diverſion to the angler, it muſt be faſtened to the hook alive, by putting the hook through the upper lip or back-fin; it muſt be kept at about mid-water, and the float muſt be a quill and a cork, that the minow alone may not be able to ſink it.

The line muſt be of ſilk, and ſtrong; and the hook armed with a ſmall and fine wire, that if a pike ſhould take the bait, as is not unfrequently the caſe, he may be taken. The way to carry the minows or ſmall gudgeons alive for baits is this: A tin pot is to be provided, with holes in the lid, and filled with water; and the fiſh being put in this, the water is to be changed once in a quarter of an hour by the holes, without taking off the lid at any time except when the bait is to be taken out.

A ſmall caſting-net, made for theſe little fiſh, ſhould be taken out with the pearch-tackle; and one or two caſts of this will take baits enough for the day, without any farther trouble. When the bait is a frog, the hook is to be faſtened to the upper part of the leg. The beſt place for the fiſhing for pearch is in the turn of the water near ſome gravelly ſcour. A place of this kind being pitched upon, it ſhould be baited over-night with lobworms chopped to pieces; and in the morning, on going to it, the depth is to be regularly plumbed, and then the hook is to be baited with the worm or other bait; and as it drags along, the pearch will ſoon ſeize upon it.

PEARCH-*Glue*, the name of a kind of glue, of remarkable ſtrength and purity, made from the ſkins of pearches.

PEARL, in natural hiſtory, a hard, white, ſhining body, uſually roundiſh, found in a teſtaceous fiſh reſembling an oyſter.

Pearls, though eſteemed of the number of gems by our jewellers, and highly valued, not only at this time but in all ages, proceed only from a diſtemper in the creature that produces them, analogous to the bezoars and other ſtony concretions in ſeveral animals of other kinds.

The fiſh in which theſe are uſually produced is the Eaſt Indian pearl-oyſter, as it is commonly called. Beſides this ſhell, there are many others that are found to produce pearls; as the common oyſter, the muſcle, and ſeveral others; the pearls of which are often very good; but thoſe of the true Indian berberi, or pearl-oyſter, are in general ſuperior to all. The ſmall or ſeed-pearls, alſo called *ounce-pearls*, from their being ſold by the ounce and not by tale, are vaſtly the moſt numerous and common: but, as in diamonds, among the multitudes of ſmall ones, there are ſmaller numbers and larger found, ſo in pearls there are larger and larger kinds; but as they increaſe in ſize, they are proportionably leſs frequent; and this is one reaſon of their great price. We have Scotch pearls frequently as big as a little

tare, ſome as big as a large pea, and ſome few of the ſize of a horſe-bean; but theſe are uſually of a bad ſhape, and of little value in proportion to their weight. Philip II. of Spain had a pearl perfect in its ſhape and colour, and of the ſize of a pigeon's egg. The fineſt, and what is called the true ſhape of the pearl, is a perfect round; but if pearls of a conſiderable ſize are of the ſhape of a pear, as is not unfrequently the caſe, they are not leſs valued, as they ſerve for ear-rings and other ornaments. Their colour ought to be a pure white; and that not a dead and lifeleſs, but a clear and brilliant one: they muſt be perfectly free from any foulneſs, ſpot, or ſtain; and their ſurfaces muſt be naturally ſmooth and gloſſy; for they bring their natural poliſh with them, which art is not able to improve.

All pearls are formed of the matter of the ſhell, and conſiſt of a number of coats ſpread with perfect regularity one over another, in the manner of the ſeveral coats of an onion, or like the ſeveral ſtrata of the ſtones found in the bladders or ſtomachs of animals, only much thinner.

The manner of fiſhing for PEARLS in the *Eaſt Indies* is this: There are two ſeaſons for pearl-fiſhing: the firſt is in March and April, and the laſt in Auguſt and September; and the more rain there falls in the year, the more plentiful are theſe fiſheries. At the beginning of the ſeaſon there are ſometimes 250 barks on the banks: the larger barks have two divers, and the ſmaller one. As ſoon as the barks arrive at the place where the fiſh lie, and have caſt anchor, each diver binds a ſtone, ſix inches thick and a foot long, under his body, which ſerves him as a ballaſt, prevents his being driven away by the motion of the water, and enables him to walk more ſteadily under the waves. They alſo tie another very heavy ſtone to one foot, by which they are very ſpeedily ſent to the bottom of the ſea: and as the oyſters are uſually firmly faſtened to the rocks, they arm their hands with leather mittens, to prevent their being wounded in pulling them violently off; but this taſk ſome perform with an iron rake. In the laſt place, each diver carries down with him a large net, in the manner of a ſack, tied to his neck by a long cord, the other end of which is faſtened to the ſide of the bark. This net is to hold the oyſters gathered from the rock, and the cord is to pull up the diver when his bag is full, or when he wants air.

In this equipage he ſometimes precipitates himſelf ſixty feet under water; and as he has no time to loſe, he no ſooner arrives at the bottom, than he begins to run from ſide to ſide, tearing up all the oyſters he meets with, and cramming them into his budget.

At whatever depth the divers are, the light is ſo great, that they eaſily ſee whatever paſſes in the ſea; and, to their great conſternation, ſometimes perceive monſtrous fiſhes, from which all their addreſs in muddying the water, &c. will not always ſave them, but they unhappily become their prey: and of all the dangers of the fiſhery, this is one of the greateſt and moſt uſual. The beſt divers will keep under water near half an hour, and the reſt do not ſtay leſs than a quarter. During this time they hold their breath, without the uſe of oils or any other liquors; only acquiring the habit by long practice. When they find themſelves ſtraitened, they pull the rope to which the bag is faſtened, and hold faſt by it with both hands; when thoſe in the bark, taking the ſignal, heave them up into the air, and unload them of their fiſh; which is ſometimes 500 oyſters, and ſometimes not above 50. Some of the divers need a moment's reſpite to recover breath; others jump in again inſtantly, continuing this violent exerciſe without intermiſſion for ſeveral hours.

On the ſhore they unload their barks, and lay their oyſters in an infinite number of little pits dug in the ſand four or five feet ſquare, raiſing heaps of ſand over them to the height of a man; and in this condition they are left till the rain, wind, and ſun, have obliged them to open, which ſoon kills them: upon this the fleſh rots and dries, and the pearls, thus diſengaged, fall into the pit on their taking out the ſhells. After clearing the pits of the groſſer filth, they ſift the ſand ſeveral times in order to find the pearl; but, whatever care they take, they always loſe a great many. After cleaning and drying the pearls, they are paſſed through a kind of ſieve, according to their ſizes; the ſmalleſt are then ſold as ſeed pearls, and the reſt put up to auction, and ſold to the higheſt bidder.

Though thoſe ornaments are met with in all quarters of the globe, the moſt eſteemed have always been thoſe of Aſia, and the eaſt coaſt of Africa. In the kingdom of Madura, which lies on the eaſt of Malabar, there are many pearl-fiſheries. Tutukurin or Tutucorin is the principal, if not the only, city on the fiſhery coaſt. At the time the Portugueſe were maſters in theſe parts, the taking of oyſters in the ſtraits betwixt the iſland of Ceylon and the continent was ſtyled, by way of excellence, the *fiſhery*, and very deſervedly; for though ſome preſer the pearls taken near the iſland of Baharen in the Perſian gulf, and thoſe likewiſe found on the coaſt of China at Hainan, yet it might be very eaſily proved, from the compariſon of the annual amount of thoſe fiſheries within this period, that they were very ſeldom ſuperior to this of which we are ſpeaking. It was one of the wiſeſt points in the Portugueſe policy, that, though they were really in poſſeſſion of this beneficial commerce, yet they choſe to diſſemble it, and took all imaginable precautions in order to make the natives believe that they were perfectly free, and that their interpoſition was not ſo much the effects of authority as of good-will: it was for this reaſon that they never pretended to erect any fort either at Tutucorin or at Calipatnam, two towns upon the continent, from whence moſt of the fiſhers and their barks came, and that they ſuffered the ancient cuſtoms to take place.

The ſeaſon of the fiſhery was the latter end of April or the beginning of May, ſometimes ſooner, ſometimes later, according to the weather. The direction of it was left entirely to the ſovereign of the country, called the *naik*; and the Portugueſe, in quality of the protectors of the ſea, ſent two frigates to defend the fiſhing-veſſels from the Malabar and Maldive pirates. The time which this pearl-fiſhing laſted was about a fortnight, of the beginning of which the naik gave public notice; and, the day being come, there repaired to the place aſſigned ſeveral thouſands of people of all ſexes and ages, and an indefinite number of fiſhing veſſels, and divers from five or ſix hundred to a thouſand or more. Upon a ſignal given the boats put to ſea; and, having choſe their proper ſtations, the divers plunged and brought up the oyſters in little baſkets upon their heads; with which the boats being ſufficiently laden, they were carried on ſhore, where the people who remained there for that purpoſe buried them in the ſand, till, by the heat of the ſun, the fiſh was corrupted and conſumed, and the pearls eaſily taken out. The whole conduct of the firſt day's fiſhery belonged to the naik; and, after that deduction, what was caught every day was ſeparated, and particularly diſtinguiſhed, but went to the common profit. The whole number of the people employed at ſea and on ſhore amounted frequently to 50,000 or 60,000 ſouls; and the pavilions and tents ſet up for their accommodation made a fine appearance at a diſtance. When the pearls were extracted, cleanſed, and dried, they paſſed them through a kind of ſieves, by which their ſizes were diſtinguiſhed. When all was over, the naik appointed a time and place for the public market; in conſequence of which there was a kind of fair, that laſted commonly from the cloſe of June till the beginning of September. The ſmalleſt, which are what we call *ſeed pearl*, they ſold by weight, and all the reſt according to their reſpective ſizes and beauty, from a few ſhillings up to ten or twenty pounds, and ſometimes more a-piece; but there were few buyers, except the

Portugueſe merchants, who, bringing ready money, had got bargains, and thus all parties were pleaſed. The Portugueſe aſſumed the protection of this fiſhery very ſoon after they ſettled in the Indies, and held it till the year 1658; when, in conſequence of their loſſes in Ceylon and elſewhere, it fell into the hands of the Dutch, who have remained in poſſeſſion of it ever ſince.

The Dutch method of diſpoſing of their pearls is a little curious. On the coaſt of Madura, upon the continent, and ſometimes on the iſland of Manar, the oyſters caught are put up in tuns or barrels, of which when a certain number are full, they put them up to ſale by way of auction; and the merchants bid according as they have an opinion of the oyſters for the ſeaſon: but the middle price is between 30 and 40 ſhillings ſterling per caſk. When a merchant has bought ſuch a lot as this, he carries it to his quarters; and after a certain number of days he proceeds to opening the oyſters, but always in the air, for the ſtench is ſo great as to be almoſt inſupportable. They open them over tubs, into which they pour what comes out of the oyſters, as alſo that muddy water that remains in the caſk; next they draw it out into cullenders of ſeveral ſizes, and at length perhaps they find four or five ſhillings worth of pearls, ſometimes to the value of ten or twelve pounds; ſo that it is a perfect lottery, by which ſome few becoming rich, it betrays numbers into beggary. This pearl-fiſhery, we are told, brings the Dutch company an annual tribute of 20,000l.

There are a variety of rivers great and ſmall in Eaſtern Tartary conſiderable for pearl fiſhing; but theſe pearls, though much eſteemed by the Tartars, would be little valued by Europeans, on account of their defects in ſhape and colour. The Emperor Kang-hi had ſeveral chaplets or ſtrings of theſe pearls, each containing 100, which were very large, and exactly matched. There are many rivulets in Livonia which produce pearls almoſt equal in ſize and clearneſs to the oriental ones. There are ſeveral fiſheries both on the eaſtern and weſtern coaſts of Africa; the moſt conſiderable of which lie round ſome ſmall iſlands, over-againſt the kingdom of Sofala; but the people thus employed, inſtead of expoſing the oyſters to the warmth of the ſun, which would induce them to open, lay them upon the embers; by which abſurd method, thoſe pearls which they catch contract a dull kind of redneſs, which robs them of their natural luſtre as well as of their value. Pearl-fiſhing is performed by the women as well as the men; both being equally expert. In the ſea of California alſo there are very rich pearl-fiſheries. In Japan likewiſe there are found pearls of great price. Pearls are met with in all parts of the Red Sea, in the Indian Ocean, on the low part of the coaſt of Arabia Felix named *Baharen*, adjoining to the Perſian Gulf. They are likewiſe found on the low coaſt about Gunibroom to the eaſtward of the Perſian Gulf; and many of the fineſt kind are met with on the coaſts of Ceylon. They are moſt plentiful in the Baharen, between the coaſt of Arabia Felix and Ormus, whence they are tranſported to Aleppo, then ſent to Leghorn, and then circulated through Europe.

Mr. Bruce denies, what has been very commonly ſuppoſed, that pearls are found in a kind of oyſters. He informs us, that there is no ſuch fiſh as an oyſter to be met with in the Red Sea in particular. They are indeed found in bivalve ſhells, of which there are three kinds commonly ſought after by the pearl-fiſhers. One of theſe is a kind of muſcle now very rare; but whether more plentiful formerly than at preſent is not known: they are principally found in the north end of the Red Sea and on the Egyptian ſide; and Mr. Bruce informs us, that the only place in which he ever met with them was about Coſſair, and to the northward of it, where there was an ancient port called *Myos Hermos*, "which (ſays Mr. Bruce) commentators have called the port of the *Mouſe*, when they ſhould have tranſlated it the harbour of the *Muſcle*."

The ſecond ſort of ſhell is called *Pinna*. It is broad, and ſemicircular at the top, decreaſing gradually until it turns ſharp at the lower end, where the hinge is. The outſide is rough and figured, of a beautiful red colour, and ſometimes three feet long, and extremely brittle; the inſide lined with that beautiful ſubſtance called *nacre*, or mother-of-pearl.

The third kind of Pearl-ſhell is the only one which can be ſaid to bear any reſemblance to the oyſter; though even this is evidently of a different genus.

In a general view of the writings of Linnæus by Richard Pulteney, M. D. p. 42, it is ſaid that Linnæus made a remarkable diſcovery relating to the generation of pearls, in the river pearl-muſcle (*mya margaritifera*), a ſhell-fiſh found in ſeveral rivers of Great Britain and Ireland; that this fiſh will bear removal remarkably well; and that in ſome places they form reſervoirs for the purpoſe of keeping it, and taking out the pearl, which in a certain period will be renewed again. The diſcovery was a method which Linnæus found of putting theſe muſcles into a ſtate of producing pearls at his pleaſure, though the final effect did not take place for ſeveral years; but that, in five or ſix years after the operation, the pearl would have acquired the ſize of a vetch. Dr. Pulteney regrets that we are unacquainted with the means by which Linnæus accompliſhed this extraordinary operation, which was conſidered as important, ſince it is certain the author was rewarded with a munificent premium from the ſtates of the kingdom on that account.

The colours of pearls are different according to the ſhells in which they are found. The firſt kind often produces thoſe of a fine ſhape and excellent luſtre, but ſeldom of that very fine colour which enhances their price. The ſecond kind produces pearls having the reddiſh caſt of the inner ſhell of the pinna, called *mother of pearl*; which ſeems to confirm the opinion of Reaumur, that the pearls are formed from the glutinous fluid which makes the firſt rudiments of the ſhell; and this kind of pearl is found to be more red as it is formed nearer the broad part of the ſhell, which is redder than the other end. Mr. Bruce is of opinion that the pearl found in this ſhell is the *penim* or *peninim* of Scripture; and that this name is derived from its redneſs. "On the contrary (ſays he), the word *pinna* has been idly imagined to be derived from *penna*, a feather; as being broad and round at the top, and ending at a point, or like a quill, below. The Engliſh tranſlation of the Scripture, erroneous and inaccurate in many things more material, tranſlates this *peninim* by rubies, without any foundation or authority but becauſe they were both red, as are bricks or tiles, and many other things of baſe materials. The Greeks have tranſlated it literally *pina* or *pinna*, and the ſhell they call *pinnicus*; and many places occur in Strabo, Theophraſtus, Elian, and Ptolemy, which are mentioned as famous for this kind of pearl. I ſhould imagine alſo, that by Solomon ſaying it is the moſt precious of all productions, he means that this ſpecies of pearl was the moſt valued or the beſt known in Judæa; for, though we learn from Pliny that the excellency of pearls was their whiteneſs, yet we know that the pearls of a yellowiſh caſt are thoſe eſteemed in India to this day, as the *peninim* or reddiſh pearl was in Judæa in the days of Solomon. In Job, where all the variety of precious ſtones are mentioned, the tranſlater is forced, as it were unwillingly, to render *peninim* pearls, as he ought indeed to have done in many other places where it occurs."

The third ſort of ſhell produces pearls of extreme whiteneſs, which Bochart ſays are called *darra* or *dora* in Arabic; which ſeems to be a general term for all kinds of pearls in Scripture, whereas the *peninim* is one in particular. But though the character of this pearl be extreme whiteneſs, we are told by Pliny that there are ſhades or differences of it. The cleareſt, he ſays, are thoſe of the Red Sea; but the pearls of India have the colour of the flakes or diviſions of the lapis ſpecularis. The moſt excellent are thoſe like a ſolution of alum, limpid, milky-

like, and even with a certain almoſt imperceptible caſt of a fiery colour. Theophraſtus tells us, that theſe pearls are tranſparent, as the deſcription of Pliny would lead us to imagine; but it is not ſo; and if they were, it is apprehended they would loſe all their beauty and value, and approach too much to glaſs. The value of theſe commodities depends upon their ſize, regularity of form, whether round or not, weight, ſmoothneſs, colour, and the different ſhades of that colour. The pearl-fiſhers ſay, that when the ſhell is ſmooth and perfect, they never expect to find any pearls, but always do ſo when it has begun to be deformed and diſtorted. Hence it would ſeem, that as the fiſh turned older, the veſſels containing the juice for forming the ſhell, and keeping it in its vigour, grew weak and ruptured; and thence, from this juice accumulating in the fiſh, the pearl was formed, and the ſhell brought to decay, as ſuppoſed by Mr. Reaumur. If this be the caſe, it ought to be known by the form of the ſhell whether the pearl is large or ſmall; and thus the ſmaller ones being thrown back into the ſea, a conſtant crop of large pearls might be obtained.

Pliny ſays that pearls are the moſt valuable and excellent of all precious ſtones; and from our Saviour's comparing the kingdom of heaven to a pearl, it would ſeem that they really were held in ſuch high eſtimation at that time. Mr. Bruce, however, is of opinion, that this extraordinary value was put only upon the very large kind; of which we are told, that Servilia, the mother of Marcus Brutus, preſented one to Cæſar of the value of 50,000l. of our money; and Cleopatra diſſolved one worth 250,000l. in vinegar, which ſhe drank at a ſupper with Mark Antony.

It is generally ſaid that the pearl-ſhells grow on rocks, which, together with the method of catching them, we have already mentioned. Some ſay they are taken with nets: from whence Mr. Bruce contraverts the idea of their growing on rocks; for nobody, he ſays, would employ nets to gather fiſh from among rocks. He tells us, that all kinds of them are found in the deepeſt and ſtilleſt water, and ſofteſt bottom; the parts of moſt of them being too fine to bear the agitation of the ſea among the rocks. It is obſerved that they produce the moſt beautiful pearls in thoſe places of the ſea where a quantity of freſh water falls. "Thus (ſays Mr. Bruce), in the Red Sea, they are always moſt eſteemed that were fiſhed from Suakern ſouthward, that is, in thoſe parts correſponding to the country anciently called *Berberia* and *Azamia*; on the Arabian coaſt, near the iſland Camaran, where there is abundance of freſh water; and in the iſland of Fooſht. As it is a fiſh that delights in repoſe, I imagine it avoids this part of the Gulf, as lying open to the Indian Ocean, and agitated by variable winds."

Mr. Bruce mentions a muſcle found in the ſalt ſprings of the Nubian deſert; in many of which he found thoſe excreſcences which might be called pearls, but all of them ill formed, foul, and of a bad colour, though of the ſame conſiſtence, and lodged in the ſame part of the body as thoſe in the ſea. "The muſcle, too (ſays our author), is in every reſpect ſimilar, I think larger. The outer ſkin or covering of it is of a vivid green. Upon removing this, which is the epidermis, what next appears is a beautiful pink, without gloſs, and ſeemingly of a calcareous nature. Below this, the mother-of-pearl, which is undermoſt, is a white without luſtre, partaking much of the blue and very little of the red; and this is all the difference I obſerved between it and the pearl-bearing muſcle of the Red Sea."

The mother-of-pearl manufactory is brought to the greateſt perfection at Jeruſalem. The moſt beautiful ſhell of this kind is that of the peninim already mentioned; but it is too brittle to be employed in any large pieces of workmanſhip; whence that kind named *dora* is moſt uſually employed; and great quantities of this are daily brought from the Red Sea to Jeruſalem. Of theſe, all the fine works, the crucifixes, the wafer-boxes, and the beads, are made, which are ſent to the Spaniſh dominions in the New World, and produce a return incomparably greater than the ſtaple of the greateſt manufactory in the Old.

Very little is known of the natural hiſtory of the pearl fiſh. Mr. Bruce ſays, that, as far as he has obſerved, they are all ſtuck upright in the mud by an extremity; the muſcle by one end, the pinna by the ſmall ſharp point, and the third by the hinge or ſquare part which projects from the round. "In ſhallow and clear ſtreams (ſays Mr. Bruce), I have ſeen ſmall furrows or tracks upon the ſandy bottom, by which you could trace the muſcle from its laſt ſtation; and theſe not ſtraight, but deviating into traverſes and triangles, like the courſe of a ſhip in a contrary wind laid down upon a map, probably in purſuit of food. The general belief is, that the muſcle is conſtantly ſtationary, in a ſtate of repoſe, and cannot transfer itſelf from place to place. This is a vulgar prejudice, and one of thoſe facts that are miſtaken for want of ſufficient pains or opportunity to make more critical obſervations. Others, finding the firſt opinion a falſe one, and that they are endowed with power of changing place like other animals, have, upon the ſame foundation, gone into the contrary extreme, ſo far as to attribute ſwiftneſs to them, a property ſurely inconſiſtent with their being fixed to rocks. Pliny and Solinus ſay that the muſcles have leaders, and go in flocks; and that their leader is endowed with great cunning to protect himſelf and his flock from the fiſhers; and that, when he is taken, the others fall an eaſy prey. This, however, we may juſtly look upon to be a fable. Some of the moſt accurate obſervers having diſcovered the motion of the muſcle, which indeed is wonderful, and that they lie in beds, which is not at all ſo, have added the reſt, to make their hiſtory complete." Our author informs us, that the muſcles found in the ſalt ſprings of Nubia likewiſe travel far from home, and are ſometimes ſurpriſed, by the ceaſing of the rains, at a greater diſtance from their beds than they have ſtrength and moiſture to carry them. He aſſures us, that none of the pearl-fiſh are eatable; and that they are the only fiſh he ſaw in the Red Sea that cannot be eaten.

Artificial PEARLS. Attempts have been made to take out ſtains from pearls, and to render the foul opaque-coloured ones equal in luſtre to the oriental. Abundance of proceſſes are given for this purpoſe in books of ſecrets and travels; but they are very far from anſwering what is expected from them. Pearls may be cleaned indeed from any external foulneſſes by waſhing and rubbing them with a little Venice ſoap and warm water, or with ground rice and ſalt, with ſtarch and powder-blue, plaſter of Paris, coral, white vitriol and tartar, cuttle-bone, pumice-ſtone, and other ſimilar ſubſtances; but a ſtain that reaches deep into the ſubſtance of pearls is impoſſible to be taken out. Nor can a number of ſmall pearls be united into a maſs ſimilar to an entire natural one, as ſome pretend.

There are, however, methods of making artificial pearls, in ſuch manner as to be with difficulty diſtinguiſhed from the beſt oriental. The ingredient uſed for this purpoſe was long kept a ſecret; but it is now diſcovered to be a fine ſilver-like ſubſtance found upon the under ſide of the ſcales of the blay or bleak fiſh. The ſcales, taken off in the uſual manner, are waſhed and rubbed with freſh parcels of fair water, and the ſeveral liquors ſuffered to ſettle: the water being then poured off, the pearly matter remains at the bottom, of the conſiſtence of oil, called by the French *eſſence d'orient*. A little of this is dropped into a hollow bead of blueiſh glaſs, and ſhaken about ſo as to line the internal ſurface; after which the cavity is filled up with wax, to give ſolidity and weight. Pearls made in this manner are diſtinguiſhable from the natural only by their having fewer blemiſhes.

Mother-of-PEARL, the ſhell, not of the pearl-oyſter, but of the *mytilus margaritifera*. See MYTILUS.

PEARL-*Aſh*, a kind of fixed alkaline ſalt, prepared chiefly in Germany, Ruſſia, and Poland, by melting the ſalts out of the aſhes of burnt wood; and having reduced them again to dryneſs, evaporating the moiſture, and calcining them for a conſiderable time in a furnace moderately hot. The goodneſs of pearl-aſhes muſt be diſtinguiſhed by the uniform and white appearance of them: they are nevertheleſs ſubject to a common adulteration, not eaſy to be diſtinguiſhed by the mere appearance, which is done by the addition of common ſalt. In order to find out this fraud, take a ſmall quantity of the ſuſpected ſalt; and after it has been ſoftened by lying in the air, put it over the fire in a ſhovel: if it contains any common ſalt, a crackling and kind of ſlight exploſion will take place as the ſalt grows hot.

Pearl-aſhes are much uſed in the manufacture of glaſs, and require no preparation, except where very great tranſparency is required, as in the caſe of looking-glaſs, and the beſt kind of window-glaſs. For this purpoſe diſſolve them in four times their weight of boiling water: when they are diſſolved, let the ſolution be put into a clean tub, and ſuffered to remain there 24 hours or more. Let the clear part of the fluid be then decanted off from the ſediment, and put back into the iron pot in which the ſolution was made; in this let the water be evaporated till the ſalts be left perfectly dry. Keep thoſe that are not deſigned for immediate uſe in ſtone jars, well ſecured from moiſture and air.

Mr. Kirwan, who has tried a courſe of experiments on the alkaline ſubſtances uſed in bleaching, &c. (ſee *Iriſh Tranſ.* for 1789), tells us, that in 100 parts of the Dantzick pearl-aſh the vegetable alkali amounted to ſomewhat above 63. His pearl-aſh he prepares by calcining a ley of vegetable aſhes dried into a ſalt to whiteneſs. In this operation, he ſays, "particular care ſhould be taken that it ſhould not melt, as the extractive matter would not be thoroughly conſumed, and the alkali would form ſuch a union with the earthy parts as could not eaſily be diſſolved." He has "added this caution, as Dr. Lewis and Mr. Doſſie have inadvertently directed the contrary." We apprehend, however, that here is a little inaccuracy; and that it was not for pearl-aſh, but for the unrefined pot-aſh, that theſe gentlemen directed fuſion. The fact is, that the American pot-aſhes, examined by them, had unqueſtionably ſuffered fuſion; which was effected in the ſame iron pot in which the evaporation was finiſhed, by rather increaſing the fire at the end of the proceſs: by this management, one of the moſt troubleſome operations in the whole manufacture, the ſeparation of the hard ſalt from the veſſels with hammers and chiſſels, was avoided; and though the extractive matter was not conſumed, it was burnt to an indiſſoluble coal; ſo that the ſalt, though black itſelf, produced a pale or colourleſs ſolution, and was uncommonly ſtrong. Mr. Kirwan has alſo given tables of the quantities of aſhes and ſalt obtained from different vegetables; and he concludes from them, 1. "That in general weeds yield much more aſhes, and their aſhes much more ſalt, than woods; and that, conſequently, as to ſalts of the vegetable alkali kind, neither America, Trieſte, nor the northern countries, poſſeſs any advantage over us. 2. That of all weeds, fumitory produces moſt ſalt, and next to it wormwood; but if we attend only to the quantity of ſalt in a given weight of aſhes, the aſhes of worm wood contain moſt. *Trifolium febrinum* alſo produces more aſhes and ſalt than fern." See POTASH.

PEARSON (JOHN), a very learned Engliſh biſhop in the 17th century, was born at Snoring in 1613. After his education at Eton and Cambridge, he entered into holy orders in 1639, and was the ſame year collated to the prebend of Nether-haven in the church of Sarum. In 1640 he was appointed chaplain to the lord keeper Finch, and by him preſented to the living of Torrington in Suffolk. In 1650 he was made miniſter of St. Clement's, Eaſt-cheap, in London. In 1657, he and Mr. Gunning had a diſpute with two Roman Catholics upon the ſubject of ſchiſm; a very unfair account of which was printed at Paris in 1658. Some time after, he publiſhed at London an Expoſition of the Creed, in folio, dedicated to his pariſhioners of St. Clement's, Eaſt-cheap, to whom the ſubſtance of that excellent work had been preached ſeveral years before, and by whom he had been deſired to make it public. The ſame year he likewiſe publiſhed The Golden Remains of the ever memorable Mr. John Hales of Eton; to which he prefixed a preface, containing, of that great man, with whom he had been acquainted for many years, a character drawn with great elegance and force. Soon after the Reſtoration, he was preſented by Juxon, then biſhop of London, to the rectory of St. Chriſtopher's in that city; created doctor of divinity at Cambridge, in purſuance of the king's letters mandatory; inſtalled prebendary of Ely; archdeacon of Surry; and made maſter of Jeſus college in Cambridge: all before the end of the year 1660. March 25th 1661, he was appointed Margaret profeſſor of divinity in that univerſity; and, the firſt day of the enſuing year, was nominated one of the commiſſioners for the review of the liturgy in the conference at the Savoy. April 14th 1662, he was admitted maſter of Trinity college in Cambridge; and, in Auguſt, reſigned his rectory of St. Chriſtopher's and prebend of Sarum. In 1667 he was admitted a Fellow of the Royal Society. In 1672 he publiſhed at Cambridge, in 4to, *Vindiciæ Epiſtolarum S. Ignatii*, in anſwer to Monſ. Daillé; to which is ſubjoined, *Iſaaci Voſſii epiſtolæ duæ adverſus Davidem Blondellum*. Upon the death of the celebrated Wilkins, Pearſon was appointed his ſucceſſor in the ſee of Cheſter, to which he was conſecrated February 9th 1672-3. In 1682, his *Annales Cyprianici, ſive tredecim annorum, quibus S. Cyprian. inter Chriſtianos verſatus eſt, hiſtoria chronologica*, was publiſhed at Oxford, with Fell's edition of that Father's works. Pearſon was diſabled from all public ſervice by ill health a conſiderable time before his death, which happened at Cheſter, July 16th 1686.

PEASANT, a hind; one whoſe buſineſs is rural labour. It is amongſt this order of men that a philoſopher would look for innocent and ingennous manners. The ſituation of the peaſantry is ſuch as ſecludes them from the devaſtations of luxury and licentiouſneſs; for, when the contagion has once reached the receſſes of rural retirement, and corrupted the minds of habitual innocence, that nation has reached the ſummit of vice, and is haſtening to that decay which has always been the effect of vicious indulgence. The peaſantry of this country ſtill in a great meaſure retain that ſimplicity of manners and ruſtic innocence which ought to be the characteriſtic of this order of ſociety; and, in many parts, their condition is ſuch as, were all its advantages ſufficiently known, would create envy in the minds of thoſe who have toiled through life, amidſt the buſtle of the world, in queſt of that happineſs which it could not confer.

O fortunatos nimium, ſua ſi bona nôrint,
Agricolas.—— VIRGIL.

In other countries the peaſants do not enjoy the ſame liberty as they do in our own, and are conſequently not ſo happy. In all feudal governments they are abject ſlaves, entirely at the diſpoſal of ſome petty deſpot. This was the caſe in Poland, where the native peaſants were ſubject to the moſt horrid ſlavery, though thoſe deſcended of the Germans, who ſettled in Poland during the reign of Boleſlaus the Chaſte and Caſimir the Great,

enjoyed very diſtinguiſhed privileges. Amongſt the native ſlaves, too, thoſe of the crown were in a better condition than thoſe of individuals.

The peaſants of Ruſſia (Mr. Coxe tells us) are a hardy race of men, and of great bodily ſtrength. Their cottages are conſtructed with tolerable propriety, after the manner of thoſe in Lithuania; but they are very poorly furniſhed. The peaſants are greedy of money, and, as the ſame author informs us, ſomewhat inclined to thieving. They afford horſes to travellers, and act the part of coachmen and poſtillions. "In their common intercourſe they are remarkably polite to each other: they take off their cap at meeting; bow ceremoniouſly and frequently, and uſually exchange a ſalute. They accompany their ordinary diſcourſe with much action, and innumerable geſtures; and are exceedingly ſervile in their expreſſions of deference to their ſuperiors: in accoſting a perſon of conſequence, they proſtrate themſelves, and even touch the ground with their heads. We were often ſtruck at receiving this kind of eaſtern homage, not only from beggars, but frequently from children, and occaſionally from ſome of the peaſants themſelves.

"The peaſants are well clothed, comfortably lodged, and ſeem to enjoy plenty of wholeſome food. Their rye-bread, whoſe blackneſs at firſt diſguſts the eye, and whoſe ſourneſs the taſte, of a delicate traveller, agrees very well with the appetite: as I became reconciled to it from uſe, I found it at all times no unpleaſant morſel, and, when ſeaſoned with hunger, it was quite delicious: they render this bread more palatable, by ſtuffing it with onions and groats, carrots or green corn, and ſeaſoning it with ſweet oil. The rye-bread is ſometimes white, and their other articles of food are eggs, ſalt fiſh, bacon, and muſhrooms; their favourite diſh is a kind of hodge podge, made of ſalt or ſometimes freſh meat, groats, rye-flour, highly ſeaſoned with onions and garlick, which latter ingredients are much uſed by the Ruſſians. Beſides, muſhrooms are ſo exceedingly common in theſe regions, as to form a very eſſential part of their proviſion. I ſeldom entered a cottage without ſeeing great abundance of them; and in paſſing through the markets, I was often aſtoniſhed at the prodigious quantity expoſed for ſale: their variety was no leſs remarkable than their number; they were of many colours, amongſt which I particularly noticed white, black, brown, yellow, green, and pink. The common drink of the peaſants is quaſs, a fermented liquor, ſomewhat like ſweet wort, made by pouring warm water on rye or barley meal; and deemed an excellent antiſcorbutic. They are extremely fond of whiſky, a ſpirituous liquor diſtilled from malt, which the pooreſt can occaſionally command, and which their inclination often leads them to uſe to great exceſs."

Theſe people are extremely backward in the mechanic arts, though, where they have much intercourſe with other nations, this does not appear, and therefore does not proceed from natural inability; indeed we have already given an inſtance of one peaſant of Ruſſia, who ſeems to poſſeſs very ſuperior talents. See NEVA.

The dreſs of theſe people is well calculated for the climate in which they live: they are particularly careful of their extremities. On their legs they wear one or two pair of thick worſted ſtockings; and they envelop their legs with wrappers of coarſe flannel or cloth ſeveral feet in length, and over theſe they frequently draw a pair of boots, ſo large as to receive their bulky contents with eaſe. The lower ſort of people are groſsly ignorant; of which we ſhall give a very ſurpriſing inſtance in the words of Mr Coxe:—"In many families, the father marries his ſon while a boy of ſeven, eight, or nine years old, to a girl of a more advanced age, in order, as it is ſaid, to procure an able-bodied woman for the domeſtic ſervice: he cohabits with this perſon, now become his daughter-in-law, and frequently has ſeveral children by her. In my progreſs through Ruſſia, I obſerved in ſome cottages, as it were, two miſtreſſes of a family; one the peaſant's real wife, who was old enough to be his mother; and the other, who was nominally the ſon's wife, but in reality the father's concubine. Theſe inceſtuous marriages, ſanctified by inveterate cuſtom, and permitted by the pariſh-prieſts, were formerly more common than they are at preſent; but as the nation becomes more refined, and the prieſts ſomewhat more enlightened; and as they have lately been diſcountenanced by government, they are daily falling into diſuſe; and, it is to be hoped, will be no longer tolerated."

The peaſants of Ruſſia, like thoſe of Poland, are divided into thoſe of the crown and thoſe of individuals; the firſt of which are in the beſt condition; but all of them undergo great hardſhips, being ſubject to the deſpotic will of ſome cruel overſeer. They may obtain freedom, 1. By manumiſſion on the death of their maſter, or otherwiſe: 2. By purchaſe; and, laſtly, by ſerving in the army or navy. The Empreſs has redreſſed ſome of the grievances of this claſs of her ſubjects. The hardineſs of the peaſants ariſes in a great meaſure from their mode of education and way of life, and from the violent changes and great extremes of heat and cold to which they are expoſed.

"The peaſants of Finland differ widely from the Ruſſians in their look and dreſs: they had for the moſt part fair complexions, and many of them red hair: they ſhave their beards, wear their hair parted at the top, and hanging to a conſiderable length over their ſhoulders. We could not avoid remarking, that they were in general more civilized than the Ruſſians; and that even in the ſmalleſt villages we were able to procure much better accommodations than we uſually met with in the largeſt towns which we had hitherto viſited in this empire."

The peaſants of Sweden (Mr. Coxe informs us) are more honeſt than thoſe in Ruſſia; in better condition, and poſſeſſing more of the conveniencies of life, both with reſpect to food and furniture. "They are well clad in ſtrong cloth of their own weaving. Their cottages, though built with wood, and only of one ſtory, are comfortable and commodious. The room in which the family ſleep is provided with ranges of beds in tiers (if I may ſo expreſs myſelf), one above the other: upon the wooden teſters of the beds in which the women lie, are placed others for the reception of the men, to which they aſcend by means of ladders. To a perſon who has juſt quitted Germany, and been accuſtomed to tolerable inns, the Swediſh cottages may perhaps appear miſerable hovels; to me, who had been long uſed to places of far inferior accommodation, they ſeemed almoſt palaces. The traveller is able to procure many conveniences, and particularly a ſeparate room from that inhabited by the family, which could ſeldom be obtained in the Poliſh and Ruſſian villages. During my courſe through thoſe two countries, a bed was a phenomenon which ſeldom occurred, excepting in the large towns, and even then not always completely equipped; but the pooreſt huts of Sweden were never deficient in this article of comfort: an evident proof that the Swediſh peaſants are more civilized than thoſe of Poland and Ruſſia.—After having witneſſed the ſlavery of the peaſants in thoſe two countries, it was a pleaſing ſatisfaction to find myſelf again among freemen, in a kingdom where there is a more equal diviſion of property; where there is no vaſſalage; where the loweſt order enjoy a ſecurity of their perſons and property; and where the advantages reſulting from this right are viſible to the commoneſt obſerver."

Till the French over-ran their country, and ſcattered the bleſſings of a ſpurious "liberty and equality" amongſt them, the peaſants of Holland and Switzerland were all in very tolerable con-

dition; not ſubject to the undiſputed controul of a hireling maſter, but enjoying in their ſeveral ſtations the bleſſings of freedom. In Bohemia, Hungary, and a great part of Germany, they are legally ſlaves, and ſuffer all the miſeries attending ſuch a condition. In Spain, Savoy, and Italy, they are little better. In France, their ſituation was ſuch as to warrant the firſt Revolution; but by carrying matters too far, they are now infinitely worſe than they ever were at any preceding period.

PEAT, a well known inflammable ſubſtance, uſed in many parts of the world as fuel. There are two ſpecies:

1. A yellowiſh-brown or black peat, found in mooriſh grounds in Scotland, Holland, and Germany. When freſh, it is of a viſcid conſiſtence, but hardens by expoſure to the air. It conſiſts, according to Kirwan, of clay mixed with calcareous earth and pyrites; ſometimes alſo it contains common ſalt. While ſoft, it is formed into oblong pieces for fuel, after the pyritaceous and ſtony matters are ſeparated. By diſtillation it yields water, acid, oil, and volatile alkali; the aſhes containing a ſmall proportion of fixed alkali; and being either white or red according to the proportion of pyrites contained in the ſubſtance.

The oil which is obtained from peat has a very pungent taſte, and an empyreumatic ſmell, leſs fetid than that of animal ſubſtances, more ſo than that of mineral bitumens: it congeals in the cold into a pitchy maſs which liquefies in a ſmall heat: it readily catches fire from a candle, but burns leſs vehemently than other oils, and immediately goes out upon removing the external flame: it diſſolves almoſt totally in rectified ſpirit of wine into a dark browniſh red liquor.

2. The ſecond ſpecies is found near Newbury in Berkſhire. In the Philoſophical Tranſactions for the year 1757, we have an account of this ſpecies, the ſubſtance of which is as follows:

Peat is a compoſition of the branches, twigs, leaves, and roots of trees, with graſs, ſtraw, plants, and weeds, which having lain long in water, is formed into a maſs ſo ſoft as to be cut through with a ſharp ſpade. The colour is a blackiſh brown, and it is uſed in many places for firing. There is a ſtratum of this peat on each ſide the Kennet, near Newbury in Berks, which is from about a quarter to half a mile wide, and many miles long. The depth below the ſurface of the ground is from one foot to eight. Great numbers of entire trees are found lying irregularly in the true peat. They are chiefly oaks, alders, willows, and firs, and appear to have been torn up by the roots: many horſes' heads, and bones of ſeveral kinds of deer; the horns of the antelope, the heads and tuſks of boars, and the heads of beavers, are alſo found in it. Not many years ago an urn of a light brown colour, large enough to hold about a gallon, was found in the peat-pit in Speen moor, near Newbury, at about 10 feet from the river, and four feet below the level of the neighbouring ground. Juſt over the ſpot where the urn was found, an artificial hill was raiſed about eight feet high; and as this hill conſiſted both of peat and earth, it is evident that the peat was older than the urn. From the ſide of the river ſeveral ſemicircular ridges are drawn round the hill, with trenches between them. The urn was broken to ſhivers by the peat-diggers who found it, ſo that it could not be critically examined; nor can it be known whether any thing was contained in it.

With peat alſo may be claſſed that ſubſtance called in England ſtone turf; which hardens after its firſt expoſure to the air, but afterwards crumbles down.—The other common turf conſiſts only of mould interwoven with the roots of vegetables; but when theſe roots are of the bulbous kind, or in large proportion, they form the worſt kind of turf. "Although it may appear incredible (ſays M. Magellan), it is nevertheleſs a real fact, that, in England, pit turf is advantageouſly employed in Lancaſhire to ſmelt the iron-ore of that county. Mr. Wilkinſon, brother-in-law to Dr. Prieſtley, makes uſe of pit-turf in his large ſmelting furnaces. I have ſeen in the poſſeſſion of Mr. S. More, ſecretary to the Society of Arts, a kind of black tallow, extracted by the ſaid Mr. Wilkinſon from pit-turf. It was very ſoft, and nearly of the ſame conſiſtence with butter. It burnt very rapidly, with a ſmoky flame in the fire; but the ſmell was very diſagreeable, like that of pit-turf." The great cauſe of the differences of peat moſt likely ariſes from the different mineral admixtures. Some ſorts of peat yield in burning a very diſagreeable ſmell, which extends to a great diſtance; whilſt others are inoffenſive. Some burn into grey or white, and others into red ferrugineous aſhes. The aſhes yield, on elixation, a ſmall quantity of alkaline ſalt, with ſometimes one and ſometimes another ſalt of the neutral kind.

The ſmoke of peat does not preſerve or harden fleſh like that of wood; and the ſoot, into which it condenſes, is more diſpoſed to liquefy in moiſt weather.

Peat-aſhes, properly burnt for a manure, are noble improvers both of corn and graſs land: but the ſubſtance from which they ſhould be got is an under ſtratum of the peat, where the fibres and roots of the earth, &c. are well decayed. Indeed the very beſt are procured from the loweſt ſtratum of all. This will yield a large quantity of very ſtrong aſhes, in colour (when firſt burnt) like vermilion, and in taſte very ſalt and pungent. Great care and caution ſhould be uſed in burning theſe aſhes, and alſo in preſerving them afterwards. The method of burning them is much the ſame as burning charcoal. The peat muſt be collected into a large heap, and covered ſo as not to flame out, but ſuffered to conſume ſlowly, till the whole ſubſtance is burnt to an aſh. The aſhes thus burnt are held in moſt eſteem; but the peat-aſhes burnt in common firing are in many places uſed for the ſame purpoſes, and ſold at the ſame prices.

Peat-aſhes are found excellent in ſweetening ſour meadow land, deſtroying ruſhes, and other bad kinds of graſs, and in their ſtead producing great quantities of natural graſs. They burn great quantities of peat-aſhes in ſome parts of Berkſhire and Lancaſhire, and eſteem them one of the beſt dreſſings for their ſpring crops.

The ſulphureous and ſaline particles with which the aſhes abound have a moſt happy effect in promoting vegetation; and if uſed with diſcretion, the increaſe procured by them is truly wonderful.

All aſhes are of a hot, fiery, cauſtic nature: they muſt therefore be uſed with caution. With reſpect to peat-aſhes, almoſt the only danger proceeds from laying them on in too great quantities at improper ſeaſons. Nothing can be better than they are for dreſſing low damp meadows, laying to the quantity of from fifteen to twenty Wincheſter buſhels on an acre: it is beſt to ſow them by hand, as they will then be more regularly ſpread. This ſhould be done in January or February at lateſt, that the aſhes may be waſhed in towards the roots of the graſs by the firſt rains that fall in the ſpring.

If they were ſpread more forward in the year, and a ſpeedy rain ſhould not ſucceed, being hot in their nature, they would be apt to burn up the graſs, inſtead of doing it any ſervice. The damper and ſtiffer the ſoil, the more peat-aſhes ſhould be laid on it; but in graſs lands the quantity ſhould never exceed thirty Wincheſter buſhels, and on light warm lands leſs than half that quantity is fully ſufficient.

On wheat crops theſe aſhes are of the greateſt ſervice, but they muſt be laid on with the utmoſt diſcretion. Were they to be ſpread in any quantity before the winter, after the ſowing the corn, they would make the wheat too rank, and do more harm than good; were the ſpreading this manure, on the contrary, deferred till the ſpring, the corn could not poſſibly during the winter ſeaſon be benefited by it. About the begin-

ning of November, before the hard froſts ſet in, ſeems to be the proper ſeaſon for this purpoſe: and it will be found neceſſary to ſow on every acre of heavy clayey wheat land about eight Wincheſter buſhels of theſe aſhes; on lighter warmer lands in wheat, four will be ſufficient for this ſeaſon. The winter dreſſing is thought by practical farmers to be of great ſervice: trifling as the quantity may ſeem, it warms the root of the plants, brings it moderately forward, preſerves its verdure, and diſpoſes it to get into a growing ſtate the firſt fine weather after Chriſtmas.

About the latter end of February, or the beginning of March, on heavy lands in wheat, another dreſſing of aſhes, by ſowing of them on every acre eight buſhels more, will do much good; on light lands, in this ſecond dreſſing, ſix buſhels may be allowed.

Theſe aſhes laid on in the ſpring are of the greateſt ſervice, without any probability of danger: if rain falls within a few days after the dreſſing is laid on, it is waſhed in, and has a happy effect on the ſucceeding crop, co-operating with the manure that was laid on in November: if, on the contrary, dry weather for a long continuance ſucceeds, the firſt winter-dreſſing has its full effect, and the quantity laid on in the ſpring is in fact ſo ſmall, that there is very little probability of its burning or hurting the crop. This excellent manure is alſo of great uſe in the turnip huſbandry on many accounts, particularly as it much contributes to preſerve the young crop from being devoured by the fly. But one of the principal advantages derived from theſe aſhes, not yet mentioned, is the very great ſervice they are of to every kind of artificial paſture.

Saintfoin receives great benefit from this manure, and ſo do clover, rye-graſs, and trefoil, provided it be laid on with diſcretion: the proper ſeaſon is about the month of February. The quantity muſt be regulated by the nature of the crop and ſoil; but it ought ſcarcely in any inſtance to exceed thirty Wincheſter buſhels. Clover, with the help of this manure, grows with great luxuriance, inſomuch that there have often been two large crops of hay from the ſame field in a year, and good autumn ſeed afterwards. They have an excellent effect on tares or vetches: to peas they ſeem to be hurtful.

The effects of this manure will be viſible at leaſt three years, nor does it, like ſome others, leave the land in an impoveriſhed ſtate, when its virtues are exhauſted and ſpent. Peat-aſhes are not, however, ſo certain a manure for barley and oats as for the winter corn: for as theſe are quick growers, and occupy the land but a few months, this warm manure is often apt to puſh them forward too faſt, and make them run too much to coarſe ſtraw, yielding only a lean immature grain. Oats, however, are not ſo apt to be damaged by it as barley.

Peat-aſhes approach, in their effects on the ſeveral crops on which they are laid, to coal-ſoot; but two-thirds of the quantity that is uſed of ſoot will be ſufficient of the aſhes, as they are in a much ſtronger degree impregnated with a vegetative power; and they are beſides in moſt places eaſier procured in quantities, and at a cheaper rate.

Peat-aſhes are almoſt, as we have already obſerved, a general manure ſuited to every ſoil. On cold clay they warm the too compact particles, diſpoſe it to ferment, crumble, and of courſe fertilize, and, in fine, not only aſſiſt it in diſcloſing and diſpenſing its great vegetable powers, but alſo bring to its aid a conſiderable proportion of ready prepared aliment for plants. On light lands theſe aſhes have a different effect: here the pores are too large to be affected, or farther ſeparated by the ſalts or ſulphur contained in them; but, being cloſely attached to the ſurfaces of the large particles of which this earth is generally compoſed, this manure diſpoſes them, by means of its ſalts, to attract the moiſture contained in the air: by this operation, the plants which grow on theſe porous ſoils are prevented from being ſcorched up and burnt; and if they want, which they generally do, more nouriſhment than the land is of itſelf capable of affording, this is readily and abundantly ſupplied by this uſeful manure. In large farms it is very uſual to ſee all the home-fields rich and well mended by the yard dung, &c. whereas the more diſtant lands are generally poor, impoveriſhed, and out of heart, for want of proper manure being applied in time. See CHEMISTRY.

PEAUCIER, in anatomy, a name given by Winſlow, in his Treatiſe on the Head, and by ſome of the French writers, to the muſcle called by Albinus *latiſſimus colli*; and by others *detrahens quadratus*, and *quadratus genæ*. Santorini has called the part of this which ariſes from the cheek *muſculus riſorius novus*; and ſome call the whole *platyſma myoides*. See ANATOMY, *Table of the Muſcles*.

PEBBLES, the name of a genus of foſſils, diſtinguiſhed from the flints and homocroa by their having a variety of colours. Theſe are defined to be ſtones compoſed of a cryſtalline matter debaſed by earths of various kinds in the ſame ſpecies, and then ſubject to veins, clouds, and other variegations, uſually formed by incruſtation round a central nucleus, but ſometimes the effect of a ſimple concretion; and veined like the agates, by the diſpoſition which the motion of the fluid they were formed in gave their differently coloured ſubſtances.

The variety of pebbles is ſo great, that an haſty deſcriber would be apt to make almoſt as many ſpecies as he ſaw ſpecimens. A careful examination will teach us, however, to diſtinguiſh them into a certain number of eſſentially different ſpecies, to which all the reſt may be referred as accidental varieties. When we find the ſame colours, or thoſe reſulting from a mixture of the ſame, ſuch as nature frequently makes in a number of ſtones, we ſhall eaſily be able to determine that theſe are all of them the ſame ſpecies, though of different appearances; and that whether the matter be diſpoſed of in one or two, or in 20 cruſts, laid regularly round a nucleus; or thrown irregularly, without a nucleus, into irregular lines; or, laſtly, if blended into an uniform maſs.

Theſe are the three ſtates in which every pebble is found; for, if it has been naturally and regularly formed by incruſtation round a certain nucleus, we find that always the ſame in the ſame ſpecies, and the cruſts not leſs regular and certain. If the whole has been more haſtily formed, and the reſult only of one ſimple concretion, if that has happened while its different ſubſtances were all moiſt and thin, they have blended together and made a mixed maſs of the joint colour of them all. But if they have been ſomething harder when this has happened, and too far concreted to diffuſe wholly among one another, they are found thrown together into irregular veins. Theſe are the natural differences of all the pebbles; and having regard to theſe in the ſeveral variegations, all the known pebbles may be reduced to 34 ſpecies.

In all the ſtrata of pebbles there are conſtantly found ſome which are broken, and of which the pieces lie very near one another; but as bodies of ſuch hardneſs could not be broken without ſome conſiderable violence, their preſent ſituation ſeems to indicate that they have ſuffered that great violence in or near the places where they now lie. Beſide theſe, we often meet with others which have as plainly had pieces broken off from them, though thoſe pieces are nowhere to be found; whence it ſeems equally plain, that, whatever has been the cauſe of their fracture, they have been brought broken, as we find them, from ſome other place, or elſe that the pieces broken from them muſt at ſome time or other have been carried from this place to ſome other diſtant one.

Several of theſe broken pebbles have their edges and corners ſo ſharp and even, that it ſeems evident they never can have

been toſſed about or removed ſince the fracture was made; and others have their ſides and corners ſo rounded, blunted and worn away, that they ſeem to have been roughly moved and rolled about among other hard bodies, either with great violence, or for a very long continuance; ſince ſuch hard bodies could not have been reduced to the condition in which we now ſee them without long friction. It may be ſuppoſed by ſome, that theſe ſtones never were broken, but have been naturally formed of this ſhape; but it will be eaſily ſeen, by any one who accurately ſurveys their veins or coats, which ſurround the nucleus like the annular circles of a tree, that they muſt have been originally entire; and this will be the more plain if they are compared with a ſtone broken by art. Such pebbles as are found in ſtrata near the ſurface of the earth, are much more brittle than thoſe which lie in deeper ſtrata; and the more clear and tranſparent the ſand is which is found among pebbles, the more beautiful the pebbles are generally obſerved to be.

The uſe of theſe ſtones, and their diſpoſition in the earth, is a ſubject of great wonder; and may ſerve as one of the numerous proofs of an over-ruling Providence in the diſpoſition of all natural bodies. The ſurface of the earth is compoſed of vegetable mould, made up of different earths mixed with the putrid remains of animal and vegetable bodies, and of the proper texture and compages for conducting the moiſture to the roots of trees and plants. Under this are laid the ſands and pebbles which ſerve as a ſort of drain to carry off the redundant moiſture deeper into the earth, where it may be ready to ſupply the place of what is conſtantly riſing in exhalations; and leſt the ſtrata of ſand ſhould be too thick, it is common to find thin ones of clay between, which ſerve to put a ſtop to the deſcent of the moiſture, and keep it from paſſing off too ſoon; and leſt theſe thin ſtrata of clay ſhould yield and give way, and by their ſoftneſs when wetted give leave to the particles of ſand to blend themſelves with, and even force their way through them, there are found in many places thin coats of a poor iron ore, placed regularly above and below the clay; and by theſe means not only ſtrengthening and ſupporting the clay, but effectually keeping the ſand from making its way into it. There are many people of opinion, that the ſwallowing of pebbles is very beneficial to health, in helping the ſtomach to digeſt its food; and a pebble-poſſet is an old woman's medicine in the colic in many parts of England. They uſually order the ſmall white ſtones to be picked out of gravel walks for this purpoſe, and eat them in large quantities in ſome ſort of ſpoon meat, of which milk is an ingredient.

The thing that has given occaſion to this practice ſeems to have been, that people obſerve the birds to pick up the gravel, and that they are never well unleſs they have frequent recourſe to this to help their digeſtion: but this is no ſimilar caſe at all, for the gizzard or ſtomach of a bird is made very ſtrong, becauſe the creature has no teeth to chew its food; and this gizzard is lined with a rough coat, by the help of which and theſe ſtones the food they ſwallow whole is ſo ground as to yield its juices to the nouriſhment of the animal. But the ſtomach of man is formed ſo very differently, that it can never require thoſe aſſiſtances to the comminution of food. Many people have, however, accuſtomed themſelves to ſwallow not only theſe ſmall white ſtones, but large pebbles, even to the ſize of a walnut each; and theſe will often paſs ſafely; and people who have long accuſtomed themſelves to ſwallow them, boaſt of receiving no injury from them. We can never know, however, that the death of ſuch perſons is not owing to them at laſt; and as they can do no good, it is beſt always to avoid them. There are, indeed, inſtances on record in which they have undoubtedly done much miſchief.

PECARY, in zoology. See TAJACU.

PECCANT, in medicine, an epithet given by the old phyſicians to the humours of the body, when they offended either in quantity or quality, *i. e.* when ſuppoſed morbid, or in too great abundance.

PECHEM, in the materia medica, a name given by the modern Greek writers to the root called *behem* by Avicenna and Serapion. Many have been at a loſs to know what this root pechem was; but the virtues aſcribed to it are the ſame with thoſe of the behem of the Arabians; its deſcription is the ſame, and the diviſion of it into white and red is alſo the ſame as that of the behem. Nay, the word *pechem* is only formed of *behem* by changing the *b* into a *p*, which is very common, and the aſpirate into *χ*, or *ch*, which is as common. Myrepſus, who treats of this root, ſays the ſame thing that the Arabian Avicenna ſays of behem, namely, that it was the fragments of a woody root, much corrugated and wrinkled on the ſurface, which was owing to its being ſo moiſt whilſt freſh, that it always ſhrunk greatly in the drying.

PECHYAGRA, a name given by authors to the gout affecting the elbow.

PECHYS, a name uſed by ſome anatomical writers for the elbow.

PECHYTYRBE, an epithet uſed by ſome medical writers for the ſcurvy.

PECK, a meaſure of capacity, four of which make a buſhel.

PECK (Francis), was born at Stamford in Lincolnſhire, May 4th, 1692, and educated at Cambridge, where he took the degrees of B. and M. A. He was the author of many works, of which the firſt is a poem, entitled, "Sighs on the Death of Queen Anne;" printed probably about the time of her death in 1714. Two years afterwards he printed "ΤΟ ΥΨΟΣ ΤΗΣ ΚΤΙΣΕΩΣ; or, an Exerciſe on the Creation, and an Hymn to the Creator of the World; written in the expreſs Words of the Sacred Text, as an Attempt to ſhow the Beauty and Sublimity of the Holy Scriptures, 1716, 8vo." In 1721, being then curate of King's Clifton in Northamptonſhire, he iſſued propoſals for printing the Hiſtory and Antiquities of his native town, which was publiſhed in 1727, in folio, under the title of "*Academia tertia Anglicana*; or, the Antiquarian Annals of Stamford in Lincoln, Rutland, and Northampton ſhires; containing the Hiſtory of the Univerſity, Monaſteries, Guilds, Churches, Chapels, Hoſpitals, and Schools there, &c." inſcribed to John Duke of Rutland. This work was haſtened by "An Eſſay on the ancient and preſent State of Stamford, 1726, 4to," written by Francis Hargrave, who, in his preface, mentions the difference which had ariſen between him and Mr. Peck, on account of the former's publication unfairly foreſtalling that intended by the latter. Mr. Peck is alſo therein roughly treated, on account of a ſmall work he had formerly printed, entitled, "The Hiſtory of the Stamford Bull-running." Mr. Peck had before this time obtained the rectory of Godeby near Milton in in Leiceſterſhire, the only preferment he ever enjoyed. In 1729 he printed, on a ſingle ſheet, "Queries concerning the Natural Hiſtory and Antiquities of Leiceſterſhire and Rutland," which were afterwards reprinted in 1740; but although the progreſs he had made in the work was very conſiderable, yet it never made its appearance. In 1732 he publiſhed the firſt volume of *Deſiderata Curioſa*; or, a Collection of divers ſcarce and curious Pieces relating chiefly to Matters of Engliſh Hiſtory; conſiſting of choice tracts, memoirs, letters, wills, epitaphs, &c. tranſcribed, many of them, from the originals themſelves, and the reſt from divers ancient MS. copies, or the MS. collations of ſundry famous antiquaries and other eminent perſons, both of the laſt and preſent age: the whole, as nearly as poſſible, digeſted into order of time, and illuſtrated with ample notes, contents, additional diſcourſes, and a complete index." This volume was dedicated to lord William Manners, and was followed, in 1735, by a ſecond

volume, dedicated to Dr. Reynolds biſhop of Lincoln. In 1735 Mr. Peck printed in a 4to pamphlet, "A complete catalogue of all the diſcourſes written both for and againſt popery in the time of king James II. containing in the whole an account of 457 books and pamphlets, a great number of them not mentioned in the three former catalogues; with references after each title, for the more ſpeedy finding a further account of the ſaid diſcourſes and their authors in ſundry writers, and an alphabetical liſt of the writers on each ſide." In 1739 he was the editor of "Nineteen Letters of the truly reverend and learned Henry Hammond, D. D. (author of the Annotations on the New Teſtament, &c.) written to Mr. Peter Stainnough and Dr. Nathaniel Angelo, many of them on curious ſubjects, &c." Theſe were printed from the originals, communicated by Mr. Robert Marſden archdeacon of Nottingham, and Mr. John Worthington. The next year, 1740, produced two volumes in 4to, one of them entitled "Memoirs of the Life and Actions of Oliver Cromwell, as delivered in three panegyrics of him written in Latin; the firſt, as ſaid, by Don Juan Roderiguez de Saa Meneſes, Conde de Penguiao, the Portugal ambaſſador; the ſecond, as affirmed by a certain Jeſuit, the lord ambaſſador's chaplain; yet both, it is thought, compoſed by Mr. John Milton (Latin ſecretary to Cromwell), as was the third; with an Engliſh verſion of each. The whole illuſtrated with a large hiſtorical preface; many ſimilar paſſages from the Paradiſe Loſt, and other works of Mr. John Milton, and notes from the beſt hiſtorians. To all which is added, a collection of divers curious hiſtorical pieces relating to Cromwell, and a great number of other remarkable perſons (after the manner of *Deſiderata Curioſa*, vols. i. and ii.)" The other, "New Memoirs of the Life and poetical Works of Mr. John Milton; with, firſt, an examination of Milton's ſtyle; and ſecondly, explanatory and critical notes on divers paſſages in Milton and Shakſpeare, by the editor. Thirdly, Baptiſtes, a ſacred dramatic poem in defence of liberty, as written in Latin by Mr. George Buchanan, tranſlated into Engliſh by Mr. John Milton, and firſt publiſhed in 1641, by order of the houſe of commons. Fourthly, the Parallel; or, Archbiſhop Laud and Cardinal Wolſey compared; a Viſion, by Milton. Fifthly, the Legend of Sir Nicholas Throckmorton, knt. chief butler of England, who died of poiſon, *anno* 1570, an hiſtorical poem by his nephew Sir Thomas Throckmorton, knt. Sixth, Herod the Great, by the editor. Seventh, the Reſurrection, a poem in imitation of Milton, by a friend. And eighth, a Diſcourſe on the Harmony of the Spheres, by Milton; with prefaces and notes." Theſe were the laſt publications which he gave the world. When theſe appeared, he had in contemplation no leſs than nine different works; but whether he had not met with encouragement for thoſe which he had already produced, or whether he was rendered incapable of executing them by reaſon of his declining health, is uncertain; but none of them ever were made public. He concluded a laborious, and, it may be affirmed, an uſeful life, wholly devoted to antiquarian purſuits, Aug. 13th, 1743, at the age of 61 years.

PECORA, in zoology, the fifth order of the claſs mammalia, in the Linnean ſyſtem. See ZOOLOGY.

PECQUET (JOHN), was a phyſician in Dieppe, and died at Paris in 1674. He was phyſician in ordinary to the celebrated Fouquet, whom he entertained at his ſpare hours with ſome of the moſt amuſing experiments in natural philoſophy. He acquired immortal honour to himſelf by the diſcovery of a lacteal vein, which conveys the chyle to the heart; and which from his name is called *le Reſervoir de Pecquet*. This diſcovery was a freſh proof of the truth of the circulation of the blood: though it met with oppoſition from many of the learned, particularly from the famous Riolan, who wrote a treatiſe againſt the author of it, with this title: "*Adverſus Pecquetum & Pecquetianos.*" The only works which we have of Pecquet are, 1. *Experimenta nova Anatomica*, publiſhed at Paris, 1654. 2. A Diſſertation, *De Thoracis Lacteis*, publiſhed at Amſterdam, 1661. He was a man of a lively and active genius; but his ſprightlineſs ſometimes led him to adopt dangerous opinions. He recommended, as a remedy for all diſeaſes, the uſe of brandy. This remedy, however, proved fatal to himſelf, and contributed to ſhorten his days, which he might have employed to the advantage of the public.

PECTEN, the SCALLOP: a genus of ſhell-fiſh, the characters of which are theſe: The animal is a tethys; the ſhell bivalve and unequal; the hinge toothleſs, having a ſmall ovated hollow. This ſhell-fiſh is one of the ſpinners, having the power of ſpinning threads like the muſcles: but they are much ſhorter and coarſer than even thoſe of that fiſh; ſo that they can never be wrought into any kind of work like the longer and finer threads of the pinna marina. The uſe of the threads which are ſpun by the ſcallop is to fix the creature to any ſolid body near its ſhell. All theſe proceed, as in the muſcle, from one common trunk. It is an evident proof that the fiſh has a power of fixing itſelf at pleaſure to any ſolid body by means of theſe threads; that after ſtorms the ſcallops are often found toſſed upon rocks, where there were none the day before; and yet theſe are fixed by their threads, as well as thoſe which had remained ever ſo long in their place. They form their threads in the very ſame manner with the muſcle; only their organ which ſerves for ſpinning is ſhorter, and has a wider hollow, whence the threads are neceſſarily thicker and ſhorter.

Mr. Barbut divides the genus oſtrea into four families; which he thus names according to their characters: 1. The winged equilateral pectens. 2. The pectens that have one ear inwardly, ſpringing by being ciliated. 3. The pectens that have their valves more gibbous on one ſide than on the other. 4. The rough ones, commonly called *oyſters*. Of the locomotive powers of the pecten, we have already ſpoken under the article *Animal* MOTION.

The pectens, ſuch as the ſole-pecten, the ducal-mantle pecten, the knotted, and others, ſeem to be in general inhabitants of the Indian ſeas: ſome of them frequent thoſe of Africa and the South ſeas. The moſt remarkable ſpecies is the *maximus* or great ſcallop, being the ſame with what Barbut calls the *ducal-mantle pecten*. It has 14 rays, very prominent and broad, and ſtriated both above and below. They are rugged, and imbricated with ſcales. They grow to a large ſize; are found in beds by themſelves; are dredged up, and barrelled for ſale. The ancients ſay that they have a power of removing themſelves from place to place by vaſt ſprings or leaps. This ſhell was uſed both by the Greeks and Latins as a food. When dreſſed with pepper and cummin, it was taken medicinally. The ſcallop was commonly worn by pilgrims on their hat, or the cape of their coat, as a mark that they had croſſed the ſea in their way to the Holy Land, or ſome diſtant object of devotion.

The name *pecten* ſeems to have been given to theſe animals, from the longitudinal ſtriæ with which their ſurface is covered, which reſemble ſomewhat the teeth of a comb; and hence alſo the Greek name κτεις. By the general character of this ſhell, it evidently includes cockles as well as ſcallops, which are the pectens without ears, and having leſs flat or elated ſhells. They are called by all authors by a name which is only a diminutive of *pecten*, *pectunculus*. The having ears indeed is the common mark of diſtinction between the pectens and the cockles, which laſt uſually have none; yet the genera are not diſtinct, as ſome have imagined: for there are ſhells univerſally allowed to be pectens or ſcallops, which have no ears, and others as univerſally allowed to be pectuncles or cockles, which have. Hence then appears the error of Liſter, who made them two diſtinct genera, and gave the ears and the equal convexity of both ſhells as the

great characteriſtics of them; which, though they be good marks to diſtinguiſh the ſpecies by, are far from being ſo unalterable as to found different genera upon.

Barbut, we have ſeen, ranks the pectens under the genus oſtrea; but he ſays, that though the generic character of the hinge agrees in both, the animal inhabiting the pectens is very different from that of the oyſter; for which reaſon Linnæus has divided the genus into ſections. The pectines by ſome are eſteemed as delicious a food as the oyſter. They differ very materially in a variety of circumſtances. The pectens, as we have already obſerved, ſail on the ſurface of the water; and beſides, if they are attacked by a foe, they let down the membrane which nature has provided them for a ſail, and drop to the bottom. "Behold (ſays Barbut) the ſplendour of the pectines, which rival the glowing colours of the papilionaceous tribe, as numerous as they are beautiful, flirting from place to place, and may well be called the papiliones of the ocean. What ſuperior qualities does not the pecten enjoy above the oſtrea edulis, which, conſtantly confined to its native bed, ſeems wholly deſtined to afford food to other creatures, not having any means of defence but its ſhelly caſtle, which is frequently attacked and ſtormed by its numerous enemies? This creature is not only uſeful to man as a dainty food, but the ſhell, being levigated into a ſubtle powder, is employed as an abſorbent in heart-burns and other like complaints ariſing from acidities in the firſt paſſages: the hollow ſhells are generally made choice of, as containing more than the thinner flat ones, of the fine white earth, in proportion to the outer rough coat, which laſt is found to be conſiderably impregnated with ſea-ſalt."

The grand mark of diſtinction between the pectens and oyſter ſeems to be the locomotive faculty. It was long ſuppoſed that the oyſter poſſeſſed no power of motion, that it always remained in the place in which nature or accident had placed it, and that its life differed little from that of vegetables. The Abbé Dicquemare, however, has taught us to doubt theſe premature concluſions. "As I was exploring the coaſt of Lower Normandy (ſays he), I perceived in an oyſter-bed one of them changing place pretty quickly. On my return, therefore, to Havre, I made new diſpoſitions to diſcover the means by which the motions of oyſters are performed, and I ſucceeded. This animal ejects the water by that part of the ſhell which is diametrically oppoſite to the hinge; it can alſo throw it out at the ſides, at each extremity of the hinge, or even from the whole opening at once. For this purpoſe, it can vary the action of its internal mechaniſm; but the ſoft parts are not the only organs that perform this function; in certain caſes the ſhells aſſiſt in forcing out the water."

The ſame writer adds: "Thoſe authors are not ſo enlightened as they imagine, who repreſent the oyſter as an animal deprived of ſenſation, as an intermediate being between animals and vegetables, as a plant, and even in ſome reſpects as inferior to a plant. It is thus that the oyſter has been made a foundation for many an abſurd hypotheſis with reſpect to the nature of animals."—

"The oyſter is conſcious of its exiſtence, and conſcious alſo that ſomething exiſts exterior to itſelf. It chooſes, it rejects; it varies its operations with judgement, according to circumſtances; it defends itſelf by means adequate and complicated; it repairs its loſſes; and it can be made to change its habits. Oyſters newly taken from places which the ſea had never left, inconſiderately open their ſhells, loſe the water they contain, and die in a few days; but thoſe that have been taken from the ſame place, and thrown into beds or reſervoirs from which the ſea occaſionally retires, where they are incommoded by the rays of the ſun, or by the cold, or where they are expoſed to the injuries of man, learn to keep themſelves cloſe when they are abandoned by the water, and live a much longer time." See Ostrea.

PECTORAL, a ſacerdotal habit or veſtment, worn by the Jewiſh high-prieſt. The Jews called it *Hhoſchen*, the Greeks λογιον, the Latins *rationale* and *pectorale*, and in our verſion of the Bible it is called *breaſtplate*. It conſiſted of embroidered ſtuff, about a ſpan ſquare, and was worn upon the breaſt, ſet with twelve precious ſtones, ranged in four rows, and containing the names of the twelve tribes. It was faſtened to the ſhoulder by two chains and hooks of gold. God himſelf preſcribed the form of it. See Breastplate.

Pectorale, a breaſtplate of thin braſs, about 12 fingers ſquare, worn by the poorer ſoldiers in the Roman army who were rated under 1000 drachmæ. See Lorica.

Pectoral, an epithet for medicines good in diſeaſes of the breaſt and lungs.

PECTORALIS, in Anatomy. See Anatomy, *Table of the Muſcles*.

PECULATE, in civil law, the crime of embezzling the public money, by a perſon intruſted with the receipt, management, or cuſtody thereof. This term is alſo uſed by civilians for a theft, whether the thing be public, fiſcal, ſacred or religious.

PECULIAR, in the canon law, ſignifies a particular pariſh or church that has juriſdiction within itſelf for granting probates of wills and adminiſtrations, exempt from the ordinary or biſhop's courts. The king's chapel is a royal peculiar, exempt from all ſpiritual juriſdiction, and reſerved to the viſitation and immediate government of the king himſelf. There is likewiſe the archbiſhop's peculiars; for it is an ancient privilege of the ſee of Canterbury, that wherever any manors or advowſons belong to it, they forthwith become exempt from the ordinary, and are reputed peculiars: there are 57 ſuch peculiars in the ſee of Canterbury. Beſides theſe, there are ſome peculiars belonging to deans, chapters, and prebendaries, which are only exempted from the juriſdiction of the archdeacon: theſe are derived from the biſhop, who may viſit them, and to whom there lies an appeal.

Court of Peculiars, is a branch of, and annexed to, the court of Arches. It has a juriſdiction over all thoſe pariſhes diſperſed through the province of Canterbury in the midſt of other dioceſes, which are exempt from the ordinary's juriſdiction, and ſubject to the metropolitan only. All eccleſiaſtical cauſes ariſing within theſe peculiar or exempt juriſdictions are originally cognizable by this court; from which an appeal lay formerly to the pope, but now, by the ſtat. 25 H. VIII. c. 19. to the king in chancery.

PECULIUM, the ſtock or eſtate which a perſon in the power of another, whether male or female, either as his or her ſlave, may acquire by his induſtry. Roman ſlaves frequently amaſſed conſiderable ſums in this way. The word properly ſignifies the advanced price which a ſlave could get for his maſter's cattle, &c. above the price fixed upon them by his maſter, which was the ſlave's own property. In the Romiſh church, peculium denotes the goods which each religious reſerves and poſſeſſes to himſelf.

PEDALS, the largeſt pipes of an organ, ſo called becauſe played and ſtopped with the foot. The pedals are made ſquare, and of wood; they are uſually 13 in number. They are of modern invention, and ſerve to carry the ſounds of an octave deeper than the reſt. See Organ.

PEDAGOGUE, or Pædagogue, a tutor or maſter, to whom is committed the diſcipline and direction of a ſcholar, to be inſtructed in grammar and other arts. The word is formed from the Greek παιδων αγωγος, *puerorum ductor*, "leader of boys." M. Fleury obſerves, that the Greeks gave the name *pedagogues* to ſlaves appointed to attend their children, lead

them, and teach them to walk, &c. The Romans gave the ſame denomination to the ſlaves who were intruſted with the care and inſtruction of their children.

PEDANT, a ſchoolmaſter or pedagogue, who profeſſes to inſtruct and govern youth, teach them the humanities, and the arts. See PEDAGOGUE.

PEDANT is alſo uſed for a rough, unpoliſhed man of letters, who makes an impertinent uſe of the ſciences, and abounds in unſeaſonable criticiſms and obſervations. Dacier defines a pedant, a perſon who has more reading than good ſenſe. See PEDANTRY.

Pedants are people ever armed with quibbles and ſyllogiſms, who breathe nothing but diſputation and chicanery, and purſue propoſition to the laſt limits of logic. Malebranche deſcribes a pedant as a man full of falſe erudition, who makes a parade of his knowledge, and is ever quoting ſome Greek or Latin author, or hunting back to a remote etymology. St. Evremont ſays, that to paint the folly of a pedant, we muſt repreſent him as turning all converſation to ſome one ſcience or ſubject he is beſt acquainted withal.

There are pedants of all conditions, and all robes. Wicquefort ſays, an ambaſſador, always attentive to formalities and decorums, is nothing elſe but a political pedant.

PEDANTRY, or PEDANTISM, the quality or manner of a pedant. See PEDANT. To ſwell up little and low things; to make a vain ſhow of ſcience; to heap up Greek and Latin without judgment; to tear thoſe to pieces who differ from us about a paſſage in Suetonius or other ancient authors, or in the etymology of a word; to ſtir up all the world againſt a man for not admiring Cicero enough; to be intereſted for the reputation of an ancient as if he were our next of kin, is what we properly call *pedantry*.

PEDARIAN, in Roman antiquity, thoſe ſenators who ſignified their votes by their feet, not with their tongues; that is, ſuch as walked over to the ſide of thoſe whoſe opinion they approved of, in diviſions of the ſenate. Dr. Middleton thus accounts for the origin of the word. He ſays, that though the magiſtrates of Rome had a right to a place and vote in the ſenate both during their office and after it, and before they were put upon the roll by the cenſors, yet they had not probably a right to ſpeak or debate there on any queſtion, at leaſt in the earlier ages of the republic. For this ſeems to have been the original diſtinction between them and the ancient ſenators, as it is plainly intimated in the formule of the conſular edict, ſent abroad to ſummon the ſenate, which was addreſſed to all ſenators, and to all thoſe who had a right to vote in the ſenate. From this diſtinction, thoſe who had only a right to vote were called in ridicule *pedarian*; becauſe they ſignified their votes by their feet, not their tongues, and upon every diviſion of the ſenate went over to the ſide of thoſe whoſe opinion they approved. It was in alluſion to this old cuſtom, which ſeems to have been wholly dropped in the latter ages of the republic, that the mute part of the ſenate continued ſtill to be called by the name of *pedarians*, as Cicero informs us, who, in giving an account to Atticus of a certain debate, and decree of the ſenate upon it, ſays that it was made with the eager and general concurrence of the pedarians, though againſt the authority of all the conſulars.

PEDATURA, a term uſed, in Roman antiquity, for a ſpace or proportion of a certain number of feet ſet out. This word often occurs in writers on military affairs: as in Hyginus de Caſtrametatione we meet with *meminerimus itaque ad computationem cohortis equitatæ milliariæ pedaturam ad mille trecentos ſexaginta dari debere*; which is thus explained: The pedatura, or ſpace allowed for a *cohors equitata* or provincial cohort, conſiſting of both horſe and foot, could not be the ſame as the pedatura of an uniform body of infantry, of the ſame number, but muſt exceed it by 360 feet; for the proportion of the room of one horſeman to one foot ſoldier he aſſigns as two and a half to one.

PEDERASTS, the ſame with SODOMITES.

PEDESTAL, in architecture, the loweſt part of an order of columns, being that part which ſuſtains the column, and ſerves it as a foot or ſtand. See COLUMN.

PEDIÆAN, in Grecian antiquity. The city of Athens was anciently divided into three different parts; one on the deſcent of an hill; another on the ſea-ſhore; and a third in a plain between the other two. The inhabitants of the middle region were called Πεδιαοι, *Pediæans*, formed from πεδιον, "plain," or "flat;" or, as Ariſtotle will have it, *Pediaci*: thoſe of the hill, Diacrians; and thoſe of the ſhore, Paralians. Theſe quarters uſually compoſed ſo many different factions. Piſiſtratus made uſe of the Pediæans againſt the Diacrians. In the time of Solon, when a form of government was to be choſen, the Diacrians choſe it democratic; the Pediæans demanded an ariſtocracy; and the Paralians a mixed government.

PEDICLE, among botaniſts, that part of a ſtalk which immediately ſuſtains the leaf of a flower or a fruit, and is commonly called a *footſtalk*.

PEDICULUS, the LOUSE: in zoology, a genus of inſects belonging to the order of aptera. It has ſix feet, two eyes, and a ſort of ſting in the mouth; the feelers are as long as the thorax; and the belly is depreſſed and ſublobated. It is an oviparous animal. They are not peculiar to man alone, but infeſt other animals, as quadrupeds and birds, and even fiſhes and vegetables; but theſe are of peculiar ſpecies on each animal, according to the particular nature of each, ſome of which are different from thoſe which infeſt the human body. Nay, even inſects are infeſted with vermin which feed on and torment them. Several kinds of beetles are ſubject to lice; but particularly that kind called by way of eminence the *louſy beetle*. The lice on this are very numerous, and will not be ſhook off. The earwig is often infeſted with lice, juſt at the ſetting on of its head: theſe are white, and ſhining like mites, but they are much ſmaller; they are round-backed, flat-bellied, and have long legs, particularly the foremoſt pair. Snails of all kinds, but eſpecially the large naked ſorts, are very ſubject to lice; which are continually ſeen running about them, and devouring them. Numbers of little red lice, with a very ſmall head, and in ſhape reſembling a tortoiſe, are often ſeen about the legs of ſpiders, and they never leave the animal while he lives; but if he is killed, they almoſt inſtantly forſake him. A ſort of whitiſh lice is found on humble-bees; they are alſo found upon ants; and fiſhes are not leſs ſubject to them than other animals.

Kircher tells us, that he found lice alſo on flies, and M. de la Hire has given a curious account of the creature which he found on the common fly. Having occaſion to view a living fly with the microſcope, he obſerved on its head, back, and ſhoulders, a great number of ſmall animals crawling very nimbly about, and often climbing up the hairs which grow at the origin of the fly's legs. He with a fine needle took up one of theſe, and placed it before the microſcope uſed to view the animalcules in fluids. It had eight legs; four on each ſide. Theſe were not placed very diſtant from each other; but the four towards the head were ſeparated by a ſmall ſpace from the four towards the tail. The feet were of a particular ſtructure, being compoſed of ſeveral fingers, as it were, and fitted for taking faſt hold of any thing; but the two neareſt the head were alſo more remarkable in this particular than thoſe near the tail; the extremities of the legs for a little way above the feet were dry and void of fleſh like the legs of birds, but above

this part they appeared plump and fleſhy. It had two ſmall horns upon its head, formed of ſeveral hairs arranged cloſely together; and there were ſome other cluſters of hairs by the ſide of theſe horns, but they had not the ſame figure; and towards the origin of the hinder legs there were two other ſuch cluſters of hairs which took their origin at the middle of the back. The whole creature was of a bright yellowiſh red; the legs, and all the body, except a large ſpot in the centre, were perfectly tranſparent. In ſize, he computed it to be about $\frac{1}{3000}$th part of the head of the fly; and he obſerves, that ſuch kind of vermin are rarely found on flies.

The louſe which infeſts the human body makes a very curious appearance through a microſcope. It has ſuch a tranſparent ſhell or ſkin, that we are able to diſcover more of what paſſes within its body than in moſt other living creatures. It has naturally three diviſions, the head, the breaſt, and the tail part. In the head appear two fine black eyes, with a horn that has five joints, and is ſurrounded with hairs ſtanding before each eye; and from the end of the noſe or ſnout there is a pointed projecting part, which ſerves as a ſheath or caſe to a piercer or ſucker, which the creature thruſts into the ſkin to draw out the blood and humours which are its deſtined food; for it has no mouth that opens in the common way. This piercer or ſucker is judged to be 700 times ſmaller than a hair, and is contained in another caſe within the firſt, and can be drawn in or thruſt out at pleaſure. The breaſt is very beautifully marked in the middle; the ſkin is tranſparent, and full of little pits; and from the under part of it proceed ſix legs, each having five joints, and their ſkin all the way reſembling ſhagreen, except at the ends, where it is ſmoother. Each leg is terminated by two claws, which are hooked, and are of an unequal length and ſize. Theſe it uſes as we would a thumb and middle finger; and there are hairs between theſe claws as well as all over the legs. On the back part of the tail there may be diſcovered ſome ring-like diviſions, and a ſort of marks which look like the ſtrokes of a rod on the human ſkin; the belly looks like ſhagreen, and towards the lower end it is very clear, and full of pits: at the extremity of the tail there are two ſemicircular parts all covered over with hairs, which ſerve to conceal the anus. When the louſe moves its legs, the motion of the muſcles, which all unite in an oblong dark ſpot in the middle of the breaſt, may be diſtinguiſhed perfectly, and ſo may the motion of the muſcles of the head when it moves its horns. We may likewiſe ſee the various ramifications of the veins and arteries, which are white, with the pulſe regularly beating in the arteries. But the moſt ſurpriſing of all the ſights is the periſtaltic motion of the guts, which is continued all the way from the ſtomach down to the anus.

If one of theſe creatures, when hungry, be placed on the back of the hand, it will thruſt its ſucker into the ſkin, and the blood which it ſucks may be ſeen paſſing in a fine ſtream to the fore-part of the head; where, falling into a roundiſh cavity, it paſſes again in a fine ſtream to another circular receptacle in the middle of the head; from thence it runs through a ſmall veſſel to the breaſt, and then to a gut which reaches to the hinder part of the body, where in a curve it turns again a little upward; in the breaſt and gut the blood is moved without intermiſſion, with a great force; eſpecially in the gut, where it occaſions ſuch a contraction of the gut as is very ſurpriſing. In the upper part of the crooked aſcending gut above mentioned, the propelled blood ſtands ſtill, and ſeems to undergo a ſeparation, ſome of it becoming clear and wateriſh, while other black particles are puſhed forward to the anus. If a louſe is placed on its back, two bloody darkiſh ſpots appear; the larger in the middle of the body, the leſſer towards the tail; the motions of which are followed by the pulſation of the dark bloody ſpot, in or over which the white bladder ſeems to lie. This motion of the ſyſtole and diaſtole is beſt ſeen when the creature begins to grow weak; and on pricking the white bladder, which ſeems to be the heart, the creature inſtantly dies. The lower dark ſpot is ſuppoſed to be the excrement in the gut.

Lice have been ſuppoſed to be hermaphrodites: but this is erroneous; for Mr. Lieuwenhoeck obſerved, that the males have ſtings in their tails, which the females have not. And he ſuppoſes the ſmarting pain which thoſe creatures ſometimes give, to be owing to their ſtinging with theſe ſtings when made uneaſy by preſſure or otherwiſe. He ſays, that he felt little or no pain from their ſuckers, though ſix of them were feeding on his hand at once.

In order to know the true hiſtory and manner of breeding of theſe creatures, Mr. Lieuwenhoeck put two female lice into a black ſtocking, which he wore night and day. He found, on examination, that in ſix days one of them had laid above 50 eggs; and, upon diſſecting it, he found as many yet remaining in the ovary: whence he concludes, that in 12 days it would have laid 100 eggs. Theſe eggs naturally hatch in ſix days, and would then probably have produced 50 males, and as many females; and theſe females coming to their full growth in 18 days, might each of them be ſuppoſed after 12 days more to lay 100 eggs; which eggs, in ſix days more, might produce a young brood of 5000: ſo that, in eight weeks, one louſe may ſee 5000 of its own deſcendants.

Signior Rhedi, who has more attentively obſerved theſe animals than any other author, has given ſeveral engravings of the different ſpecies of lice found on different animals. Men, he obſerves, are ſubject to two kinds; the common louſe and the crab-louſe. He obſerves alſo, that the ſize of the lice is not at all proportioned to that of the animal which they infeſt; ſince the ſtarling has them as large as the ſwan.

Some kinds of conſtitutions are more favourable to the propagation of lice than others; but it is a vulgar error to ſuppoſe that lice are ſpontaneouſly produced, or, in other words, *ſelf-generated*, under any circumſtances. It is an obſervation of Oviedo, that the Spaniſh ſailors, who are generally much afflicted with lice, always loſe them in a certain degree of latitude in their voyages to the Eaſt Indies, and have them again on their returning to the ſame degree. And in the Indies it is ſaid there is no ſuch thing as a louſe about the body, though the people be ever ſo naſty. The ſailors continue free from theſe creatures till their return; but, in going back, they uſually begin to be louſy after they arrive at the latitude of the Madeira iſlands. The extreme ſweats, which the working people naturally fall into between the latitude of Madeira and the Indies, drown and deſtroy the lice; and have the ſame effect as the rubbing over the louſy heads of children with butter and oil. But the people in general in the Indies are ſubject to lice in their heads, though free from them on their bodies. The reaſon of this is, that their heads ſweat leſs than their bodies, and they take no care to comb and clean them. The Spaniſh negroes waſh their heads thoroughly once every week with ſoap, to prevent their being louſy. This makes them eſcape much better than the other negroes who are ſlaves there; for the lice grow ſo numerous in their heads, that they often eat large holes in them.

Cleanlineſs is doubtleſs the grand ſecret by which to keep clear from lice, eſpecially when we wear woollen clothes; for there can be no lice but by communication. As a cure of the pedicular diſeaſe, it is neceſſary to rub the body with ſulphur and tobacco, weak mercurial ointment, or black pepper and lard. Monkeys and ſome Hottentots, we are told, eat lice; and are thence denominated *phthirophages*. It is a fact that the negroes on the weſt coaſt of Africa take great delight in making their women clear their bodies of lice, and thoſe latter devour them with greedineſs as faſt as they find them.

In ancient medicine lice were eſteemed aperient, febrifuge, and proper for curing a pale complexion. The natural repugnance to thoſe ugly creatures (ſays Lemery) perhaps contributed more to baniſh the fever than the remedy itſelf. In the jaundice five or ſix were ſwallowed in a ſoft egg. In the ſuppreſſion of urine, which happens frequently to children at their birth, a living louſe is introduced into the urethra, which, by the tickling which it occaſions in the canal, forces the ſphincter to relax, and permits the urine to flow. Farriers have alſo a cuſtom (ſays M. Bourgeois) of introducing one or two lice into the urethra of horſes when they are ſeized with a retention of urine, a diſeaſe pretty common among them. The great diſtinction between thoſe which infeſt mankind is into the head and body louſe. The former is hard and high coloured, and the latter leſs compact and more of an aſhen colour.

PEDILUVIUM, or BATHING *of the* FEET. The uſes of warm bathing in general, and of the pediluvium in particular, are ſo little underſtood, that they are often prepoſterouſly uſed, and ſometimes as injudiciouſly abſtained from. The benefit obtained by a warm pediluvium is juſtly attributed to its making a derivation into the parts immerſed, and a revulſion from thoſe affected, becauſe they are relieved. In recent colds, with ſlight humoral peripneumonies, it frequently works an immediate cure. Borelli, Boerhaave, and Hoffman, are all of opinion, that the warm pediluvium acts by driving a larger quantity of blood into the parts immerſed; but their arguments have been diſputed in the Edinburgh Medical Eſſays by a writer who endeavours to prove, that the warm pediluvium acts by rarefying the blood, and relaxing the veſſels on the ſurface of the body. A pediluvium ought to be no more than pleaſantly warm, for, if *hot*, its operation will be directly contrary to the intentions of cure: and it is this circumſtance, probably, which has given riſe to the difference of opinion relative to the modus operandi of the warm pediluvium, which is an excellent remedy if properly uſed.

PEDIMENT. See ARCHITECTURE.

PEDLAR, a travelling foot-trader. See HAWKERS. In Britain (as formerly in France) the pedlars are deſpiſed; but it is otherwiſe in certain countries. In Spaniſh America, the buſineſs is ſo profitable, that it is thought by no means diſhonourable; and there are many gentlemen in Old Spain, who, when their circumſtances are declining, ſend their ſons to the Indies to retrieve their fortunes in this way. Almoſt all the commodities of Europe are diſtributed through the ſouthern continent of America by means of theſe pedlars. They come from Panama to Paita by ſea; and in the road from the port laſt mentioned, they make Peura their firſt voyage to Lima. Some take the road through Caxamalia; others through Truxillo, along ſhore from Lima. They take their paſſage back to Panama by ſea, and perhaps take with them a little cargo of brandy. At Panama they again ſtock themſelves with European goods, returning by ſea to Paita, where they are put on ſhore; there they hire mules and load them, the Indians going with them in order to lead them back. Their travelling expences are next to nothing; for the Indians are brought under ſuch ſubjection, that they find lodging for them, and provender for their mules, frequently thinking it an honour done them for their gueſts to accept of this for nothing, unleſs the ſtranger now and then, out of generoſity or compaſſion, makes a ſmall recompenſe.

In Poland, where there are few or no manufactures, almoſt all the merchandiſe is carried on by pedlars, who are ſaid to be generally Scotſmen, and who, in the reign of king Charles II. are ſaid to have amounted to no fewer than 53,000.

PEDOMETER, or PODOMETER, formed from *πες*, *pes*, "foot," and *μετρον*, "meaſure," way-wiſer; a mechanical inſtrument, in form of a watch, conſiſting of various wheels with teeth, catching in one another, all diſpoſed in the ſame plane; which, by means of a chain or ſtring faſtened to a man's foot, or to the wheel of a chariot, advance a notch each ſtep, or each revolution of the wheel; ſo that the number being marked on the edge of each wheel, one may number the paces, or meaſure exactly the diſtance from one place to another. There are ſome of them which mark the time on a dial-plate, and are in every reſpect much like a watch, and are accordingly worn in the pocket like a watch.

PEDRO (Don) of Portugal, duke of Coimbra, was the fourth child and ſecond ſurviving ſon of king John of Portugal, and was born March the 4th, 1394. His father gave him an excellent education, which, joined to ſtrong natural abilities and much application, rendered him one of the moſt accompliſhed princes of his time. He was not only very learned himſelf, but a great lover of learning, and a great patron of learned men. It was chiefly with a view to improve his knowledge that he ſpent four years in travelling through different countries in Europe, Aſia, and Africa, with a train ſuitable to his quality; of which travels there is a relation ſtill extant, but ſo loaded with fabulous circumſtances that it wounds the reputation it was deſigned to raiſe. At his return he eſpouſed Iſabella, daughter to the count of Urgel, and grand-daughter to Don Pedro, the fourth king of Portugal, which was eſteemed a very great advancement of his fortune. He was elected into the moſt noble order of the Garter, April 22, 1417, in the fifth year of the reign of his couſin Henry V. grandſon of John of Gaunt, by the father's ſide, as our duke of Coimbra was by the mother. In 1440 he was declared regent during the minority of his couſin Don Alonſo V. ſon of king Edward, who died by the plague. He found ſome difficulty at firſt in the diſcharge of his office, both from the queen-mother and others. But, upon the whole, his adminiſtration was ſo mild and ſo juſt, that the magiſtrates and people of Liſbon concurred in demanding his leave to erect a ſtatue to him. The regent thanked them, ſaid he ſhould be unwilling to ſee a work of theirs demoliſhed; and that he was ſufficiently rewarded by this public teſtimony of their affections. The queen-dowager wiſhed to raiſe diſturbances in Portugal by aiming to recover the regency to herſelf; but the ſteadineſs of the regent's adminiſtration, the attachment of the beſt part of the nobility to him, and his enjoying, in ſo abſolute a degree, the confidence of the people, not only ſecured the interior tranquillity of the ſtate, but raiſed the credit likewiſe of the crown of Portugal to a very great height in the ſentiments of its neighbours: for in the courſe of his regency he had made it his continual ſtudy to purſue the public good; to eaſe the people in general, and the inhabitants of Liſbon in particular, of ſeveral impoſitions; to maintain the laws in their full vigour; to give the king an excellent education; and, if that had been at all practicable, to diffuſe a perfect unanimity through the court, by aſſuaging the malice and envy of his enemies. The king when he came of age, and the *cortes* or parliament, expreſſed their entire ſatisfaction with the regent's adminiſtration; and all parties entirely approved of the king's marriage with Donna Iſabella, the regent's daughter, which was celebrated in 1446. The enmity of his enemies, however, was not in the leaſt abated by the regent's being out of office. They ſtill perſecuted him with their unjuſt calumnies, and unfortunately made the king hearken to their falſehoods. The unfortunate duke, when ordered to appear before the king, was adviſed to take with him an eſcort of horſe and foot. In his paſſage he was proclaimed a rebel, and quickly after he was ſurrounded by the king's troops. Soon after he was attacked, and in the heat of action he was killed: nor was the envy of his enemies even then ſatiated; his body was forbid burial, and was at length taken away privately by the peaſants. His virtue, however hated in courts, was adored by the uncorrupt

part of his countrymen. At length, though, by an inſpection of his papers, the king ſaw, when it was too late, the injuſtice that had been done the man who had behaved ſo well in ſo high and difficult an office; and whoſe papers only diſcovered ſigns of further benefit to the king and his dominions. In conſequence of theſe diſcoveries, the duke's adherents were declared loyal ſubjects, all proſecutions were ordered to ceaſe, and the king deſired the body of Coimbra to be tranſported with great pomp from the caſtle of Abrantes to the monaſtery of Batalha; where it was interred in the tomb which he had cauſed to be erected for himſelf. The royal name of Don Pedro occurs often in the hiſtory of Portugal, and many who bore the name were ſingularly diſtinguiſhed either for internal abilities or external ſplendour. See PORTUGAL.

PEDUNCLE, in botany. See PEDICLE.

PEEBLES, or TWEEDDALE, a county of Scotland, extending 25 miles in length and 18 in breadth. It is bounded on the eaſt by Ettrick Foreſt, on the ſouth by Annandale, on the weſt by Clydeſdale, and on the north by Mid Lothian. Tweeddale is a hilly country, well watered with the Tweed, the Yarrow, and a great number of ſmaller ſtreams that fertilize the valleys, which produce good harveſts of oats and barley, with ſome proportion of wheat. All the rivers of any conſequence abound with trout and ſalmon. The lake called *Weſt-Water Loch* ſwarms with a prodigious number of eels. In the month of Auguſt, when the weſt wind blows, they tumble into the river Yarrow in ſuch ſhoals, that the people who wade in to catch them run the riſk of being overturned. There is another lake on the borders of Annandale, called *Loch-gennen*, which forms a cataract over a precipice 250 paces high: here the water falls with ſuch a momentum as to kill the fiſh underneath. About the middle of this country is the hill or mountain of Braidalb, from the top of which the ſea may be ſeen on each ſide of the iſland. Tweeddale abounds with limeſtone and freeſtone. The hills are generally as green as the downs in Suſſex, and feed innumerable flocks of ſheep, that yield great quantities of excellent wool. The country is well ſhaded with woods and plantations, abounds with all the neceſſaries of life, and is adorned with many fine ſeats and populous villages. The earls of March were hereditary ſheriffs of Tweeddale, which beſtows the title of *marquis* on a branch of the ancient houſe of Hay, earls of Errol, and hereditary high conſtables of Scotland. The family of Tweeddale is, by the female ſide, deſcended from the famous Simon de Fraſer, proprietor of great part of this country, who had a great ſhare in obtaining the triple victory at Roſlin. The chief, and indeed the only town of conſequence in Tweeddale, is PEEBLES, a ſmall inconſiderable royal borough, and ſeat of a preſbytery, pleaſantly ſituated on the banks of the Tweed, over which there is at this place a ſtately ſtone bridge of five arches. In the neighbourhood of Peebles, near the village of Romana, on the river Lene, we ſee the veſtiges of two Roman caſtella, or ſtationary forts; and a great many terraces on the neighbouring hills, which perhaps have ſerved as itinerary encampments. In the ſhire of Tweeddale there are many ancient and honourable families of the gentry. Among theſe, Douglas of Cavers, who was hereditary ſheriff of the county, ſtill preſerves the ſtandard and the iron mace of the gallant lord Douglas, who fell in the battle of Otterburn, juſt as his troops had defeated and taken Henry Percy, ſurnamed *Hotſpur*. In the church-yard of Drumelzier, belonging to an ancient branch of the Hay family, the famous Merlin is ſuppoſed to lie buried. There was an old traditional prophecy, that the two kingdoms ſhould be united when the waters of the Tweed and the Panſel ſhould meet at his grave. Accordingly, the country people obſerve that this meeting happened in conſequence of an inundation at the acceſſion of James VI. to the crown of England.

PEEK, in the ſea-language, is a word uſed in various ſenſes. Thus the anchor is ſaid to be a-peek, when the ſhip being about to weigh comes over her anchor in ſuch a manner that the cable hangs perpendicularly between the hauſe and the anchor. To heave a-peek, is to bring the peek ſo as that the anchor may hang a-peek. A ſhip is ſaid to ride a-peek, when, lying with her main and fore-yards hoiſted up, one end of her yards is brought down to the ſhrouds, and the other raiſed up on high; which is chiefly done when ſhe lies in rivers, leſt other ſhips falling foul of the yards ſhould break them. Riding a-broad peek denotes much the ſame, excepting that the yards are only raiſed to half the height. *Peek* is alſo uſed for a room in the hold, extending from the bitts forward to the ſtern: in this room men of war keep their powder, and merchantmen their victual.

PEEL, in the Iſle of Man, formerly Holm-town, has a fort in a ſmall iſland, and a garriſon well ſupplied with cannon. In it are the ancient cathedral, the lord's houſe, with ſome lodgings of the biſhops, and ſome other remains of antiquity.

PEER, in general, ſignifies an equal, or one of the ſame rank and ſtation: hence, in the acts of ſome councils, we find theſe words, *with the conſent of our peers, biſhops, abbots*, &c. Afterwards the ſame term was applied to the vaſſals or tenants of the ſame lord, who were called *peers*, becauſe they were all equal in condition, and obliged to ſerve and attend him in his courts; and peers *in fiefs*, becauſe they all held fiefs of the ſame lord. The term *peers* is now applied to thoſe who are impanelled in an inqueſt upon a perſon for convicting or acquitting him of any offence laid to his charge; and the reaſon why the jury is ſo called, is becauſe, by the common law and the cuſtom of this kingdom, every perſon is to be tried by his peers or equals; a lord by the lords, and a commoner by commoners. See the article JURY.

PEER *of the Realm*, a noble lord who has a ſeat and vote in the Houſe of Lords, which is alſo called the *Houſe of Peers*. Theſe lords are called *peers*, becauſe, though there is a diſtinction of degrees in our nobility, yet in public actions they are equal, as in their votes in parliament, and in trying any nobleman or other perſon impeached by the commons, &c. See PARLIAMENT.

Houſe of PEERS, or *Houſe of Lords*, forms one of the three eſtates of parliament. See LORDS and PARLIAMENT.

In a judicative capacity, the houſe of peers is the ſupreme court of the kingdom, having at preſent no original juriſdiction over cauſes, but only upon appeals and writs of error; to rectify any injuſtice or miſtake of the law committed by the courts below. To this authority they ſucceeded of courſe upon the diſſolution of the *Aula Regia*. For, as the barons of parliament were conſtituent members of that court, and the reſt of its juriſdiction was dealt out to other tribunals, over which the great officers who accompanied thoſe barons were reſpectively delegated to preſide, it followed, that the right of receiving appeals, and ſuperintending all other juriſdictions, ſtill remained in that noble aſſembly, from which every other great court was derived. They are therefore in all caſes the laſt reſort, from whoſe judgment no farther appeal is permitted; but every ſubordinate tribunal muſt conform to their determinations; the law repoſing an entire confidence in the honour and conſcience of the noble perſons who compoſe this important aſſembly, that they will make themſelves maſters of thoſe queſtions upon which they undertake to decide, ſince upon their deciſion all property muſt finally depend. See LORDS, NOBILITY.

PEERESS, a woman who is noble by deſcent, creation, or marriage. For, as we have noblemen of ſeveral ranks, ſo we may have noblewomen: thus king Henry VIII. made Anne Bullen marchioneſs of Pembroke; king James I. created the lady Compton, wife to ſir Thomas Compton, counteſs of Buckingham, in the lifetime of her huſband, without any addition of honour to him. The ſame king made the lady Finch viſcounteſs of Maidſtone, and afterwards counteſs of Winchelſea, to her and the heirs of her

body: and king George I. made the lady Schulenberg duchess of Kendal. If a peeress, by descent or creation, marries a person under the degree of nobility, she still continues noble: but if she obtains that dignity only by marriage, she loses it on her afterwards marrying a commoner; yet, by the courtesy of England, she generally retains the title of her nobility. A countess or baroness may not be arrested for debt or trespass; for though, in respect of their sex, they cannot sit in parliament, they are nevertheless peers of the realm, and shall be tried by their peers, &c.

PEEWIT, in ornithology. See LARUS.

PEGASUS, among the poets, a horse imagined to have wings; being that whereon Bellerophon was fabled to be mounted when he engaged the Chimera. See CHIMERA. The opening of the fountain Hippocrene on mount Helicon is ascribed to a blow of Pegasus's hoof. It was feigned to have flown away to heaven, where it became a constellation. Hence

PEGASUS, in astronomy, the name of a constellation of the northern hemisphere, in form of a flying horse. See ASTRONOMY.

PEGMARES, a name by which certain gladiators were distinguished, who fought upon moveable scaffolds called *pegmata*, which were sometimes unexpectedly raised, and by this means surprised the people with gladiators in hot contention. They were sometimes so suddenly lifted up as to throw the combatants into the air; and sometimes they were let down into dark and deep holes, and then set on fire, thus becoming the funeral piles of these miserable wretches, and roasting them alive to divert the populace.

PEGU, a very considerable kingdom of Asia, beyond the Ganges. The country properly so called is but about 350 miles in length from north to south, and as much in breadth from east to west. It is situated on the eastern side of the bay of Bengal, nearly opposite to Arixa, and to the north-east of the coast of Coromandel. It is bounded on the north by the kingdoms of Arrakan and Ava; on the east by the Upper and Lower Siam; on the south by part of Siam and the sea; and on the west by the sea and part of Arrakan.

The kingdom of Pegu is said to have been founded about 1100 years ago. Its first king was a seaman; concerning whom and his successors we know nothing till the discovery of the East Indies by the Portuguese in the beginning of the 16th century. In 1518 the throne of Pegu was possessed by one Bresiagukan, with whom Antony Correa the Portuguese ambassador solemnly concluded a peace in 1519. This monarch was possessed of a very large and rich empire, nine kingdoms being in subjection to him, whose revenues amounted to three millions of gold. We hear no farther account of his transactions after the conclusion of the treaty with the Portuguese. In 1539 he was murdered on the following occasion: Among other princes who were his tributaries was Para Mandara, king of the Barmas. These people inhabited the high lands called *Pangavirau*, to the northward of the kingdom of Pegu. Their prince, by one of the terms of his vassalage, was obliged to furnish the king of Pegu with 30,000 Barmas, to labour in his mines and other public works. As the king used frequently to go and see how his works went forward, and in these journeys took along with him none but his women, the Barmas observing these visits frequently repeated, formed a design of robbing the queen and all the concubines of their jewels; and pursuant to this design, the next time the king visited the works, they murdered him, and, having stripped the ladies, fled to their own country.

By this enormity all Pegu was thrown into confusion: but, instead of revenging the death of their king, the people divided every where into factions; so that Dacha Rupi, the lawful heir to the crown, found himself unable to maintain his authority. Of these commotions the king of the Barmas taking the advantage, not only shook off the yoke, but formed a design of conquering the kingdom of Pegu itself. With this view he invaded the country with an army of more than a million of foot, and 5000 elephants; besides a great fleet which he sent down the river Ava towards Bagou or Pegu, the capital of the empire; while he himself marched thither by land. Just at this time Ferdinand de Mirales arrived at Pegu from Goa with a large galleon richly laden on account of the king of Portugal. As soon as Dacha Rupi heard of his coming, he sent to desire his assistance against the enemy. This he obtained by great presents and promises; and Mirales, setting out in a galliot, joined the king's ships. Had the numbers been any thing near an equality, the superior skill of Mirales would undoubtedly have gained the victory; but the fleet of the Barmas covered the whole river, though as large as the Ganges, while that of Dacha Rupi could scarce be observed in comparison with them. Mirales did every thing that man could do, and even held out alone after the natives had deserted him; but at last, oppressed and overwhelmed with numbers, he was killed, with all his men.

Thus Para Mandara became master of all Pegu; after which he attacked the tributary kingdoms. In 1544 he besieged Martavan, the capital of a kingdom of the same name, then very great and flourishing. The land-forces which he brought against it consisted of 700,000 men, while by sea he attacked it with a fleet of 1700 sail; 100 of which were large galleys, and in them 700 Portuguese commanded by John Cayero, who had the reputation of being a valiant and experienced officer. The siege however continued seven months, during which time the Barmas lost 120,000 men; but at last the besieged king, finding himself straitened for want of provisions, and unable to withstand so great a power, offered terms of capitulation. The besiegers would admit of no terms; upon which the distressed king applied to the Portuguese in the service of his enemy; for by their assistance he doubted not to be able to drive away the Barmas. Accordingly, he sent one Seixas to Cayero, entreating him to receive himself, his family, and treasure, on board the four ships he had under his command; offering, on that condition, to give half his riches to the king of Portugal, to become his vassal, and pay such tribute as should be agreed upon. Cayero consulted the principal officers, and in their presence asked Seixas what he thought the treasure might amount to. Seixas answered, that out of what he had seen, for he had not seen all, two ships might be loaded with gold, and four or five with silver. This proposal was too advantageous to be slighted; but the rest of the officers envying the great fortune which Cayero would make, threatened to discover the whole to the king of Barma if he did not reject it. The unhappy king of Martavan had now no other resource but to set fire to the city, make a sally, and die honourably with the few men he had with him: but even here he was disappointed; for by the desertion of 4000 of his troops the enemy were apprised of his design, and prevented it. Thus betrayed, he capitulated with the Barma king for his own life and the lives of his wife and children, with leave to end his days in retirement. All this was readily granted, but the conqueror intended to perform no part of his promise. The city was plundered and burnt, by which above 60,000 persons perished, while at least an equal number were carried into slavery. Six thousand cannon were found in the place; 100,000 quintals of pepper, and an equal quantity of other spices. The day after this destruction, 21 gibbets were erected on an hill adjoining to the city; on which the queen, her children, and ladies, were executed, by hanging them up alive by the feet: however, the queen expired with anguish before she suffered such a cruel indignity. The king, with 50 of his chief lords, was cast into the sea with stones about their necks. This monstrous cruelty so provoked the tyrant's soldiers, that they mutinied, and

he was in no ſmall danger of ſuffering for it: however, he found means to pacify them; after which he proceeded to beſiege Prom, the capital of another kingdom. Here he increaſed his army to 900,000 men. The queen by whom it was governed offered to ſubmit to be his vaſſal; but nothing would ſatisfy the Barma monarch leſs than her ſurrender at diſcretion, and putting all her treaſure into his hands. This ſhe, who knew his perfidy, refuſed to do; on which the city was fiercely aſſaulted, but greatly to the diſadvantage of the Barmas, who loſt near 100,000 men. However, the city was at laſt betrayed to him, when Mandara behaved with his uſual cruelty. Two thouſand children were ſlain, and their bodies cut in pieces and thrown to the elephants; the queen was ſtripped naked, publicly whipped, and then tortured till ſhe died; the young king was tied to her dead body, and both together caſt into a river, as were alſo 300 other people of quality.

While the tyrant was employed in fortifying the city, he was informed, that the prince of Ava had ſailed down the river Queytor with 400 rowing veſſels having 30,000 ſoldiers on board; but that, hearing of the queen's diſaſter, he ſtopped at Meletay, a ſtrong fortreſs about twelve leagues north of Prom, where he waited to be joined by his father the king of Ava with 80,000 men. On this news the Barma king ſent his foſter-brother Chaumigrem along the river ſide with 200,000 men, while he himſelf followed with 100,000 more. The prince in this emergency burnt his barks, forming a vanguard of the mariners, and, putting his ſmall army in the beſt poſition he could, expected the enemy. A moſt deſperate engagement enſued, in which only 800 of the prince's army were left, and 115,000 out of 200,000 Barmas who oppoſed him were killed. The 800 Avans retired into the fort: but Mandara coming up ſoon after, and being enraged at the terrible havock made in his army, attacked the fortreſs moſt violently for ſeven days; at the end of which time, the 800, finding themſelves unable to hold out any longer, ruſhed out in a dark and rainy night, in order to ſell their lives at as dear a rate as poſſible. This laſt effort was ſo extremely violent, that they broke through the enemy's troops in ſeveral places, and even preſſed ſo hard on the king himſelf that he was forced to jump into the river. However, they were at laſt all cut off, but not before they had deſtroyed 12,000 of their enemies.

Mandara having thus become maſter of the fort, commanded it to be immediately repaired; and ſailed up the river to the port of Ava, about a league from the capital, where he burnt between 2000 and 3000 veſſels, and loſt in the enterpriſe about 8000 men. The city itſelf he did not think proper to inveſt, as it had been newly fortified, was defended by a numerous garriſon, and an army of 80,000 men was advancing to its relief. The king alſo, apprehenſive of Mandara's power, had implored the protection of the emperor of Siam; offering to become his tributary on condition that he would aſſiſt him with his forces in recovering the city of Prom. To this the emperor readily aſſented; which news greatly alarmed the Barma monarch, ſo that he diſpatched ambaſſadors to the Kalaminham or ſovereign of a large territory adjacent, requeſting him to divert the emperor from his purpoſe. On the ambaſſadors' return from this court, it appeared that the treaty had already taken effect; but as the ſeaſon was not yet arrived for invading Ava, Chaumigrem the king's foſter-brother was ſent with 150,000 men to reduce Sebadi or Savadi, the capital of a ſmall kingdom about 130 leagues north-eaſt from Pegu. The general, however, failed in his attempt; and afterwards endeavouring to revenge himſelf on a town in the neighbourhood, he was ſurpriſed by the enemy and put to flight.

In the mean time, the empire of Siam fell into great diſtractions; the king, together with the heir to the crown, were murdered by the queen, who had fallen in love with an officer, whom ſhe married after her huſband's death. However, both of them were ſoon after killed at an entertainment; and the crown was given to a natural brother of the late king, but a coward and a tyrant. On this Mandara reſolved to invade the country; and his principal courtiers concurring in the ſcheme, he collected an army of 800,000 men, with no fewer than 20,000 elephants. In this army were 1000 Portugueſe, commanded by one James Suarez, who already had a penſion of 200,000 ducats a year from the king of Pegu, with the title of his brother, and governor of the kingdom. With this formidable army he ſet out in April 1548. His firſt achievement was the taking of a fortreſs on the borders of the enemy's country; before which being ſeveral times repulſed, and having loſt 3000 of his men, he revenged himſelf by putting all the women to the ſword. He next beſieged the capital itſelf; but though the ſiege was continued for five months, during which time the moſt violent attacks were made upon it, the aſſailants were conſtantly repulſed with great loſs. However, it was ſtill reſolved to continue the ſiege; and a mount of earth was raiſed, on which were placed 40 pieces of cannon, ready to batter it anew, when, in October, advice was received of a rebellion having broke out in Pegu.

The perſon who headed the rebels on the preſent occaſion was Shoripam Shay, near akin to the former monarch ſlain twelve years before. He was a religious perſon, of great underſtanding, and eſteemed a ſaint. As he was a famous preacher, he made a ſermon, in which he ſet forth the tyranny of the Barmas in ſuch a manner, that he was immediately taken out of the pulpit, and proclaimed king by the people, who, as a token of ſovereignty, gave him the title of *Shemindoo*. The firſt act of ſovereignty which he exerted was to cut in pieces 15,000 Barmas, and ſeize on the treaſure: and ſo agreeable was this change of government to all ranks of people, that in three weeks time all the ſtrong holds of Pegu fell into his hands.

On this news the king immediately raiſed the ſiege in which he was engaged, and in 17 days got to Martavan. Here he was informed, that Shemindoo had poſted 500,000 men in different places, in order to intercept his paſſage; at the ſame time that he had the mortification to find 50,000 of his beſt troops deſerted. To prevent a greater deſertion, after 14 days ſtay, he departed from Martavan, and ſoon met Shemindoo at the head of 600,000 men. A deſperate engagement followed; in which Shemindoo was entirely defeated, with the loſs of 300,000 men. Of the Barma troops were ſlain 60,000; among whom were 280 Portugueſe.

The morning after this victory, the tyrant marched to the city; the inhabitants of which ſurrendered, on condition of having their lives and effects ſpared. The kingdom being thus again brought under his ſubjection, his next ſtep was to puniſh the principal perſons concerned in the rebellion: their heads he cut off, and confiſcated their eſtates, which amounted to no leſs than ten millions of gold. Others ſay, that he put all without diſtinction to the ſword, excepting only 12,000, who took ſhelter in James Suarez's houſe, that alone affording an aſylum from the general ſlaughter. The plunder was incredible, Suarez alone getting three millions. All theſe cruelties, however, were inſufficient to ſecure the allegiance of the tyrant's ſubjects: for in leſs than three months news was brought that the city of Martavan had revolted; and that the governor had not only declared for Shemindoo, but murdered 2000 Barmas. Mandara then ſummoned all the lords of the kingdom to meet him with their force, within 15 days, at a place called *Mouchan*, not far from his capital, whither he himſelf went with 300 men, to wait their arrival. But in the mean time he received intelligence that the ſhemin or governor of Zatan, a city of ſome conſequence, had ſubmitted to Shemindoo, and alſo lent him a large ſum of gold. The ſhemin was immediately ſent

for in order to be put to death: but he, ſuſpecting Mandara's deſign, excuſed himſelf by pretending ſickneſs; after which, having conſulted with his friends, he drew together about 600 men; and having with theſe privately advanced to the place where the king was, he killed him, with the few attendants that were about him at the time. The guards in the court being alarmed with the noiſe, a ſkirmiſh enſued with the ſhemin's men, in which about 800 were ſlain on both ſides, moſt of them Barmas. The ſhemin then retreated to a place called *Pontel*; whither the people of the country, hearing of the death of the king, who was univerſally hated, reſorted to him. When he had aſſembled about 5000 men, he returned to ſeek the troops which the late king had with him; and, finding them diſperſed in ſeveral places, eaſily killed them all. With the Barmas were ſlain 80 out of 300 Portugueſe. The remainder ſurrendered, with Suarez their leader; and were ſpared, on condition of their remaining in the ſervice of the ſhemin.

The ſhemin, now finding his forces daily increaſe, aſſumed the title of *king*; and, to render himſelf the more popular, gave out that he would exterminate the Barmas ſo effectually, as not to leave one in all the kingdom. It happened, however, that one of thoſe who were with the late king at the time he was murdered, eſcaped the general ſlaughter; and, ſwimming over the river, informed Chaumigrem of the king's death. He had with him 180,000 men, all of them natives of Pegu, excepting 30,000 Barmas. He knew very well, that if the natives had known that the king was dead, he and all his Barmas would have inſtantly been put to the ſword. Pretending, therefore, that he had received orders to put garriſons into ſeveral places, Chaumigrem diſpatched all the natives into different parts, and thus got rid of thoſe whom he had ſo much cauſe to fear. As ſoon as they were marched, he turned back upon the capital, and ſeized the king's treaſure, together with all the arms and ammunition. He then ſet fire to the magazines, arſenals, palace, ſome of whoſe apartments were ceiled with gold, and 2000 rowing veſſels which were on the river. Then deſtroying all the artillery, he fled with the 30,000 Barmas to his own country, being purſued in vain by the natives of Pegu.

Thus the ſhemin of Zatan was left in quiet poſſeſſion of the kingdom; but, by his repeated acts of tyranny and cruelty, he ſo diſguſted his ſubjects, that many fled to foreign countries, while others went over to Shemindoo, who began now to gather ſtrength again. In the mean time, James Suarez, the Portugueſe whom we have often mentioned, loſt his life by attempting to raviſh a young woman of diſtinction; the ſhemin being unable to protect him, and obliged to give him up to the mob, who ſtoned him to death. The ſhemin himſelf did not long ſurvive him; for, being grown intolerable by his oppreſſions, moſt of his followers abandoned him, and he was beſieged in his capital by Shemindoo, with an army of 200,000 men, and ſoon after ſlain in a ſally: ſo that Shemindoo now ſeemed to be fully eſtabliſhed on the throne. But in the mean time Chaumigrem, the foſter-brother to the deceaſed king, hearing that Pegu was very ill provided with the means of defence, invaded the kingdom with an army of 300,000 men. Shemindoo met him with three times their number; but his men, being all natives of Pegu, were inferior in ſtrength, notwithſtanding their numbers, to the enemy. The conſequence was, that Shemindoo was defeated with prodigious ſlaughter, and Chaumigrem cauſed himſelf to be proclaimed king of Pegu. Shortly after, Shemindoo himſelf was taken; and, after being treated with the utmoſt cruelty, was beheaded.

The hiſtory of Chaumigrem is very imperfect. However, we know that he was a very great conqueror, and not at all inferior in cruelty to his predeceſſors. He reduced the empire of Siam and Arrakan, and died in 1583; being ſucceeded by his ſon named *Pranjinoko*, then about 50 years of age. When this prince aſcended the throne, the kingdom of Pegu was in its greateſt height of grandeur; but by his tyranny and obſtinacy he loſt all that his father had gained. He died in 1599, and after his death the kingdom of Pegu became ſubject to Arrakan. For ſome time paſt it has been tributary to the more powerful kingdom of Ava; the ſovereigns of which country have hitherto been extremely cautious of permitting Europeans to obtain any ſettlement among them.

The air of Pegu is very healthy, and preſently recovers ſick ſtrangers. The ſoil alſo is very rich and fertile in corn, rice, fruit, and roots; being enriched by the inundations of the river Pegu, which are almoſt incredible, extending above 30 leagues beyond its channel. It produces alſo good timber of ſeveral kinds. The country abounds with elephants, buffaloes, goats, hogs, and other animals, particularly game; and deer is ſo plenty in September and October, that one may be bought for three or four pence: they are very fleſhy, but have no fat. There is ſtore of good poultry; the cocks are vaſtly large, and the hens very beautiful. As for fiſh, there are many ſorts, and well taſted. In Pegu are found mines, not only of gold, iron, tin, and lead, or rather a kind of copper or mixture of copper and lead, but alſo of rubies, diamonds, and ſapphires. The rubies are the beſt in the world; but the diamonds are ſmall, and only found in the craws of poultry and pheaſants. Beſides, only one family has the privilege of ſelling them; and none dare open the ground to dig for them. The rubies are found in a mountain in the province of Kablan, or Kapelan, between the city of Pegu and the port of Sirian.

The inhabitants are of an olive, or rather a tawny complexion. The women are branded by ſome travellers as having ſhook off all modeſty, on account of their expoſing ſome parts of their bodies which ought to be concealed from ſight. Some alſo tell us, that the men wear bells, which at a certain age, *viz.* 25 or 30, or, according to others, when they are capable of making uſe of women, are inſerted on each ſide the virile member between the ſkin and the fleſh, which is opened for that purpoſe, and healed in ſeven or eight days. The Peguers may be ranked among the moſt ſuperſtitious of all mankind. They maintain and worſhip crocodiles; and will drink nothing but the waters of the ditches where thoſe monſtrous animals harbour. By thus expoſing themſelves to the manifeſt hazard of their lives, they have frequently the misfortune to be devoured. They have five principal feſtivals in the year, called *ſapans*, which they celebrate with extraordinary magnificence. In one of them the king and queen make a pilgrimage about 12 leagues from the city, riding on a triumphal car, ſo richly adorned with jewels, that it may be ſaid without an hyperbole that they carry about with them the value of a kingdom. This prince is extremely rich; and has in the chapel of his palace idols of ineſtimable value, ſome of them being of maſſy gold and ſilver, and adorned with all ſorts of precious ſtones. The talapoins, or prieſts of this country, have no poſſeſſions; but ſuch is the reſpect paid them by the people, that they are never known to want. They preach to them every Monday not to commit murder; to take from no perſon any thing belonging to him; to do no hurt; to give no offence; to avoid impurity and ſuperſtition; but above all, not to worſhip the devil: but theſe diſcourſes have no effect in the laſt reſpect. The people, attached to manicheiſm, believe that all good comes from God; that the devil is the author of all the evil that happens to men; and that therefore they ought to worſhip him, that he may not afflict them. This is a common notion among the Indian idolaters.

The inhabitants of Pegu are accuſed by ſome authors with being ſlovenly in their houſes, and naſty in their diet, on account of their ſeaſoning their victuals with ſidol, a compoſition made of ſtinking fiſh, reduced to a conſiſtency like muſtard, ſo nau-

ſeous and offenſive that none but themſelves can endure the ſmell of it. Balbi ſays, he could ſooner bear the ſcent of ſtinking carrion; and yet with this they ſeaſon their rice and other ſoups, inſtead of oil or butter. As they have no wheat in this country, their bread is rice made into cakes. Their common drink is water, or a liquor diſtilled from cocoa-nut water. They are a ſpirited and warlike people; open, generous, and hoſpitable; and have neither the indolence nor the jealouſy of moſt other eaſtern nations.

The men here, as in moſt eaſtern countries, buy their wives, or pay their parents a dowry for them. They have an odd cuſtom; which is, to offer their daughters to ſtrangers, and hire them out for a time: ſome ſay they hire out their wives in the ſame manner. Theſe marriages for a time are well regulated, and often prove very beneficial to the occaſional huſband. Moſt of the foreigners who trade hither, marry a wife for the time of their ſtay. In caſe of a ſeparation, the father is obliged to take care of the boys, and the mother of the girls. We are told that no woman is looked upon the worſe, but rather the better, for having had ſeveral European huſbands: nay, we are told, that no perſon of faſhion in Pegu, from the gentleman to the king, will marry a maiden, till ſome acquaintance or ſtranger has had the firſt night's lodging with her.

In Pegu, the inheritance of all land is in the king: he is likewiſe the heir of all his ſubjects who die without iſſue; but in caſe they have children, two-thirds go to them, and the reſt to his majeſty.

In the government of this country, deſpotiſm prevails in its full extent, and deſpotiſm too of the very worſt kind; for the inhabitants are under the abſolute power of a ſet of petty tyrants, who are themſelves nothing more than ſlaves to the king of Ava. As they have little or no emolument, except what they can raiſe by extortion, it is exerciſed in the moſt unlimited manner. They take cognizance of all diſputes between individuals that come to their ears, without the caſe being laid before them by either of the parties; and on whatever ſide the cauſe is determined, there is a never-failing charge brought in againſt both, for juſtice, as they expreſs it; and this price of juſtice is often three or four times greater than the value of the matter in agitation.

But the inconveniences that this government labours under are not only thoſe of deſpotiſm; the unhappy ſubjects feel thoſe of anarchy too. There are about twenty perſons concerned in the government of Rangoon, who, though one is ſubordinate to another, and though matters of the firſt conſequence are determined in a council of the whole, can yet act ſeparately; and any one member of this body can by his own authority give out orders, which no inhabitant of Pegu dares to diſobey. Thoſe orders may be contrary to the ſenſe of the whole body; in which caſe they are, indeed, reverſed in council: but then there are inſtances, and "I myſelf (ſays a late traveller) obſerved one, of ſuch orders being notwithſtanding repeated more than once by the ſame perſon, and obeyed each time, till they were again reverſed: nor was any redreſs obtained by the party aggrieved, or any effectual meaſures taken to prevent ſuch a contempt of authority for the future."

When a perſon falls ſick, we are told that they generally make a vow to the devil, from whom they believe all evil comes. Then a ſcaffold is built, and victuals are ſpread on the top of it to ſolace Old Nick, and render him propitious. This feaſt is accompanied with lighted candles and muſic; and the whole is managed by an undertaker called the *devil's father*.

The commodities exported from this country are gold, ſilver, rubies, muſk, benjamin, long pepper, tin, lead, copper; lakka, or gum-lac, whereof they make hard wax; rice; rice-wine; and ſome ſugar-canes, of which they would have plenty, but that the elephants eat them. It may be obſerved, that under the name of *rubies*, the Peguers compriſe topazes, ſapphires, amethyſts, and other ſtones; which they diſtinguiſh by ſaying the blue, the violet, and the yellow rubies. The true ruby is red, tranſparent, or ſparkling, inclining near the ſurface to the violet of the amethyſt. Cotton cloths from Bengal and Coromandel, with ſome ſtriped ſilks, are beſt for the Pegu market, and ſilver of any ſort will go off there: for the king, in return for his eight and a half *per cent.* duty on it, allows the merchants to melt it down, and put what copper alloy they pleaſe in it. They wear none of our European commodities in Pegu but hats and ribbons. The gentry will give extravagant prices for fine beaver hats, which they wear without any cocks. They are no leſs fond of ribbons flowered with gold and ſilver, which they wear round their hats.

As to the religion of the Peguers, it is the ſame at bottom with that which prevails over the reſt of India and Tibet; only varies in dreſs ſomewhat in different countries, according to the humour or intereſt of the prieſts. They hold the exiſtence of one ſupreme God, of whom they make no image; but they have many inferior created gods, whoſe images are ſet up in the temples for the laity to worſhip. Not content with theſe, we are told they worſhip the devil alſo. Many are ſeen to run about the ſtreets every morning, with rice in one hand and a torch in the other, crying aloud, that they are going to give the devil his breakfaſt, that he may not hurt them all the day. Beſides the Manichean doctrine of two principles, one the author of good and the other of evil, from whence their worſhipping the devil has its riſe, they believe an eternal ſucceſſion of worlds without creation. The Peguers hold the doctrine of the Metempſychoſis, or tranſmigration of the human ſoul, which, after paſſing through the bodies of various animals, ſhall attain to the perfection and felicity of their gods; which in effect is no other than a ſtate of annihilation. They have a ſtrong opinion of the ſanctity of apes and crocodiles, inſomuch that they believe the perſons to be perfectly happy who are devoured by them. Their temples are of a conic form, and ſome of them a quarter of a mile round. They obſerve a great many feſtivals, ſome of which are called *ſapan*. The images of their inferior gods are in a ſitting poſture, with their legs acroſs, and toes of equal length; their arms and hands very ſmall in proportion to their bodies; their faces longer than human; their ears long, and the lappets very thick. The congregation bow to them when they come in and when they go out; and that is all the worſhip which they pay to them. The prieſts of Pegu, called *talapoins*, are a ſort of mendicant friars. They obſerve celibacy; and eat but once a-day, living in the woods, in a ſort of neſts or cages built on the tops of trees for fear of the tigers. They preach frequently, lead very innocent lives, and are very hoſpitable and humane.

The king of Pegu's revenues ariſe chiefly from the rent of lands, of which he is the ſole proprietor. Another branch of it are the duties paid for the commodities imported or exported. In a word, he is judged the richeſt monarch in the world, next to the emperor of China.

PEGUNTIUM (anc. geog.), Ptolemy; *Piguntiæ*, (Pliny); a town or citadel of Dalmatia, on the Adriatic, oppoſite to the iſland Brattia, ſcarce five miles off, and 40 miles to the eaſt of Salonæ. According to Fortis, a mountain, a large hollow, and ſubmarine ſprings are ſeen here. "This hollow (ſays he, in his Travels into Dalmatia) ſeems to have been excavated by ſome ancient river. The ſprings which bubble up from under the ſea are ſo conſiderable, that they might paſs for the riſing again of a river ſunk under ground. Vrullia has the ſame derivation as the word *Vril*, which in Sclavonian ſignifies a fountain; and this etymology, rendering the name of Vrullia the *Berullia* of Porphyrogenitus analogous to that of Peguntium, ſince Πηγυ and Vril are ſynonymous, induces me

to believe, that the caſtle named Peguntium by ancient geographers was ſituated in this place, and not at the mouth of the Cettina. No remarkable veſtiges of antiquity now exiſt on the ſpot; yet it is evident, by the quantity of fragments of vaſes, tiles, and ſepulchral inſcriptions now and then dug up, that this tract of coaſt was well inhabited in the Roman times. The principal cauſe why the tracts of ancient habitations cannot be diſcovered about Vrullia, is the ſteepneſs of the hill above it, and the quantity of ſtones brought down from thence by the waters. The mouth of the hollow of Vrullia is dreaded by ſeamen, on account of the ſudden impetuous guſts of wind that blow from thence, and in a moment raiſe a kind of hurricane in the channel between the Primorie and the iſland of Brazza, to the great danger of barks ſurpriſed by it."

PEINE FORT ET DURE, (Lat. *pœna fortis et dura*), ſignifies a ſpecial puniſhment inflicted on thoſe who, being arraigned of felony, refuſe to put themſelves on the ordinary trial, but ſtubbornly ſtand mute; it is vulgarly called *preſſing to death*. See ARRAIGNMENT.

PEIRCE (JAMES), an eminent diſſenting miniſter, was born at Wapping, in London, in the year 1674, and was educated at Utrecht and Leyden; after which he ſpent ſome time at Oxford, in order to enjoy the benefit of frequenting the Bodleian library. He then for two years preached the Sunday-evening's lecture at the meeting-houſe in Miles-Lane, London, and then ſettled at Cambridge. In 1713 he was removed to a congregation at Exeter, where he continued till the year 1718; when the Calviniſts among the diſſenters propoſing a ſubſcription to articles of faith to be ſigned by all the diſſenting miniſters in the kingdom, ſeveral articles were propoſed to him and Mr. John Hallet, another diſſenting miniſter at Exeter, in order to their ſubſcribing them. They both refuſed, imagining this proceeding of their diſſenting brethren to be an unworthy impoſition on religious liberty and private judgment; for which they were ejected from their congregation. Upon this, a new meeting was opened for them at Exeter, of which Mr. Peirce continued miniſter till his death, in 1726. He was a man of the ſtricteſt virtue, exemplary piety, and great learning. He wrote, 1. *Exercitatio philoſophica de Homœmeria Anaxagorea.* 2. Thirteen pieces on the Controverſy between the Church of England and the Diſſenters. 3. Ten pieces on the Controverſy about the Ejectment at Exeter. 4. Six pieces on the Doctrine of the Trinity. 5. A Paraphraſe and Notes on the Epiſtles of St. Paul to the Coloſſians, Philippians, and Hebrews. 6. An Eſſay in favour of giving the Euchariſt to Children. 7. Fourteen Sermons.

PEIRESC (NICOLAS CLAUDE FABRI), born in 1580, was deſcended from an ancient and noble family, ſeated originally at Piſa in Italy. At ten years of age he was ſent to Avignon, where he ſpent five years in the Jeſuits college, in the ſtudy of what in Scotland and on the Continent is called *humanity*. From Avignon he was, in 1595, removed to Aix, and entered upon the ſtudy of philoſophy. In the interim he attended the proper maſters for dancing, riding, and handling arms; in all which, though he performed the leſſons regularly, it was with reluctance: for this being done only to pleaſe an uncle, whoſe heir he was to be, he never practiſed by himſelf, eſteeming all the time loſt that was not ſpent in the purſuits of literature. During this period, his father being preſented with a medal of the emperor Arcadius, which was found at Belgenſer, Peireſc begged the favour of it; and, charmed with deciphering the characters in the exergue, and reading the emperor's name, he carried the medal with a tranſport of joy to his uncle; who for his encouragement gave him two more, together with ſome books upon the ſubject. This is the epoch of his application to antiquities, for which he became afterwards ſo famous. In 1596, he was ſent to finiſh his courſe of philoſophy under the Jeſuits at Tournon, where he turned his attention particularly to coſmography, as being neceſſary to the underſtanding of hiſtory; abating, however, nothing of his application to antiquity, in which he was much aſſiſted by Petrus Rogerus, one of the profeſſors, and a ſkilful medaliſt: nor did he omit the ſtudy of humanity in general, wherein he was the maſter and inſtructor of a brother who was with him. But to do all this he was obliged to ſit up late at nights; and ſo much labour and attention, as he was naturally of a tender conſtitution, increaſed the weakneſs of his ſtomach formerly contracted, and for which he had uſed a kind of digeſtive powder. Being recalled by his uncle in 1597, he returned to Aix, and entered there upon the ſtudy of the law; which he proſecuted, however, ſo as to find leiſure to viſit and converſe frequently with Peter A. R. Bagarr, a moſt ſkilful antiquary, who was afterwards made maſter of the jewels to Henry IV.

The following year he went again to Avignon, to carry on his courſe of law under one Peter David; who, being well ſkilled likewiſe in antiquities, was pleaſed to ſee Peireſc join this ſtudy to that of the law. But Ghibertus of Naples, auditor to cardinal Aquāviva, fed his curioſity the moſt, in ſhowing him ſome rarities, ſuch as he had never ſeen before. Ghibertus alſo lent him Goltzius's Treatiſe upon Coins, and adviſed him to go into Italy, eſpecially to Rome, where he would meet with curioſities to ſatisfy his moſt ardent wiſhes. Accordingly, his uncle having procured a proper governor, he and his brother ſet out upon that tour Sept. 1599; and paſſing through Florence, Bononia, and Ferrara, when he had ſtayed a few days at Venice, he fixed his reſidence at Padua, in order to complete his courſe of law. But once a quarter, going to Venice to get caſh for bills of exchange, he took theſe opportunities of introducing himſelf to the moſt diſtinguiſhed literati there; and was particularly careſſed by F. Contarin, procurator of St. Mark, who was poſſeſſed of a curious cabinet of medals, and other antiquities, without knowing the value of them. This was fully ſhown to him by Peireſc, who likewiſe explained the Greek inſcriptions upon his medals, and the monumental ſtones. After a year's ſtay at Padua, he ſet out for Rome, and arrived there Oct. 1600, in order to be in time for ſeeing the jubilee: to celebrate which, the Porta Sancta would be opened in the beginning of the next year. He paſſed ſix months in this city, viewing the numberleſs curioſities there, and in cultivating the friendſhip of Galileo, by whom he was much beloved. This friendſhip led him to carry his reſearches into aſtronomy and natural philoſophy; and he was preſent when Fabricius ab Aquapendente, out of a parcel of eggs upon which a hen was ſitting, took one every day, to obſerve the gradual formation of the chick from firſt to laſt. From this time it was generally acknowledged, that he had taken the helm of learning into his hand, and began to guide the commonwealth of letters.

Having now ſpent almoſt three years in Italy, he began to prepare for his departure; and in the end of 1602, having packed up all the rarities, gems, &c. which he had procured, and put them into the road to Marſeilles, he left Padua, and, croſſing the Alps to Geneva, went to Lyons; where receiving money, he made a handſome preſent to his governor, who took the route of Paris. From Lyons he went to Montpellier, to improve himſelf in the law under Julius Parius. From Montpellier he diſpatched more rarities to his uncle, who ſending for him home, he arrived at Aix in November; but, bringing Parius along with him, he obtained leave to return to Montpellier in a few days. He waited upon Parius back again, under whom he continued purſuing his law ſtudies till the end of 1603, when he returned to Aix, at the earneſt requeſt of his uncle, who, having reſigned to him his ſenatorial dignity, had ever ſince the beginning of the year laboured to get the king's

patent. The degree of doctor of law was a neceſſary qualification for that dignity. Peireſc, therefore, having kept the uſual exereiſe, took that degree Jan. 18. 1604, when the aforeſaid patent was given in to the ſenate, and ordered to be recorded: yet Peireſc procured leave not to be preſently entered into the liſt of ſenators. The bent of his inclination was not ſo much to buſineſs as to advance arts and ſciences, and to aſſiſt all the promoters of learning. For this purpoſe, he reſolved to lead a ſingle life; ſo that, when his father had concluded a match for him with a reſpectable lady, he begged to be excuſed.

In 1605, he accompanied G. Varius, firſt preſident of the ſenate at Aix, who was very fond of him, to Paris; whence, having viſited every thing curious, he croſſed the water, in company with the king's ambaſſador, 1606, to England. Here he was very graciouſly received by king James I.; and having ſeen Oxford, and viſited Camden, Sir Robert Cotton, Sir Henry Saville, and other learned men, he paſſed over to Holland; and after viſiting the ſeveral towns and univerſities, with the literati in each, he went through Antwerp to Bruſſels, and thence back to Paris, to ſee the ceremony of the Dauphin's baptiſm; which being ſolemnized Aug. 24, he returned home in September 1606, being expected for the ordering of the family affairs.

Preſently after this, he purchaſed the barony of Rians; and at the ſolicitation of his uncle, having approved himſelf before that aſſembly, he was received a ſenator on the 1ſt of July 1607. Jan. 1608 he loſt his uncle; and the following year, falling himſelf into a dangerous fever, recovered by eating muſk-melons before ſupper, for which he had conceived a longing. He was ordered by his phyſician to eat them before his meals without bread, and to drink a glaſs of pure wine upon them. He continued this method all his life afterwards; and grew ſo fond of them, that, though he could abſtain from any other meat as he liſted, yet towards them he profeſſed he was unable to maſter himſelf. He frequently experienced, that in the muſk-melon ſeaſon he was never troubled with the gravel. In 1618, having procured a faithful copy of "the Acts of the Monaſtery of Maren in Switzerland," he publiſhed a ſecond edition of that work. As it was written in defence of the royal line of France againſt Theodoric Pieſpordius, who had attempted to prove the title of the Auſtrian family to the French crown by right of ſucceſſion, he was, upon this publication, nominated the ſame year, by Louis XIII, abbot of Sancta Maria Aquiſtrienſis. He ſtayed in France till 1623; when, upon a meſſage from his father, now grown old and ſickly, he left Paris, where he had ſpent ſeven years and ſome months. He arrived at Aix in October; and not long after preſented to the court a patent from the king, permitting him to continue in the function of his ancient dignity, and to exerciſe the office of a ſecular or lay perſon, notwithſtanding that, being an abbot, he had aſſumed the character of a churchman. To this the court of parliament not aſſenting, decreed unanimouſly, that, being already admitted into the firſt rank, he ſhould abide perpetually therein; not returning, as the cuſtom of the court was, to the inferior auditory, wherein trials are uſually had of criminal caſes. In 1625, he buried his father, who had been long afflicted with the gout. In 1627, he prevailed with the archbiſhop of Aix to eſtabliſh a poſt thence to Lyons, and ſo to Paris and all Europe; by which the correſpondence conſtantly held with the literati every where was much facilitated. In 1629, he began to be much tormented with the ſtrangury and hæmorrhoides; and in 1631, having completed the marriage of his nephew Claudius with Margaret Alreſia, a noblewoman of the county of Avignon, he beſtowed upon him the barony of Rianty, together with a grant of his ſenatorial dignity, only reſerving the function to himſelf for three years. But the parliament not waiting his ſurrendry of it, he reſented that affront ſo heinouſly, that he procured, in 1635, letters patent from the king to be reſtored, and to exerciſe the office for five years longer, which happened to be till his death: for, being ſeized, June 1637, with a fever that brought on a ſtoppage of urine, this put an end to his life on the 24th of that month, in his 57th year.

The character of Peireſc may be ſummed up in a few words. His perſon was of a middle ſize, and of a thin habit: his forehead large, and his eyes grey; a little hawk-noſed; his cheeks tempered with red; the hair of his head yellow, as alſo his beard, which he uſed to wear long; his whole countenance bearing the marks of uncommon and rare courteſy and affability. In his diet he affected cleanlineſs, and in all things about him; but nothing ſuperfluous or coſtly. His clothes were ſuitable to his dignity; yet he never wore ſilk. In like manner, the reſt of his houſe was adorned according to his condition, and very well furniſhed; but he neglected his own chamber. Inſtead of tapeſtry, there hung the pictures of his chief friends and of famous men, beſides innumerable bundles of commentaries, tranſcripts, notes, collections from books, epiſtles, and ſuch like papers. His bed was exceeding plain, and his table continually loaded and covered with papers, books, letters, and other things; as alſo all the ſeats round about, and the greateſt part of the floor. Theſe were ſo many evidences of the turn of his mind; in reſpect of which, the writer of his eulogy compares him to the Roman Atticus; and Bayle, conſidering his univerſal correſpondence and general aſſiſtance to all the literati in Europe, daſhed it out luckily enough, when he called him "the attorney general of the literary republic." The works which he publiſhed are, "Hiſtoria provinciæ Galliæ Narbonenſis;" "Nobilium ejuſdem provinciæ familiarum Origines, et ſeparatim Fabriciæ;" "Commentarii rerum omnium memoria dignarum ſua ætate geſtarum;" "Liber de ludicris naturæ operibus;" "Mathematica & aſtronomica varia;" "Obſervationes mathematicæ;" "Epiſtolæ ad S. P. Urbanum VIII. cardinales Barberinos, &c.;" "Authores antiqui Græci et Latini de ponderibus et menſuris;" "Elogia et epitaphia;" "Inſcriptiones antiquæ et novæ;" "Genealogia domûs Auſtriacæ;" "Catalogus librorum biblioth. reg.;" "Poemata varia;" "Nummi Gallici, Saxonici, Britannici, &c.;" "Linguæ orientales, Hebræa, Samaritana, Arabica, Egyptiaca, et Indices librorum harum linguarum;" "Obſervationes in varios auctores." It is remarkable, that though Peireſc bought more books than any man of his time, yet his collection left was not large. The reaſon was, that, as faſt as he purchaſed, he kept continually making preſents of them to ſuch learned men as he knew they would be uſeful to.

PEKIN, the capital city of the empire of China, in Aſia, where the emperor generally reſides. It is ſituated in a very fertile plain, 20 leagues diſtant from the great wall. This name, which ſignifies the *northern court*, is given to it, to diſtinguiſh it from another conſiderable city called *Nanking*, or the *ſouthern court*. The emperor formerly reſided in the latter; but the Tartars, a reſtleſs and warlike people, obliged this prince to remove his court to the northern provinces, that he might more effectually repel the incurſions of thoſe barbarians, by oppoſing to them a numerous militia which he generally keeps around his perſon. It is an exact ſquare, and divided into two parts; namely, that which contains the emperor's palace, which is in the new city, or, as it is called, the Tartar's city, becauſe it is inhabited by Tartars ever ſince they conquered this empire; the other, called the *Old city*, is inhabited by the Chineſe. The circuit of both theſe together is 52 Chineſe lys, each of which contains 240 geometrical paces; being, without the ſuburbs, full ſix leagues in circumference, according to the moſt accurate meaſurement made by order of the emperor.

Thoſe who have paid attention to the population of this place, reckon the number of inhabitants at 2,000,000, though there are others that double that number.

Groſier tells us, "that the height and enormous thickneſs of the walls of the Tartar city excite admiration; twelve horſemen might eaſily ride abreaſt upon them: they have ſpacious towers raiſed at intervals, a bow-ſhot diſtant from one another, and large enough to contain bodies of reſerve in caſe of neceſſity. The city has nine gates, which are lofty and well arched. Over them are large pavilion-roofed towers divided into nine ſtories, each having ſeveral apertures or port-holes: the lower ſtory forms a large hall for the uſe of the ſoldiers and officers who quit guard, and thoſe appointed to relieve them. Before each gate a ſpace is left of more than 360 feet: this is a kind of place of arms, incloſed by a ſemicircular wall equal in height and thickneſs to that ſurrounding the city. The great road, which ends here, is commanded by a pavilion-roofed tower like the firſt, in ſuch manner, that, as the cannon of the former can batter the houſes of the city, thoſe of the latter can ſweep the adjacent country. The ſtreets of Pekin are ſtraight, about 120 feet wide, a full league in length, and bordered with ſhops. It is aſtoniſhing to ſee the immenſe concourſe of people that continually fills them, and the confuſion cauſed by the prodigious number of horſes, camels, mules, and carriages, which croſs or meet each other. Beſides this inconvenience, one is every now and then ſtopped by crowds, who ſtand liſtening to fortune-tellers, jugglers, ballad-ſingers, and a thouſand other mountebanks and buffoons, who read and relate ſtories calculated to promote mirth and laughter, or diſtribute medicines, the wonderful effects of which they explain with all the eloquence peculiar to them.

"People of diſtinction oblige all their dependents to follow them. A mandarin of the firſt rank is always accompanied in his walks by his whole tribunal; and, to augment his equipage, each of the inferior mandarins in his ſuite is generally attended by ſeveral domeſtics. The nobility of the court, and princes of the blood, never appear in public without being ſurrounded by a large body of cavalry; and, as their preſence is required at the palace every day, their train alone would be ſufficient to create confuſion in the city. It is very ſingular, that in all this prodigious concourſe no women are ever ſeen: hence we may judge how great the population of China muſt be, ſince the number of females in this country, as well as every where elſe, is ſuperior to that of the other ſex.

"As there is a continual influx of the riches and merchandize of the whole empire into this city, the number of ſtrangers that reſort hither is immenſe. They are carried in chairs, or ride on horſeback; the latter is more common: but they are always attended by a guide acquainted with the ſtreets, and who knows the houſes of the nobility and principal people of the city. They are alſo provided with a book, containing an account of the different quarters, ſquares, remarkable places, and of the reſidence of thoſe in public offices. In ſummer there are to be ſeen ſmall temporary ſhops, where people are ſerved with water cooled by means of ice; and one finds everywhere eating-houſes, with refreſhments of tea and fruits. Each kind of proviſion has a certain day and place appointed for its being expoſed to ſale.

"The governor of Pekin, who is a Mantchew Tartar, is ſtyled governor of the Nine Gates. His juriſdiction extends not only over the ſoldiers, but alſo over the people in every thing that concerns the police. No police can be more active; and it is ſurpriſing to ſee, among an infinite number of Tartars and Chineſe mixed together, the greateſt tranquillity prevail. It is rare, in a number of years, to hear of houſes being robbed, or people aſſaſſinated. All the principal ſtreets have guard-rooms, and ſoldiers patrol night and day, each having a ſabre hanging from his girdle, and a whip in his hand, to correct, without diſtinction, thoſe who excite quarrels or cauſe diſorder. The lanes are guarded in the ſame manner; and have latticed gates, which do not prevent thoſe from being ſeen who walk in them: they are always kept ſhut during the night, and ſeldom opened even to thoſe who are known; if they are, the perſon to whom this indulgence is granted muſt carry a lanthorn, and give a ſufficient reaſon for his going out. In the evening, as ſoon as the ſoldiers are warned to their quarters by beat of drum, two ſentinels go and come from one guard-room to another, making a continual noiſe with a kind of caſtanet, to ſhow that they are not aſleep. They permit no one to walk abroad in the night-time. They even examine thoſe whom the emperor diſpatches on buſineſs; and if their reply gives the leaſt cauſe of ſuſpicion, they have a right to convey them to the guard-room. The ſoldiers in each of the guard-rooms are obliged to anſwer every time the ſentinels on duty call out.

"It is by theſe wiſe regulations, obſerved with the greateſt ſtrictneſs, that peace, ſilence, and ſafety reign throughout the whole city. The governor is alſo obliged to go the round; and the officers ſtationed on the walls, and in the towers over the gates (in which are kept large kettle-drums that are beat every time the guard is relieved), are continually diſpatching ſub-alterns to examine the quarters belonging to the gates where they are poſted. The leaſt neglect is puniſhed next morning, and the officer who was on guard is caſhiered. This police, which prevents nocturnal aſſemblies, would appear no doubt extraordinary in Europe, and in all probability would not be much reliſhed by our young men of fortune and ladies of quality. But the Chineſe think juſtly: they conſider it to be the duty of the magiſtrates of a city to prefer good order and public tranquillity to vain amuſements, which generally occaſion many attempts againſt the lives and property of the citizens. It is true, the ſupport of this police coſts the emperor a great deal; for part of the ſoldiers we have mentioned are maintained for this purpoſe only. They are all infantry, and their pay is generally very high. Their employment conſiſts not only in watching for thoſe who may occaſion diſturbance in the day-time, or walk abroad during the night; they muſt alſo take care that the ſtreets are kept clean and ſwept every day; that they are watered morning and evening in time of dry weather; and that every nuiſance is removed. They have orders alſo to aſſiſt in this labour themſelves; and to clear the kennels, that the water may have a free courſe."

The walls of the emperor's palace, including that and the gardens, are about two miles in length. "Although (ſays Groſier) the Chineſe architecture has no reſemblance to that of Europe, the imperial palace of Pekin does not fail to ſtrike beholders by its extent, grandeur, and the regular diſpoſition of its apartments, and by the ſingular ſtructure of its pavilion-roofs, ornamented at each corner with a carved platband, the lower extremity of which is turned upwards. Theſe roofs are covered with varniſhed tiles of ſo beautiful a yellow colour, that, at a diſtance, they make as ſplendid an appearance as if they were gilded. Below the upper roof there is another of equal brilliancy, which hangs ſloping from the wall, ſupported by a great number of beams, daubed over with green varniſh, and interſperſed with gilt figures. This ſecond roof, with the projection of the firſt, forms a kind of crown to the whole edifice. The palace is a ſmall diſtance from the ſouth gate of the Tartar city. The entrance to it is through a ſpacious court, to which there is a deſcent by a marble ſtaircaſe, ornamented with two large copper lions, and a baluſtrade of white marble. This baluſtrade runs in the form of a horſe-ſhoe, along the banks of a rivulet, that winds acroſs the palace with a ſerpentine courſe

the bridges over which are of marble. At the bottom of this firſt court, ariſes a façade with three doors: that in the middle is for the emperor only; the mandarins and nobles paſs through thoſe on each ſide. Theſe doors conduct to a ſecond court, which is the largeſt of the palace: it is about 300 feet in length, and 50 in breadth. An immenſe gallery runs round it, in which are magazines, containing rich effects, which belong to the emperor as his private property; for the public treaſure is entruſted to a ſovereign tribunal called *Houpou*. The firſt of theſe magazines is filled with plate and veſſels of different metals; the ſecond contains the fineſt kinds of furs; the third, dreſſes lined with ſable, ermine, minever, and foxes ſkins, which the emperor ſometimes gives in preſents to his officers; the fourth is the depoſitory of jewels, pieces of curious marble, and pearls fiſhed up in Tartary; the fifth, conſiſting of two ſtories, is full of wardrobes and trunks, which contain the ſilk ſtuffs uſed by the emperor and his family; the reſt are filled with bows, arrows, and other pieces of armour taken from the enemy or preſented by different princes.

"The royal hall, called *Tai-kotien*, or the Hall of the Grand Union, is in this ſecond court. It is built upon a terrace about 18 feet in height, incruſted with white marble, and ornamented with baluſtrades of excellent workmanſhip. Before this hall all the mandarins range themſelves, when they go on certain days to renew their homage, and perform thoſe ceremonies that are appointed by the laws of the empire. This hall is almoſt ſquare, and about 130 feet in length. The ceiling is carved, varniſhed green, and loaded with gilt dragons. The pillars which ſupport the roof within are ſix feet in circumference towards the baſe, and are coated with a kind of maſtich varniſhed red: the floor is partly covered with coarſe carpets, after the Turkiſh manner; but the walls have no kind of ornament, neither tapeſtry, luſtres, nor paintings.

"The throne, which is in the middle of the hall, conſiſts of a pretty high alcove, exceedingly neat. It has no inſcription but the character *ching*, which the authors of this relation have interpreted by the word *holy*: but it has not always this ſignification; for it anſwers better ſometimes to the Latin word *eximius*, or the Engliſh words *excellent*, *perfect*, *moſt wiſe*. Upon the platform oppoſite to this hall ſtand large veſſels of bronze, in which incenſe is burnt when any ceremony is performing. There are alſo chandeliers ſhaped like birds and painted different colours, as well as the wax-candles that are lighted up in them. This platform is extended towards the north, and has on it two leſſer halls; one of them is a rotunda that glitters with varniſh, and is lighted by a number of windows. It is here that the emperor changes his dreſs before or after any ceremony. The other is a ſaloon, the door of which opens to the north: through this door the emperor muſt paſs, when he goes from his apartment to receive on his throne the homage of the nobility; he is then carried in a chair, by officers dreſſed in long red robes bordered with ſilk, and caps ornamented with plumes of feathers. It would be difficult to give an exact deſcription of the interior apartments which properly form the palace of the emperor, and are ſet apart for the uſe of his family. Few are permitted to enter them but women and eunuchs."

The temples and the towers of this city are ſo numerous, that it is difficult to count them. Proviſions of all kinds are exceeding plentiful, they being, as well as the merchandiſes, brought from other parts by means of canals cut from the rivers, and always crowded with veſſels of different ſizes, as well as from the adjacent country. An earthquake which happened here in 1731 buried above 100,000 perſons in the ruins of the houſes which were thrown down. E. lon. 116. 41. N. lat. 39. 54.

We have already, under the article OBSERVATORY, mentioned the famous obſervatory in this city, of which we ſhall give this further account from the Univerſal Hiſtory. "The Chineſe had thought nothing in the univerſe could equal in magnificence this famous place; and one of the moſt celebrated mathematicians of the Royal Academy of Paris hath made no ſcruple to repreſent it as one of the greateſt prodigies of art and ingenuity, of beauty and magnificence: and yet, when this celebrated ſtructure came to be viewed by more proper and unbiaſſed judges, it appears to have been of little worth as to its ancient machines, and leſs as to its ſituation; and that all that is now valuable in it is owing to the improvements made by Father Verbieſt, a Flemiſh Jeſuit, who cauſed a new ſet of inſtruments to be made, with extraordinary care, neatneſs, and preciſion.

"This fabric ſtands in a court of a moderate extent, and is built in the form of a ſquare tower, contiguous to the city-wall on the inſide, and raiſed but ten or twelve feet above its bulwark. The aſcent to the top is by a very narrow ſtaircaſe; and on the platform above were placed all the old inſtruments, which, though but few, took up the whole room, till Father Verbieſt introduced his new apparatus, which he diſpoſed in a more convenient order. Theſe are large, well caſt and embelliſhed; and were the neatneſs of the diviſions anſwerable to the work, and the teleſcopes faſtened to them according to the new method, they would be equal to thoſe of Europe; but the Chineſe artificers were, it ſeems, either too negligent, or incapable of following his directions. As to the old inſtruments, they were, by order of the emperor Kang-hi, ſet aſide as uſeleſs, and laid in the hall near the tower, where they may be ſeen through a croſs-barred window, all covered with ruſt, and buried in oblivion.

"In this famed obſervatory there are five mathematicians employed night and day, each in a proper apartment on the top of the tower, to obſerve all that paſſes over their heads: one of them is gazing towards the zenith, and the others towards the four points of the compaſs, that nothing may eſcape their notice. Their obſervations extend not only to the motions of the heavenly bodies, but to fires, meteors, winds, rain, thunder, hail, ſtorms, and other phenomena of the atmoſphere; and theſe are carefully entered in their journals, and an account of them is brought every morning to the ſurveyor of the mathematics, and regiſtered in his office."

PELAGIANS, a Chriſtian ſect who appeared about the fifth or end of the fourth century. They maintained the following doctrines: 1. That Adam was by nature mortal, and, whether he had ſinned or not, would certainly have died. 2. That the conſequences of Adam's ſin were confined to his own perſon. 3. That new-born infants are in the ſame ſituation with Adam before the fall. 4. That the law qualified men for the kingdom of heaven, and was founded upon equal promiſes with the goſpel. 5. That the general reſurrection of the dead does not follow in virtue of our Saviour's reſurrection. 6. That the grace of God is given according to our merits. 7. That this grace is not granted for the performance of every moral act; the liberty of the will, and information in points of duty, being ſufficient, &c. The founder of this ſect was

PELAGIUS, a native of Great Britain; but whether of England, Scotland, or Wales, is as uncertain as it is immaterial. He was born towards the cloſe of the fourth century, and educated in the monaſtery of Banchor, in Wales, of which he became a monk, and afterwards abbot. In the early part of his life he went over to France, and thence to Rome, where he had the inſolence to promulgate certain opinions ſomewhat different from thoſe of the infallible church. His morals being irreproachable, he gained many diſciples; and the dreadful hereſy made ſo rapid a progreſs, that, for the ſalvation of ſouls, it became neceſſary for the pope to exert his power. Pelagius, to avoid the danger, in the year 409 paſſed over to Sicily, an-

tended by his friend and pupil Celeſtius. In 411 they landed in Africa, continued ſome time at Hippo, and were preſent at the famous conference between the Catholics and Donatiſts, which was held at Carthage in 412. From thence they travelled to Egypt; and from Egypt, in 415, to Paleſtine, where they were graciouſly received by John, biſhop of Jeruſalem. In the ſame year Pelagius was cited to appear before a council of ſeventeen biſhops, held at Dioſpolis. They were ſatisfied with his creed, and abſolved him of hereſy. The African biſhops, however, being diſpleaſed with their proceedings, appealed to the Roman pontiff: he firſt approved, and afterwards condemned, the opinions of Pelagius, who, with his pupil Celeſtius, was publicly excommunicated; and all the biſhops who refuſed to ſubſcribe the condemnation of the Pelagian hereſy were immediately deprived. What became of him after this period is entirely unknown; but it ſeems very probable that he retired to Banchor, and died abbot of that monaſtery. He wrote, 1. *Expoſitionum in epiſt. Paulinas* lib. xiv. 2. *Epiſtola ad Demetriadem de virginitate.* 3. *Explanationis ſymboli ad Damaſum.* 4. *Epiſtolæ ad viduam duæ.* 5. *De libero arbitrio.* Theſe and many other fragments are ſcattered among the works of St. Jerome. They are alſo collected by Garnerius, and publiſhed in Append. Op. Mercatoris, p. 373. *Cave.*

PELAGOSA, an iſland in the Adriatic, which, together with ſeveral rocks that appear above water near it, are the remains of an ancient volcano. "I will not aſſure you," ſays Fortis, "that it was thrown up out of the ſea like ſeveral other iſlands in the Archipelago, though there is ſome ground to ſuſpect this to have been the caſe; becauſe we find no preciſe mention of it in the moſt ancient geographers. It ſhould ſeem that it ought not to be confuſed with the Diomedea, from which it is 30 miles diſtant; yet it is not impoſſible that they have reckoned it among them. The lava which forms the ſubſtance of this iſland is perfectly like the ordinary lava of Veſuvius, as far as I could diſcover in paſſing near it. If a naturaliſt ſhould land there, and viſit on purpoſe the higheſt parts of the iſland, perhaps we might then know whether it has been thrown up by a ſubmarine volcano, as the iſland near Santerini was in our age; or if we ought to believe it the top of ſome ancient volcanic mountain, of which the roots and ſides have been covered by the waters, which divided Africa from Spain, forming the ſtraits of Gibraltar; an invaſion that no one can doubt of who has examined the bottoms and ſhores of our ſea. The Liſſan fiſhermen ſay, that Pelagoſa is ſubject to frequent and violent earthquakes; and the aſpect of the iſland proves, at firſt ſight, that it has ſuffered many revolutions; for it is rugged, ruinous, and ſubverted."

PELAIAH, a Levite (Nehem. viii. 7. x. 10.). He was one of the principal Levites that returned from captivity, and was one of thoſe that ſigned the covenant that Nehemiah renewed with the Lord.

PELALIAH, ſon of Amazi and father of Jeroham, of the family of Paſhur ſon of Malchiah, of all whom mention has been made: he was of the race of the prieſts (Nehem. xi. 12.).

PELASGI. See PELASGIOTIS

PELASGIA (Pliny); the ancient name of *Lesbos*; ſo called from the Pelaſgi, its firſt inhabitants (Diodorus Siculus). Alſo the ancient name of *Peloponneſus*, from Pelaſgius, a native of the country (Nicolaus Damaſcenus, Ephorus).

PELASGICUM (Pauſanias, Pliny); the north wall of Athens; ſo called from the builders, the Pelaſgi. There was an execration pronounced on any that ſhould build houſes under this wall; becauſe the Pelaſgi, while dwelling there, entered into a conſpiracy againſt the Athenians (Thucydides).

PELASGIOTIS, a third part of Theſſaly, (Strabo); ſo called from a very ancient people, the Pelaſgi, called *Pelaſgiotæ* (Ptolemy); who formerly, together with the Æolians, occupied Theſſaly, and thence that part was called *Pelaſgicum Argos*; beſides many other parts of Greece. Their name *Pelaſgi*, or *Pelargi*, denoting ſtorks, was given them from their wandering roving life (Strabo). The poets extend the appellation to Greeks in general. *Pelaſgus*, the epithet. Some of the inhabitants of Crete were called *Pelaſgi* (Homer); who thus alſo calls the neighbouring people to the Cilicians in Troas. The Pelaſgi were originally of Arcadia, (Heſiod); but Æſchylus makes Argos, near Mycenæ, their country. The Pelaſgiotis was ſituated between Pieria and Macedonia to the north and weſt, Theſſaliotis to the ſouth, and Magneſia to the eaſt, (Strabo, Pliny.)

PELATÆ, were free-born citizens, among the Athenians, who by poverty were reduced to the neceſſity of ſerving for wages. During their ſervitude they had no vote in the management of public affairs, as having no eſtate to qualify them; but this reſtriction was removed whenever they had releaſed themſelves from their ſervile ſituation, which they were allowed to do when able to ſupport themſelves. While they continued ſervants, they had alſo a right to change their maſters. We find them ſometimes diſtinguiſhed by the name of *Thetæ*.

PELATIAH, ſon of Hananiah, and father of Iſhi, of the tribe of Simeon. He ſubdued the Amalekites upon the mountain of Seir (1 Chron. iv. 42.). The time of this action is unknown.

PELATIAH, ſon of Benaiah, a prince of the people, who lived in the time of Zedekiah king of Judah, and oppoſed the wholeſome advice given by Jeremiah, to ſubmit to king Nebuchadnezzar. Ezekiel (xi. 1, 2, 3, 4.) being a captive in Meſopotamia, had a viſion, in which he ſaw five-and-twenty men at the door of the temple of Jeruſalem, among which were Jaazaniah the ſon of Azur, and Pelatiah the ſon of Benaiah, who were the moſt remarkable. Then the Lord ſaid to him, "Son of man, theſe are the men that have thoughts of iniquity, and who are forming pernicious deſigns againſt this city, ſaying: Have not the houſes been built a long time? Jeruſalem is the pot, and we are the fleſh. Thus ſaith the Lord: You have made great havock in this city, and have filled its ſtreets with dead bodies. Theſe men are the fleſh, and the city is the pot. But as for you, I will make you come forth from the middle of the city, and I will make you periſh by the hand of your enemies." As he was propheſying in this manner, Pelatiah the ſon of Benaiah died.

PELE (Stephanus). There were two towns of this name in Theſſaly; the one ſubject to Eurypilus, the other to Achilles; both extinct. *Peleus* the gentilitious name (*id.*).

PELEG, ſon of Eber, was born in the year of the world 1757. The ſcripture ſays his father gave him the name of Peleg, ſignifying diviſion, becauſe in his time the earth began to be divided (Gen. xi. 16. x. 25.). Whether it was that Noah had begun to diſtribute the earth among his deſcendants, ſome years before the building of Babel; or that Peleg came into the world the ſame year that Babel was begun, and at the diviſion of languages; or that Eber by a ſpirit of prophecy gave his ſon the name of *Peleg* ſome years before the tower of Babel was begun, is not abſolutely certain. That which here perplexes the interpreters is, firſt, that Peleg came into the world not above 100 years after the deluge. But it ſhould ſeem, that the number of men was not then ſufficient for ſuch an undertaking as that of Babel. Secondly, Joktan the brother of Peleg had already thirteen ſons at the time of this diſperſion, which happened after the confuſion of Babel. (Gen. x. 26, 27, 28, &c.) Peleg being born in the thirty-fourth year of Eber (Gen. xi. 16.), it is impoſſible his brother Joktan ſhould have ſuch a number of children at the birth of Peleg. It ſeems therefore that he was not born at the time of the diſperſion. To this may be anſwered, that Moſes has there enumerated the names of the thirteen ſons of Joktan (in Gen. x. 26.) by way of anticipation, though they were not born till a good while after the confuſion at Babel; but as they poſſeſſed a very large

country, it was convenient to take notice of them, and to name them among the other deſcendants of Noah, who divided the provinces of the eaſt among themſelves. However this may have been, at the age of thirty years Peleg begat Reu; and he died at the age of 239.

PELETHITES. The Pelethites and Cherethites were famous under the reign of king David. They were the moſt valiant men in the army of that prince, and had the guard of his perſon. See Ezekiel xxv. 16. Zephaniah ii. 5. 1 Samuel xxx. 14. and 2 Samuel xv. 18. and xx. 7. and *Patrick's Comm. Pool's Annot.* and *Delany's Hiſt. of the Life of David.*

PELETHRONII, a name or epithet given to the Lapithæ, either becauſe they inhabited the town of Pelethronium at the foot of mount Pelion in Theſſaly, or becauſe one of their number bore the name of *Pelethronius*. It is to them, we are told, that mankind are indebted for the invention of the bit with which they tamed their horſes with ſo much dexterity.

PELETHRONIUM, (Nicander and Scholiaſt); a town of Theſſaly, ſituated in a flowery part of mount Pelios: hence the appellation *throna*, ſignifying "flowers." Lucan ſays the Centaurs were natives of that place; to whom Virgil aſſigns mount Othrys. Moſt authors, however, aſcribe the breaking of horſes to the Centaurs. Some make the Lapithæ and Centaurs the ſame; others a different people; allowed however to be both of Theſſaly. Their ſtory is greatly involved in fable. See LAPITHUS.

PELEUS, in fabulous hiſtory, a king of Theſſaly, ſon of Æacus and Endeis, the daughter of Chiron. He married Thetis one of the Nereids, and was the only mortal man who ever married an immortal. He was concerned in the murder of his brother Phocus, and was therefore obliged to leave his father's dominions. He fled to the court of Eurytus the ſon of Actor, who reigned at Phthia, or, according to the opinion of Ovid, the truth of which is queſtioned, to Ceyx king of Trachinia. He was purified of his murder by Eurytus, with the uſual ceremonies, and the king gave him his daughter Antigone in marriage. After this, as Peleus and Eurytus went to the chace of the Calydonian boar, the father-in-law was accidentally killed by an arrow which his ſon-in-law had aimed at the beaſt. This unfortunate accident obliged him to baniſh himſelf from the court of Phthia, and he went to Iolchos, where he was alſo purified of the murder of Eurytus by Acaſtus the king of the country. His reſidence at Iolchos was ſhort: Aſtydamia the wife of Acaſtus fell in love with him; but when ſhe found him inſenſible to her paſſionate declarations, ſhe accuſed him of attempts upon her virtue. The king her huſband partly believed the accuſations of his wife; but not willing to violate the laws of hoſpitality, by putting him inſtantly to death, he ordered his officers to conduct him to mount Pelion, on pretence of hunting, and there to tie him to a tree and to leave him a prey to the wild beaſts of the place. The orders of Acaſtus were faithfully obeyed; but Jupiter, knowing the innocence of his grandſon Peleus, ordered Vulcan to ſet him at liberty. As ſoon as he had been delivered from danger, Peleus aſſembled his friends in order to puniſh the ill treatment which he had received from Acaſtus. He took Iolchos by force, drove the king from his poſſeſſions, and put to death the wicked Aſtydamia. On the death of Antigone, Peleus made love to Thetis, of whoſe ſuperior charms Jupiter himſelf had been enamoured. His pretenſions were rejected; for, as he was but a mortal, the goddeſs fled from him with the utmoſt abhorrence; and the more effectually to evade his inquiries, ſhe generally aſſumed the ſhape of a bird, or a tree, or of a tigreſs. Peleus's paſſion was fanned by refuſal; he offered a ſacrifice to the gods; and Proteus informed him, that to obtain Thetis he muſt ſurpriſe her while ſhe was aſleep in her grotto, near the ſhores of Theſſaly. This advice was immediately attended to; and Thetis, unable to eſcape from the graſp of Peleus, at laſt conſented to marry him. Their nuptials were celebrated with the greateſt ſolemnity, all the gods attending, and making them each the moſt valuable preſents. The goddeſs of Diſcord was the only one of the deities who was abſent; and ſhe puniſhed this ſeeming neglect by throwing an apple into the midſt of the aſſembly of the gods, with the inſcription of *Detur pulchriori*. The celebrated Achilles was the fruit of this marriage, whoſe education was early entruſted to the Centaur Chiron, and afterwards to Phœnix, the ſon of Amyntor. Achilles, it is well known, went to the Trojan war, at the head of his father's troops; and Peleus gloried in having a ſon who was ſuperior to all the Greeks in valour and intrepidity. His death, however, was the ſource of great grief to Peleus; but Thetis, to comfort her huſband, promiſed him immortality, and ordered him to retire into the grottos of the iſland of Leuce, where he ſhould ſee and converſe with the manes of his ſon. Peleus had a daughter called *Polydora*, by Antigone.

PELEW ISLANDS, a cluſter of ſmall iſlands ſituated between the latitudes of 5° and 7° north, and the longitudes 134° and 136° eaſt. Various conjectures have been formed reſpecting the time of their firſt diſcovery by Europeans. Mr. Keate, the editor of the only voyage in which we have any account of their climate, ſoil, and produce, together with the manners of their inhabitants, thinks they were firſt noticed by the Spaniards from the Philippines, and by them named *Palos*, from the number of trees growing in them reſembling the maſts of ſhips. This conjecture has been vehemently oppoſed by a critic, who affirms that the whole of Mr. Keate's introduction is erroneous, and that the iſlands in queſtion were firſt diſcovered by a French Jeſuit named *Pere Papin*. The Jeſuit, he imagines, was directed to them by one of the inhabitants, who had found his way to the Moluccas, where he was baptized. They are ſaid to have been again noticed by *P. Centova* in 1724, who ſaw at Agdane, the capital of the Merian iſlands, ſome of the inhabitants; and from their account gives a deſcription not very favourable of theſe harmleſs iſlanders. Centova's deſcription is to be found in the 15th volume, and the relation of the diſcovery by P. Papin in the 11th volume, of *Lettres Edifiantes et Curieuſes*, publiſhed at Paris 1781.

The lateſt and moſt authentic account of them, however, is given from the Journals of captain Wilſon of the Antelope, a packet belonging to the Eaſt India company, which was wrecked upon one of them in Auguſt 1783. This ſhip was fitted out in England by the court of directors in the ſummer 1782, as was then generally underſtood, for a ſecret expedition. Whatever may have been her deſtination, as ſhe was proceeding from Macao in ſqually weather, the man who, on the night of the 10th of Auguſt, had the look-out, ſuddenly called out *Breakers!* But the ſound of the word had ſcarce reached the ears of the officer on deck, before the ſhip ſtruck and ſtuck faſt; and in leſs than an hour bulged and filled with water. Having ſecured the gunpowder, ſmall arms, bread, and ſuch other proviſions as were liable to be ſpoiled by water, captain Wilſon, after many difficulties, effected a landing. The crew of the Antelope conſiſted of 33 Europeans beſide the captain, and 16 Chineſe; and the only poſſible means by which they could be delivered from an iſland which at firſt appeared to them uninhabited, was by building a ſhip capable of tranſporting them to the neareſt European ſettlement in that quarter of the globe. Whilſt they were meditating upon this undertaking, the natives appeared on the ſecond day after their arrival; and their intercourſe with them was facilitated by means which appear as ſingular as they were providential. Captain Wilſon had a ſervant recommended to him at Macao, who ſpoke both the Malay and Engliſh languages perfectly well; and they had not been long at Pelew before they had the good fortune to meet with a Malay, who

had been thrown by a tempeſt upon this ſpot about a year before, and had made himſelf acquainted with the language of the country; ſo that by this extraordinary event each party had an interpreter who could readily explain their wants and deſires, and by that means prevent a number of miſconceptions which might have ariſen from making uſe of ſigns and geſtures only.

The natives are of a deep copper colour, going perfectly naked. They are of a middling ſtature, very ſtraight, muſcular, and well formed; but their legs, from a little above their ancles to the middle of their thighs, are tatooed ſo very thick, as to appear dyed of a far deeper colour than the reſt of their ſkin. Their hair is of a fine black, long, and rolled up behind, in a ſimple manner, cloſe to the back of their heads, which appeared both neat and becoming; but few of them had beards, it being the general cuſtom to pluck them out by the roots.

They began by ſtroking the bodies and arms of the Engliſh, or rather their waiſtcoats and coat ſleeves, as if they doubted whether the garment and the man were not of the ſame ſubſtance: and, as the Malay explained the circumſtances to them, our people were greatly ſurpriſed at the quickneſs with which they ſeemed to comprehend every information he gave them. The next thing they noticed was our people's white hands, and the blue veins of their wriſts; the former of which they ſeemed to conſider as artificial, and the other as the Engliſh manner of tatooing. After being ſatisfied in this particular, they expreſſed a further wiſh to ſee their bodies; and, among other things, were greatly ſurpriſed at finding hair on their breaſts, it being conſidered by them as a great mark of indelicacy, as it is their cuſtom to eradicate it from every part of the body in both ſexes.

They afterwards walked about, teſtifying great curioſity at every thing they ſaw, but at the ſame time expreſſing a fear that they might be thought too intruding. As our people were conducting them to the tents, one of the natives picked up a bullet, which had been caſually dropped on the ground, and immediately expreſſed his ſurpriſe, that a ſubſtance ſo ſmall to the eye ſhould be ſo very ponderous to the touch; and on their entering the tent, a large Newfoundland dog, and a ſpaniel which had been tied up there to prevent their being loſt, ſet up a moſt violent barking, and the natives a noiſe but little leſs loud, which at firſt it was not eaſy to account for. They ran in and out of the tent, and ſeemed to wiſh that they might be made to bark again. This the Malay ſoon explained to be the effect of their joy and ſurpriſe, as theſe were the firſt large animals they ever had ſeen, there being no quadrupeds of any ſpecies on theſe iſlands, except a very few grey rats in the woods.

After ſome time, it was agreed on by captain Wilſon and his people that ſome of the crew ſhould be ſent to the king of the place, in order to ſolicit his friendſhip, and entreat his permiſſion to build a veſſel that might carry them back to their own country. This buſineſs was allotted to the captain's brother; and during his abſence, Raa Kook, the king's brother, and ſeveral of the natives, remained with our people. This amiable chief ſeemed to place an entire confidence in thoſe he was among; he endeavoured to accommodate himſelf to their manners; would ſit at table as they did, inſtead of ſquatting on his hams; and inquired particularly into the principles and cauſes of every thing he obſerved about him, lending his perſonal aſſiſtance in all that was going forward, and even deſiring the cook to let him aid him in blowing the fire.

In order to conciliate their affections, captain Wilſon had preſented Arra Kooker, another of the king's brothers, with a pair of trowſers; but having conceived a greater paſſion for a white ſhirt, one was immediately given to him; which he had no ſooner put on than he began to dance and jump about with ſo much joy, that every body was diverted by his ſingular geſtures, and the contraſt which the linen formed with his ſkin. This prince was about 40, of a ſhort ſtature, but ſo plump and fat that he was nearly as broad as he was long. He poſſeſſed an abundant ſhare of good humour, and a wonderful turn for mimickry; and had beſides a countenance ſo lively and expreſſive, that though our people at this time were ſtrangers to almoſt all he ſaid, yet his face and geſtures made them accurately comprehend whatever he was deſcribing.

After three or four days, Abba Thulle the king arrived with a great retinue. He was received with every mark of reſpect by the ſhip's company, who were exerciſed before him, and fired three volleys in different poſitions. The ſurpriſe of the natives, their hooting, hallooing, jumping, and chattering, produced a noiſe almoſt equal to the diſcharge of the muſkets; and when one of the men ſhot a bird, which was done to diſplay the effect of their arms, the ſurpriſe it occaſioned was wonderful. Some of the natives ran for it, and carried it to the king, who examined it with great attention, but was unable to comprehend how it could be wounded, not having ſeen any thing paſs out of the gun.

Raa Kook expreſſed great impatience to ſhow the king whatever had impreſſed his own mind; and, taking his brother by the hand, led him to a grindſtone which was fixed behind one of the tents. He immediately put it in motion, as he had frequently done before; at the rapidity of which the king was greatly aſtoniſhed, particularly when he was informed that it would ſharpen iron. Captain Wilſon ordered a hatchet to be brought and ground, that they might more readily perceive its operation; when Raa Kook eagerly ſeized the handle, and began turning it, appearing highly delighted to let his brother ſee how well he underſtood it. The whole appeared like ſomething ſupernatural; but the circumſtance which moſt bewildered their ideas was, how the ſparks of fire could come, and how a ſtone ſo well wetted could become ſo ſoon dry.

The king then viſited the different tents, and inquired about every thing he ſaw: all was novelty, and of courſe intereſted his attention. When he got to the tent where the Chineſe men were, who had been brought with them from Macao, Raa Kook, whoſe retentive mind never loſt a ſingle trace of any thing he had been informed of, acquainted the king that theſe were a people quite different from the Engliſh, and that he had learnt there were many other nations beſides theſe interſperſed through the world, ſome of which fought with guns and others with boarding-pikes, an inſtrument which he held very cheap in compariſon with the former.

When the king heard his brother diſcourſing about a variety of nations, who all ſpoke differently, and had before him the example of the Chineſe, whoſe language was not the ſame with the Engliſh, he appeared inſtantly thoughtful and ſerious, as if ſtruck by conceptions which had never before croſſed his mind. He remained awhile penſive and bewildered; and this circumſtance impreſſed on every one at the time an idea that there was every reaſon to imagine that there had never been a communication between thoſe people and any other nation: and indeed it is evident that if Pere Papin did really viſit them in 1710, they had before 1783 loſt the remembrance of every trace of European manners. This indeed is not ſurpriſing, as they had no other record than knots ſimilar to the quipes of Peru at the landing of the Spaniards.

Raa Kook would now ſhow his brother the kitchen, which was in the hollow of a rock, a little above the cove. It was at the time when the cook was preparing dinner; and though the implements were exceedingly ſcanty, an iron pot, a tea-kettle, a tin ſauce-pan, with a poker, a pair of tongs, and a frying-pan, were here of ſufficient conſequence to excite admiration: nor were the bellows now forgotten by Raa Kook, who taking them up, as he explained their uſe to the king, ſeemed ambitious to let his brother ſee what an adept he was at blowing. The little bald cook, who was always cloſe ſhaven, and never

wore any thing on his head, was likewiſe pointed out to the king as an object of merriment and curioſity.

Some time after this the king requeſted five of captain Wilſon's men to attend him in a war which he was going to make againſt the inhabitants of a neighbouring iſland called *Oroolong*, who, as he ſaid, had done him an injury. But before this requeſt was made known, he had long ſtruggled with a delicacy of ſentiment which no one would have expected to find in regions ſo diſjoined from the reſt of mankind. This was no other than that it might prove a temporary inconvenience to the unfortunate ſtrangers who had ſought his protection, and might be conſidered by them as an ungenerous proceeding. It was, however, no ſooner made known, than captain Wilſon inſtantly complied; and every face, which had before been clouded with doubt and apprehenſion, became immediately brightened and gay.

In this enterpriſe little more was done than braving their enemies, ſtripping ſome cocoa-nut trees of their fruit, and carrying off a number of yams and other proviſions; but in another, which was undertaken againſt the iſland of Artingall, they were more ſucceſsful, and ſhowed ſigns of the ſame ſanguinary diſpoſition which ſome demon has infuſed into the whole human race. Nine priſoners of war, who had been taken upon this occaſion, were cruelly put to death; and notwithſtanding the Engliſh ſtrongly remonſtrated againſt this proceeding, all the arguments they could uſe were of no avail. In juſtification of their conduct, they alleged the neceſſity of doing it for their own ſecurity, declaring that they had formerly only detained them as menial ſervants, but that they always found means to get back to their own country, and return with ſuch a force as frequently made great depredations.

Having given this general account of the character and conduct of theſe hitherto unknown people, we now proceed to lay before our readers what we have learned of their government, cuſtoms, manners, and arts, together with a deſcription of the face of their country. In this the editor of captain Wilſon's voyage muſt be our guide; and if our narrative do not ſatisfy the man of ſcience, it is to be obſerved, that the Antelope was not a ſhip ſent out purpoſely to explore undiſcovered regions, nor were there people on board properly qualified to eſtimate the manners of a new race of men; they had amongſt them no philoſophers, botaniſts, or draughtſmen, experienced in ſuch ſcientific purſuits as might enable them to examine with judgement every object which preſented itſelf. Diſtreſs threw them upon theſe iſlands; and while they were there, all their thoughts were occupied on the means of liberating themſelves from a ſituation of all others the moſt afflicting to the mind, that of being cut off for ever from the ſociety of the reſt of the world.

It, however, clearly appears, from their uniform teſtimony, that at Pelew the king was conſidered as the firſt perſon in the government.

"He was looked up to as the father of his people; and though diveſted of all external decorations of royalty, had every mark of diſtinction paid to his perſon. His *rupacks*, or chiefs, approached him with the greateſt reſpect; and his common ſubjects, whenever they paſſed near him, or had occaſion to addreſs him, put their hands behind them, and crouched towards the ground. Upon all occurrences of moment, he convened the rupacks and officers of ſtate; their councils were always held in the open air, where the king firſt ſtated the buſineſs upon which he had aſſembled them, and ſubmitted it to their conſideration. Each rupack delivered his opinion, but without riſing from his ſeat; and when the matter before them was ſettled, the king, ſtanding up, put an end to the council.

"When any meſſage was brought him, whether in council or elſewhere, if it came by one of the common people, it was delivered at ſome diſtance, in a low voice, to one of the inferior rupacks, who, bending in an humble manner at the king's ſide, delivered it in the ſame manner, with his face turned aſide. His commands appeared to be abſolute, though he acted in no important buſineſs without the advice of his chiefs; and every day in the afternoon, whether he was at Pelew or with the Engliſh, he went to ſit in public for the purpoſe of hearing any requeſts, or of adjuſting any difference or diſpute which might have ariſen among his ſubjects."

But theſe, according to our editor, ſeldom happened; for, as their real wants were but few, and they ſaw nothing to create artificial ones, every one was chiefly occupied with his own humble purſuits: and as far as the ſhip's crew, who remained among them about three months, could decide, they appeared to conduct themſelves towards each other with the greateſt civility and benevolence; never wrangling or entering into quarrelſome contentions, as is cuſtomary among thoſe who call themſelves a poliſhed and enlightened people. Even when children ſhowed a diſpoſition of this kind, they ſtrongly marked their diſpleaſure, by ſtifling with rebuke their little animoſities.

The character of the king is thus drawn by the editor: "The excellent man who reigned over theſe ſons of nature ſhowed himſelf in every part of his conduct firm, noble, generous, and benevolent; there was a dignity in all his deportment, a gentleneſs in all his manners, and a warmth and ſenſibility about his heart, that won the love of all who approached him. Nature had beſtowed on him a contemplative mind, which he had improved by thoſe reflections that good ſenſe dictated and obſervation confirmed. The happineſs of his people ſeemed to be always in his thoughts. In order more effectually to ſtimulate them to uſeful labour, he had himſelf learnt all the few arts they poſſeſſed, and was looked on in ſome of them to be the beſt workman in his dominions. Placed as he was by Providence in its obſcurer ſcenes, he lived beloved by his chiefs, and revered by his people; over whom, whilſt he preſerved a dignity which diſtinguiſhed his ſuperior ſtation, he reigned more as the father than the ſovereign. The eyes of his ſubjects beheld their naked prince with as much awe and reſpect as thoſe are viewed with who govern poliſhed nations, and are decorated with all the dazzling parade and ornaments of royalty; nor was the purple robe or the ſplendid diadem neceſſary to point out a character which the maſterly hand of nature had rendered ſo perfect."

Next in power to the king was his brother Raa Kook, who was official general of all his forces. It was his duty to ſummon the rupacks to attend the king for whatever purpoſe they were wanted. He was alſo his preſumptive heir: the ſucceſſion of Pelew not going to the king's children till it had paſſed through his brothers; ſo that, after the demiſe of Abba Thulle, the ſovereignty would have deſcended to Raa Kook; on his demiſe to Arra Kooker; and on the death of this laſt it would have reverted to Qui Bill, the king's eldeſt ſon; when Lee Boo, his ſecond ſon, of whom we have much to ſay, would have become the hereditary general.

The office of firſt miniſter is deſcribed as follows: "The king was always attended by a particular chief or rupack, who did not appear to poſſeſs any hereditary office, but only a delegated authority. He was always near the king's perſon, and the chief who was always firſt conſulted; but whether his office was religious or civil, or both, our people could not learn with any certainty. He was not conſidered as a warrior, or even bore arms, and had only one wife, whereas the other rupacks had two. The Engliſh were never invited to his houſe, or introduced into it, although they were conducted to thoſe of almoſt every other chief."

Of the rupacks it is obſerved, "That they could only be regarded as chiefs or nobles; they were not all of the ſame degree, as was plain by a difference in the *bone* * they wore: they generally attended the king, and were always ready at his command to accompany him on any expedition with a number of canoes properly manned, and armed with darts and ſpears, who were to remain with him till they had his permiſſion to return home with their dependents. In this part of their government we may trace an outline of the feudal ſyſtem; but from the few opportunities our people had of inveſtigating points of internal government, it appeared that the titles of *rupacks* were perſonal badges of rank and diſtinction; nor did they apprehend they were hereditary honours, unleſs in the reigning family, who muſt of neceſſity be of this claſs."

As to property, it was underſtood, "That the people poſſeſſed only ſuch as aroſe from their work and labour, but no abſolute one in the ſoil, of which the king appeared to be general proprietor. A man's houſe, furniture, or canoe, was conſidered as his private property, as was alſo the land allotted him, as long as he occupied and cultivated it; but whenever he removed with his family to another place, the ground he held reverted to the king, who gave it to whom he pleaſed, or to thoſe who ſolicited to cultivate it."

All that part of the iſland which they had an opportunity of ſeeing is ſaid to have been well cultivated. It was covered with trees of various kinds and ſizes, many of which muſt have been very large, as they made canoes of their trunks, ſome of which were capable of carrying 28 or 30 men. Among the timber trees was noticed the ebony, and a tree which when pierced or wounded yielded a thick white liquor of the conſiſtence of cream. "They had alſo a ſpecies of the manchineel tree, in cutting down of which our people frequently got bliſtered and ſwelled; the inhabitants pointed out the cauſe, ſaying it was owing to their being ſprinkled by the ſap. This they reckoned among the unlucky trees, and adviſed our people againſt the uſe of it."

But the moſt ſingular tree noticed at Pelew, was one in its ſize and manner of branching not unlike our cherry-tree, but in its leaves reſembling the myrtle. Its peculiarity was, that it had no bark, but only an outward coat of about the thickneſs of a card, which was darker than the inſide, though equally cloſe in texture. Its colour was nearly that of mahogany, and the wood was ſo extremely hard, that few of the tools which the Engliſh had could work it. They alſo found cabbage-trees, the wild bread-fruit, and another tree whoſe fruit ſomething reſembled an almond. But yams and cocoa-nuts, being their principal articles of ſuſtenance, claimed their chief attention.

The iſland Coorooraa, of which Pelew is the capital, likewiſe produced plantains, bananas, Seville oranges and lemons, but neither of them in any conſiderable quantity. None of the iſlands which the Engliſh viſited had any kind of grain. As to birds, they had plenty of common cocks and hens, which, though not domeſticated, kept running about near their houſes and plantations; and what appears extremely ſingular is, that the natives had never made any uſe of them, till our people told them they were excellent eating. Pigeons they accounted a great dainty; but none but thoſe of a certain dignity were permitted to eat of them. The Engliſh left them two geeſe, which were the only remains of their live ſtock.

From the deſcription of the country it appears to be very mountainous; but ſome of the valleys are repreſented as extenſive and beautiful, affording many delightful proſpects. The ſoil being very rich, produces a great abundance of graſs, which, as there are no cattle to eat it, grows very high, and was ſcorched and burnt up by the ſun. Our people ſaw no river at Pelew; their ſupplies of freſh water being obtained from ſmall ſtreams and ponds, of which there are a great many.

From this account of the ſcanty produce of theſe iſlands, it is evident that no luxury reigned among their inhabitants, whoſe principal article of food appears to be fiſh: they had no ſalt, nor did they make uſe of ſauce or any ſeaſoning in any thing they ate. Their drink was alſo as ſimple as their diet: it principally conſiſted of the milk of the cocoa-nut; but upon particular occaſions they uſed a kind of ſweet drink and ſherbet, which latter had the addition of ſome juice of orange.

The iſlands appeared to be populous, though to what extent could not be aſcertained. Their houſes were raiſed about three feet from the ground, upon ſtones which appeared as if hewn from the quarry. The interior part of them was without any diviſion, the whole forming one great room, which roſe in a ridge like our barns, the outſide being thatched thick and cloſe with bamboos or palm leaves. All their implements, utenſils, weapons of war, and canoes, are much of the ſame kind with thoſe which were found in the South Sea iſlands.

In their marriages they allow a plurality of wives, though in general not more than two. When a woman is pregnant, the utmoſt attention is paid to her; but upon other occaſions no more reſpect is ſhown to one ſex than the other. "One of our people endeavouring to make himſelf agreeable to a lady belonging to one of the rupacks, by what we ſhould call a marked aſſiduity, Arra Kooker, with the greateſt civility, gave him to underſtand that it was not right to do ſo."

They have places particularly appropriated to ſepulture; their graves being made nearly the ſame as they are in our country church-yards. The corpſe is attended only by women, who at the place of interment make a great lamentation. The men, however, aſſemble round the body before it is carried to the grave, on which occaſion they preſerve a ſolemn ſilence; "their minds, from principles of fortitude or philoſophy, being armed to meet the events of mortality with manly ſubmiſſion, diveſted of the external teſtimony of human weakneſs."

On the article of religion our editor obſerves, "That, among all the race of men whom navigation has brought to our knowledge, few appear to be without a ſenſe of ſomething like religion, however it may be mixed with idolatry or ſuperſtition. And yet our people, during their continuance with the natives of Pelew, never ſaw any particular ceremonies, or obſerved any thing that had the appearance of public worſhip. But though there was not found on any of the iſlands they viſited any place appropriated to religious rites, it would perhaps be going too far to declare that the people of Pelew had abſolutely no idea of religion. Independent of external teſtimony, there may be ſuch a thing as the religion of the heart, by which the mind may in awful ſilence be turned to contemplate the God of Nature; and though unbleſſed by thoſe lights which have pointed to the Chriſtian world an unerring path to happineſs and peace, yet they might, by the light of reaſon only, have diſcovered the efficacy of virtue, and the temporal advantages ariſing from moral rectitude.

"Superſtition is a word of great latitude, and vaguely defined: though it hath in enlightened ages been called the offſpring of ignorance, yet in no time hath it exiſted without having ſome connection with religion. Now the people of Pelew had beyond all doubt ſome portion of it, as appeared by the wiſh expreſſed by the king when he ſaw the ſhip building,

* This was a mark of rank worn upon the wriſt, with which captain Wilſon was inveſted by the king; but what animal it came from our people could not learn.

that the Engliſh would take out of it ſome particular wood, which he perceived they had made uſe of, and which he obſerved was deemed an ill omen, or unpropitious.

"They had alſo an idea of an evil ſpirit, that often counteracted human affairs. A very particular inſtance of this was ſeen when Mr. Barker, a moſt valuable member in the Engliſh ſociety, fell backwards from the ſide of the veſſel, whilſt ſhe was on the ſtocks: Raa Kook, who happened to be preſent, obſerved that it was owing to the unlucky wood our people had ſuffered to remain in the veſſel, that the evil ſpirit had occaſioned this miſchief to Mr. Barker."

They likewiſe appeared to entertain a ſtrong idea of divination, as was evident from the ceremonies they practiſed before they undertook any enterpriſe of moment. A few occurrences, which are mentioned in the courſe of the narrative, would alſo lead us to believe that they could not be altogether unacquainted with the nature of religious worſhip; for, when they were preſent at the public prayers of the Engliſh, they expreſſed no ſurpriſe at what was doing, but ſeemed deſirous to join in them, and conſtantly preſerved the moſt profound ſilence. The general even refuſed to receive a meſſage from the king which arrived during divine ſervice. And upon another occaſion, when captain Wilſon told Lee Boo, that good men would live again above, he replied with great earneſtneſs, "All ſame Pelew; bad men ſtay in earth; good men go into ſky; become very beautiful;" holding his hand up, and giving a fluttering motion to his fingers. Some later voyagers, however, have affirmed, that theſe people, notwithſtanding their ſuperſtition, have no notion whatever of a Deity; a circumſtance to which it is extremely difficult to give full credit.

"The moſt wonderful circumſtances in the hiſtory of this people, except that laſt mentioned, are, the acuteneſs of their underſtanding, their hoſpitality, and the implicit confidence which they placed in utter ſtrangers. That their manners were pleaſing, and their ſociety not diſagreeable, is evident from the conduct of Madan Blanchard, one of the ſeamen, who, when the veſſel was built, and ready to take her departure with his captain and his companions, was left behind at his own particular requeſt. That they had the fulleſt confidence in captain Wilſon and his crew, is put beyond a doubt by the behaviour of the king and Raa Kook when their gueſts were to leave them. Raa Kook ſolicited his brother's permiſſion to accompany the Engliſh, but from prudential motives was refuſed. The ſovereign, however, reſolved to entruſt his ſecond ſon Lee Boo to captain Wilſon's care, that he might improve his mind, and learn ſuch things as at his return would benefit his country.

The inſtructions which he gave the young man, and the fortitude which he ſhowed upon this occaſion, would have done honour to the moſt enlightened mind. Upon delivering him to captain Wilſon, he uſed theſe expreſſions: "I would wiſh you to inform Lee Boo of all things which he ought to know, and make him an Engliſhman. The ſubject of parting with my ſon I have frequently revolved; I am well aware that the diſtant countries he muſt go through, differing much from his own, may expoſe him to dangers, as well as diſeaſes, that are unknown to us here, in conſequence of which he may die; I have prepared my thoughts to this: I know that death is to all men inevitable; and whether my ſon meets this event at Pelew or elſewhere is immaterial. I am ſatisfied, from what I have obſerved of the humanity of your character, that if he is ſick you will be kind to him; and ſhould that happen, which your utmoſt care cannot prevent, let it not hinder you, or your brother, or your ſon, or any of your countrymen, returning here; I ſhall receive you, or any of your people, in friendſhip, and rejoice to ſee you again." How noble! this is the language of a king, a father, and a philoſopher, who would have been delighted to ſee his ſon with European accompliſhments. But, alas! the ſubſequent hiſtory of this amiable youth muſt force a tear from the eye of every reader whoſe heart is not callous to the genuine feelings of nature and humanity. As ſoon as they arrived at Macao, the houſe into which he firſt entered, and the different articles of furniture, fixed him in ſilent admiration; but what ſtruck his imagination moſt was the upright walls and flat ceilings of the rooms, being utterly unable to comprehend how they could be ſo formed. When he was introduced to the ladies of the family, his deportment was ſo eaſy and polite, that it could be exceeded by nothing but his abundant good nature; and at his departure, his behaviour left on the mind of every one preſent the impreſſion, that, however great the ſurpriſe might be which the ſcenes of a new world had awakened in him, it could hardly be exceeded by that which his own amiable manners and native poliſh would excite in others.

They were now conducted to the houſe of an Engliſh gentleman, who introduced them into a large hall, which was lighted up, with a table in the middle, covered for ſupper, and a ſideboard handſomely decorated. Here a new ſcene burſt at once upon Lee Boo's mind; he was all eye, all admiration. The veſſels of glaſs particularly riveted his attention; but when he ſurveyed himſelf in a large pier glaſs at the upper end of the hall, he was in raptures with the deception. It was in truth, to him, a ſcene of magic, a fairy tale.

Soon after the people of the veſſel came on ſhore, ſome of them went to purchaſe things they were in want of; in doing which they did not forget Lee Boo, who was a favourite with them all. Among the trinkets they brought him was a ſtring of large glaſs beads, the firſt ſight of which almoſt threw him into an ecſtacy: he hugged them with a tranſport which could not have been exceeded by the intereſted poſſeſſor of a ſtring of oriental pearls. His imagination ſuggeſted to him that he held in his hand all the wealth the world could afford him. He ran with eagerneſs to captain Wilſon to ſhow him his riches, and begged he would get him a Chineſe veſſel to carry them to the king his father, that he might ſee what the Engliſh had done for him; adding, that if the people faithfully executed their charge, he would at their return preſent them with one or two beads as a reward for their ſervices.

Having no quadrupeds at Pelew, the ſheep, goats, and other cattle, which he met with at Macao, were viewed with wonder; but ſoon after, ſeeing a man paſs the houſe on horſeback, he was ſo much aſtoniſhed, that he wanted every one to go and look at the ſtrange ſight. After the matter, however, was explained to him, he was eaſily perſuaded to get upon horſeback himſelf; and when he was informed what a noble, docile, and uſeful animal it was, he beſought the captain to ſend one to his uncle Raa Kook, as he was ſure it would be of great ſervice to him.

Omitting a number of other particulars of this kind, which excited his curioſity and ſhowed the excellent diſpoſition of his heart, we ſhall follow him to England, the country from which he was never to return. Here he had not been long before he was ſent to an academy to be inſtructed in reading and writing, which he was extremely eager to attain, and moſt aſſiduous in learning. His temper was mild and compaſſionate in the higheſt degree; but it was at all times governed by diſcretion and judgment. If he ſaw the young aſking relief, he would rebuke them with what little Engliſh he had, telling them it was a ſhame to beg when they were able to work; but the entreaties of old age he could never withſtand, ſaying, "Muſt give poor old man, old man no able to work."

He always addreſſed Mr. Wilſon by the name of captain, but never would call Mrs. Wilſon by any other name than mother, looking on that as a mark of the greateſt reſpect; and ſuch was

the gratitude of his heart for the kindneſs they ſhowed him, that if any of the family were ill, he always appeared unhappy, would creep ſoftly up to the chamber, and ſit ſilent by the bedſide for a long time together without moving, peeping gently from time to time between the curtains, to ſee if they ſlept or lay ſtill.

He was now proceeding with haſty ſtrides in gaining the Engliſh language, writing, and accounts, when he was overtaken by that fatal diſeaſe, the ſmall-pox, which the greateſt pains had been taken to guard him againſt; and notwithſtanding the utmoſt care and attention of his phyſician, he fell a victim to this ſcourge of the human race.

Upon this trying occaſion, his ſpirit was above complaining, his thoughts being all engroſſed by the kindneſs of his benefactors and friends. He told his attendant, that his father and mother would grieve very much, for they knew he was ſick. This he repeated ſeveral times, "and begged him to go to Pelew, and tell Abba Thulle that Lee Boo take much drink to make ſmall-pox go away, but he die; that the captain and mother very kind; all Engliſh very good men; much ſorry he could not ſpeak to the king the number of fine things the Engliſh had got." Then he reckoned up the preſents which had been given him, deſiring that they might be properly diſtributed among the chiefs, and requeſting that particular care might be taken of two glaſs pedeſtals, which he begged might be preſented to his father.

We have given this ſhort hiſtory of Lee Boo, becauſe it exhibits in a ſtrong light the manners of the natives of the Pelew iſlands, to which we know nothing ſimilar in the hiſtory of man from the ſavage ſtate to that of civilization. They appear to have had no communication with any other people, and were yet neither treacherous, cruel, nor cowardly. They are a ſtriking inſtance of the weakneſs of all the philoſophic theories by which mankind are uſually traced from their origin through the ſeveral ſtages of ſavagiſm, barbariſm, and civilization, down to the period of refinement, ending in effeminacy.

Since the publication of captain Wilſon's voyage we have ſome further accounts of theſe iſlands, all confirming what we were firſt told of the gentleneſs of the people. Two armed ſhips were, by order of the court of directors, fitted out at Bombay in 1790, for the purpoſe of ſurveying the iſlands of Pelew, and furniſhing the natives with domeſtic animals, and ſuch other things as might add to the comforts of life. Among the preſents to the king were ſwords and other European implements of war; of which it is at leaſt poſſible that he and his people might have been equally happy had they remained for ever in total ignorance. The foundation of a fort was likewiſe laid on one of the iſlands, and poſſeſſion of it taken in the name of the Engliſh; we truſt with no remote view of enſlaving the people, or of driving them from their native country. It has been likewiſe announced in a late publication, that captain M'Clue, who commanded the armed ſhips, was ſo delighted with the manners of the king and his ſubjects, that he has reſolved to paſs the remainder of his days on thoſe iſlands at the early age of 34; and we hope he will prove a father to the people.

PELIAS, (fab. hiſt.), twin-brother of Neleus, was ſon of Neptune by Tyro, daughter of Salmoneus. His birth was concealed by his mother, who wiſhed her father to be ignorant of her incontinence. He was expoſed in the woods, but his life was preſerved by ſhepherds; and he received the name of *Pelias*, from a ſpot of the colour of *lead* in his face. Some time after Tyro married Cretheus, ſon of Æolus, king of Iolchos, and became mother of three children, of whom Æſon was the eldeſt. Pelias viſited his mother, and was received in her family; and after the death of Cretheus, he unjuſtly ſeized the kingdom, which belonged not to him, but to the children of Tyro by the deceaſed king. To ſtrengthen himſelf in his uſurpation, Pelias conſulted the oracle; and when he was told to beware of one of the deſcendants of Æolus, who ſhould come to his court with one foot ſhod and the other bare, he privately removed the ſon of Æſon, after he had openly declared that he was dead. Theſe precautions proved vain. Jaſon, the ſon of Æſon, who had been educated by Chiron, returned to Iolchos, when come to years of maturity; and having loſt one of his ſhoes in croſſing the river Anaurus or the Evenus, Pelias immediately perceived that this was the perſon whom he had ſo much dreaded. His unpopularity prevented him from acting with violence to a ſtranger, whoſe uncommon dreſs and commanding aſpect had raiſed admiration in the people. But his aſtoniſhment was greatly excited, when he ſaw Jaſon arrive at his palace, with his friends and his relations, and boldly demand the kingdom which he had uſurped. Pelias, conſcious that his complaints were well founded, endeavoured to divert his attention, and told him that he would voluntarily reſign the crown to him, if he went to Colchis to avenge the death of Phryxus, the ſon of Athamas, whom Æeres had cruelly murdered. He further declared, that the expedition would be attended with the greateſt glory, and that nothing but the infirmities of old age had prevented himſelf from vindicating the honour of his country, and the injuries of his family, by puniſhing the aſſaſſin. This ſo warmly recommended, was with equal warmth accepted by the young hero, and his intended expedition was made known all over Greece. While Jaſon was abſent in the Argonautic expedition, Pelias murdered Æſon and all his family; but, according to the more received opinion of Ovid, Æſon was ſtill living when the Argonauts returned, and he was reſtored to the flower of youth by the magic of Medea. This change in the vigour and the conſtitution of Æſon aſtoniſhed all the inhabitants of Iolchos; and the daughters of Pelias, who have received the patronymic of Peliades, expreſſed their deſire to ſee their father's infirmities vaniſh by the ſame powerful magic. Medea, who wiſhed to avenge the injuries which her huſband Jaſon had received from Pelias, raiſed the deſires of the Peliades, by cutting an old ram to pieces, and boiling the fleſh in a cauldron, and then turning it into a fine young lamb. After they had ſeen this ſucceſsful experiment, the Peliades cut their father's body to pieces, after they had drawn all the blood from his veins, on the aſſurance that Medea would repleniſh them by her wonderful power. The limbs were immediately put into a cauldron of boiling water; but Medea ſuffered the fleſh to be totally conſumed, and refuſed to give the promiſed aſſiſtance, and the bones of Pelias did not even receive a burial. The Peliades were four in number, Alceſte, Piſidice, Pelopea, and Hippothoe, to whom Hyginus adds Meduſa. Their mother's name was Anaxibia, the daughter of Bias or Philomache, the daughter of Amphion. After this parricide the Peliades fled to the court of Admetus, where Acaſtus, the ſon-in-law of Pelias, purſued them, and took their protector priſoner. The Peliades died, and were buried in Arcadia.

PELICAN, in ornithology. See PELICANUS.

PELICAN, in chemiſtry, is a glaſs alembic conſiſting of one piece. It has a tubulated capital, from which two oppoſite and crooked beaks paſs out, and enter again at the belly of the cucurbit. This veſſel has been contrived for a continued diſtillation and cohobation, which chemiſts call *circulation*. The volatile parts of ſubſtances put into this veſſel riſe into the capital, and are obliged to return through the crooked beaks into the cucurbit; and this without interruption, or luting and unluting the veſſels.

Although the pelican ſeems to be a very convenient inſtrument, it is nevertheleſs little uſed, and even much neglected at

preſent; either becauſe the modern chemiſts have not ſo much patience as the ancient chemiſts had for making long experiments; or becauſe they find that two matraſſes, the mouth of one of which is inſerted into the mouth of the other, produce the ſame effect.

PELICANUS, in ornithology, a genus belonging to the order of anſeres. The bill is ſtraight, without teeth, and crooked at the point; the face is naked, and the feet are palmated. Mr. Latham enumerates no leſs than 30 different ſpecies of this genus, beſides varieties. The moſt remarkable ſeem to be theſe that follow:

1. The *carbo*, or corvorant, ſometimes exceeds ſeven pounds in weight; the length three feet four; the extent four feet two; the bill duſky, five inches long, deſtitute of noſtrils; the baſe of the lower mandible is covered with a naked yellow ſkin, that extends under the chin, and forms a ſort of pouch; a looſe ſkin of the ſame colour reaches from the upper mandible round the eyes and angles of the mouth; the head and neck are of a footy blackneſs, but under the chin of the male the feathers are white; and the head in that ſex is adorned with a ſhort, looſe, pendent creſt; in ſome the creſt and hind-part of the head are ſtreaked with white. The coverts of the wings, the ſcapulars, and the back, are of a deep green, edged with black, and gloſſed with blue; the quill-feathers and tail duſky; the legs are ſhort, ſtrong, and black; the middle claw ſerrated on the inſide; the irides are of a light aſh-colour.

Theſe birds occupy the higheſt parts of the cliffs that impend over the ſea: they make their neſts of ſticks, ſea-tang, graſs, &c. and lay ſix or ſeven white eggs of an oblong form. In winter they diſperſe along the ſhores, and viſit the freſh waters, where they make great havoc among the fiſh. They are remarkably voracious, having a moſt ſudden digeſtion, promoted by the infinite quantity of ſmall worms that fill their inteſtines. The corvorant has the rankeſt and moſt diſagreeable ſmell of any bird, even when alive. Its form is diſagreeable; its voice hoarſe and croaking, and its qualities baſe. Theſe birds, however, have been trained to fiſh like falcons to fowl. Whitelock tells us, that he had a caſt of them manned like hawks, and which would come to hand. He took much pleaſure in them; and relates, that the beſt he had was one preſented him by Mr. Wood, maſter of the corvorants to Charles I. It is well known, that the Chineſe make great uſe of theſe birds, or a congenerous ſort, in fiſhing; and that not for amuſement, but profit.

2. The *graculus*, or ſhag, called in the north of England the *crane*, is much inferior in ſize to the corvorant: the length is 27 inches; the breadth three feet ſix; the weight three pounds three quarters. The bill is four inches long, and more ſlender than that of the preceding: the head is adorned with a creſt two inches long, pointing backward; the whole plumage of the upper part of this bird is of a fine and very ſhining green; the edge of the feathers a purpliſh black; but the lower part of the back, the head, and neck, wholly green; the belly is duſky; the tail of a duſky hue, tinged with green; the legs are black, and like thoſe of the corvorant.

Both theſe kinds agree in their manners, and breed in the ſame places; and, what is very ſtrange in web-footed birds, will perch and build in trees: both ſwim with their head quite erect, and are very difficult to be ſhot; for, like the grebes and divers, as ſoon as they ſee the flaſh of the gun, they pop under water, and never riſe but at a conſiderable diſtance.

3. The *baſſanus*, gannet, or ſolan gooſe, weighs ſeven pounds; the length is three feet one inch; the breadth ſix feet two inches. The bill is ſix inches long, ſtraight almoſt to the point, where it inclines down; and the ſides are irregularly jagged, that it may hold its prey with more ſecurity: about an inch from the baſe of the upper mandible is a ſhort proceſs pointing forward; it has no noſtrils; but in their place a long furrow, that reaches almoſt to the end of the bill: the whole is of a dirty white, tinged with aſh-colour. The tongue is very ſmall, and placed low in the mouth; a naked ſkin of a fine blue ſurrounds the eyes, which are of a pale yellow, and are full of vivacity: this bird is remarkable for the quickneſs of its ſight. Martin tells us, that *ſolan* is derived from an Iriſh word expreſſive of that quality.

From the corner of the mouth is a narrow ſlip of black bare ſkin, that extends to the hind-part of the head; beneath the chin is another, that, like the pouch of the pelican, is dilatable, and of ſize ſufficient to contain five or ſix entire herrings; which in the breeding ſeaſon it carries at once to its mate or young.

The young birds, during the firſt year, differ greatly in colour from the old ones; being of a duſky hue, ſpeckled with numerous triangular white ſpots; and at that time reſemble in colours the ſpeckled diver. Each bird, if left undiſturbed, would only lay one egg in the year; but if that be taken away, they will lay another; if that is alſo taken, then a third; but never more that ſeaſon. Their egg is white, and rather leſs than that of the common gooſe; the neſt is large, and formed of any thing the bird finds floating on the water, ſuch as graſs, ſea-plants, ſhavings, &c. Theſe birds frequent the Iſle of Aliſa, in the Frith of Clyde; the rocks adjacent to St. Kilda; the Stalks of Souliſkerry, near the Orkneys; the Skelig Iſles, off the coaſts of Kerry, Ireland; and the Baſs Iſle, in the Frith of Edinburgh: the multitudes that inhabit theſe places are prodigious. Dr. Harvey's elegant account of the latter will ſerve to give ſome idea of the numbers of theſe, and of the other birds that annually migrate to that little ſpot.

"There is a ſmall iſland, called by the Scotch *Baſs Iſland*, not more than a mile in circumference; the ſurface is almoſt wholly covered during the months of May and June with neſts, eggs, and young birds; ſo that it is ſcarcely poſſible to walk without treading on them: and the flocks of birds in flight are ſo prodigious as to darken the air like clouds; and their noiſe is ſuch, that you cannot without difficulty hear your next neighbour's voice. If you look down upon the ſea from the top of the precipice, you will ſee it on every ſide covered with infinite numbers of birds of different kinds, ſwimming and hunting for their prey: if in ſailing round the iſland you ſurvey the hanging cliffs, you may ſee in every crag or fiſſure of the broken rocks innumerable birds of various ſorts and ſizes, more than the ſtars of heaven when viewed in a ſerene night: if from afar you ſee the diſtant flocks, either flying to or from the iſland, you would imagine them to be a vaſt ſwarm of bees."

Nor do the rocks of St. Kilda ſeem to be leſs frequented by theſe birds; for Martin aſſures us, that the inhabitants of that ſmall iſland conſume annually no leſs than 22,600 young birds of this ſpecies, beſides an amazing quantity of their eggs, theſe being their principal ſupport throughout the year: they preſerve both eggs and fowls in pyramidal ſtone-buildings, covering them with turf-aſhes to preſerve them from moiſture.—This is a dear-bought food, earned at the hazard of their lives, either by climbing the moſt difficult and narrow paths, where (to appearance) they can barely cling, and that too at an amazing height over the raging ſea; or elſe, being lowered down from above, they collect their annual proviſion, thus hanging in midway air; placing their whole dependence on the uncertain footing of one perſon, who holds the rope by which they are ſuſpended at the top of the precipice. The young birds are a favourite diſh with the North Britons in general: during the ſeaſon, they are conſtantly brought from the Baſs Iſle to Edinburgh, ſold at 2od. a-piece, are roaſted, and ſerved up a little before dinner as a whet.

Mr. Macaulay, miſſionary from the general aſſembly to

St. Kilda, gives the following account of them in that iſland: "Theſe rocks are in ſummer totally covered with ſolan geeſe and other fowls, and appear at a diſtance like ſo many mountains covered with ſnow. The neſts of the ſolan geeſe, not to mention thoſe of other fowls, are ſo cloſe, that when one walks between them, the hatching fowls on either ſide can always take hold of one's clothes; and they will often ſit until they are attacked, rather than expoſe their eggs to the danger of being deſtroyed by the ſea-gulls; at the ſame time, an equal number fly about, and furniſh food for their mates that are employed in hatching; and there are, beſides, large flocks of barren fowls of the different tribes that frequent the rocks of St. Kilda.

"The ſolan geeſe equal almoſt the tame ones in ſize. The common amuſement of the herring-fiſhers ſhows the great ſtrength of this fowl. The fiſhers fix a herring upon a board which has a ſmall weight under it, to ſink it a little below the ſurface of the ſea: the ſolan gooſe, obſerving the fiſh, darts down upon it perpendicularly, and with ſo much force, that he runs his bill irrecoverably through the board, and is taken up directly by the fiſhers.

"The ſolan geeſe repair to St. Kilda in the month of March, and continue there till after the beginning of November. Before the middle of that month they, and all the other ſea-fowls that are fond of this coaſt, retire much about the ſame time into ſome other favourite regions; ſo that not a ſingle fowl belonging to their element is to be ſeen about St. Kilda from the beginning of winter down to the middle of February. Before the young ſolan geeſe fly off, they are larger than their mothers, and the fat on their breaſt is ſometimes three inches deep. Into what quarter of the world theſe tribes of wild fowl repair, after winter ſets in, whether into the northern ocean, the native country and winter quarters of herrings in general, or into ſome other region near the ſun; or whether they be of the ſleeping kind; they who pry into the myſteries of natural hiſtory, or have converſed much with writers of voyages, can beſt explain. I ſhall only pretend to ſay, that theſe different nations of the feathered kind are taught to chooſe the propereſt habitations and feeding-places, and to ſhift their quarters ſeaſonably, by the unerring hand of God.

"From the account given above of the multitudes of ſea-fowls that ſeek their food on this coaſt, we may juſtly conclude that there muſt be inexhauſtible ſtores of fiſh there. Let us for a moment confine our attention to the conſumption made by a ſingle ſpecies of fowls. The ſolan gooſe is almoſt inſatiably voracious; he flies with great force and velocity, toils all the day with very little intermiſſion, and digeſts his food in a very ſhort time; he diſdains to eat any thing worſe than herring or mackarel, unleſs it be in a very hungry place, which he takes care to avoid or abandon. We ſhall take it for granted that there are 100,000 of that kind around the rocks of St. Kilda; and this calculation is by far too moderate, as no leſs than 20,000 of this kind are deſtroyed every year, including the young ones. We ſhall ſuppoſe, at the ſame time, that the ſolan geeſe ſojourn in theſe ſeas for about ſeven months of the year; that each of them deſtroys five herrings in a day; a ſubſiſtence infinitely poor for ſo greedy a creature, unleſs it were more than half ſupported at the expence of other fiſhes. Here we have 100,000,000 of the fineſt fiſh in the world devoured annually by a ſingle ſpecies of the St. Kilda ſea fowls.

"If, in the next place, it be conſidered, that much the greateſt part of the other tribes have much the ſame appetite for herring, and purſue it from place to place, in the ſeveral migrations it makes from one ſea to another, the conſumption muſt be prodigiouſly great. Taking theſe into the account, and allowing them the ſame quantity of food, and of the ſame kind, by reaſon of their vaſt ſuperiority in point of numbers, though their ſtomachs are conſiderably weaker; we ſee there are no leſs than 200,000,000 of herrings ſwallowed up every year by the birds of a very ſmall diſtrict of rocks, which occupy ſo inconſiderable a ſpace in the Deucaledonian ocean.

"Should all the articles of this account be ſuſtained, articles which ſeem no leſs juſt than plain, and ſhould our curioſity lead us into a new calculation, allowing between 600 and 700 to every barrel, it is evident that more than 330,000 barrels are annually carried away by ſuch creatures."

Theſe birds are well known on moſt of the coaſts of England, but not by the name of the *ſolan gooſe*. In Cornwall and in Ireland they are called *gannets*; by the Welſh *gan*. Mr. Ray ſuppoſed the Corniſh gannet to be a ſpecies of large gull; a very excuſable miſtake; for, during his ſix months reſidence in Cornwall, he never had an opportunity of ſeeing that bird, except flying; and in the air it has the appearance of a gull. On that ſuppoſition he gave our ſkua the title of *cataracta*, a name borrowed from Ariſtotle, and which admirably expreſſes the rapid deſcent of this bird on its prey. Mr. Moyle firſt detected this miſtake; and the Rev. Dr. William Borlaſe, by preſenting us with a fine ſpecimen of this bird, confirms the opinion of Mr. Moyle; at the ſame time giving the following natural hiſtory of the bird:

"The gannet comes on the coaſts of Cornwall in the latter end of ſummer, or beginning of autumn; hovering over the ſhoals of pilchards that come down to us through St. George's Channel from the northern ſea. The gannet ſeldom comes near the land, but is conſtant to its prey, a ſure ſign to the fiſhermen that the pilchards are on the coaſts; and when the pilchards retire, generally about the end of November, the gannets are ſeen no more. The bird now ſent was killed at Chandour, near Mountſbay, Sept. 30, 1762, after a long ſtruggle with a water-ſpaniel, aſſiſted by the boatmen; for it was ſtrong and pugnacious. The perſon who took it obſerved that it had a tranſparent membrane under the eye-lid, with which it covered at pleaſure the whole eye, without obſcuring the ſight or ſhutting the eye-lid; a gracious proviſion for the ſecurity of the eyes of ſo weighty a creature, whoſe method of taking its prey is by darting headlong on it from a height of 150 feet or more into the water. About four years ago, one of theſe birds flying over Penzance, (a thing that rarely happens,) and ſeeing ſome pilchards lie on a fir plank, in a cellar uſed for curing fiſh, darted itſelf down with ſuch violence, that it ſtruck its bill quite through the board, (about an inch and a quarter thick,) and broke its neck."

Theſe birds are ſometimes taken at ſea by a deception of the like kind; the fiſhermen faſtening a pilchard to a board, as in St. Kilda they faſten herrings, and which in the ſame manner decoys the unwary gannet to its own deſtruction.

In the *cataracta* of Juba may be found many characters of this bird. He ſays, that the bill is toothed; that its eyes are fiery; and that its colour is white: and in the very name is expreſſed its furious deſcent on its prey. The reſt of his accounts ſavour of fable.—We are uncertain whether the gannet breeds in any other parts of Europe beſides our own iſlands; except, as Mr. Ray ſuſpects, the ſula (deſcribed in Cluſius's Exotics, which breeds in Ferroe Iſles) be the ſame bird.

4. The *ſula*, or booby, is ſomewhat leſs than a gooſe; the baſis of the bill yellow, and bare of feathers; the eyes of a light-grey colour; the lower part of the bill of a light brown. The colours of the body are brown and white; but varied ſo in different individuals, that they cannot be deſcribed by them. Their wings are very long; their legs and feet pale yellow, ſhaped like thoſe of corvorants. They frequent the Bahama iſlands, where they breed all months in the year, laying one, two, or three eggs, on the bare rock. While young, they are covered with a white down, and continue ſo till they are almoſt ready to fly. They feed on fiſh like the reſt of this genus; but

have a very troubleſome enemy of the man of-war bird, which lives on the ſpoils obtained from other ſea-birds, particularly the booby. As ſoon as this rapacious enemy perceives that the booby has taken a fiſh, he flies furiouſly at him, upon which the former dives to avoid the blow; but as he cannot ſwallow his prey below water, he is ſoon obliged to come up again with the fiſh in his bill as before, when he ſuffers a new aſſault; nor does his enemy ceaſe to perſecute him till he lets go the fiſh, which the other immediately carries off.

5. The great booby, called by Linnæus *Pelicani Balſani puſſus*, frequents the rivers and ſea-coaſts of Florida, purſuing and devouring fiſhes like others of the genus. Mr. Cateſby informs us, that he has ſeveral times found them diſabled, and ſometimes dead, on the ſhore; whence he thinks that they meet with ſharks, or other voracious fiſhes, which deſtroy them. The bird is about the ſize of a gooſe; the head and neck remarkably prominent; the back of a brown colour; the belly duſky white; the feet black, and ſhaped like thoſe of a corvorant; the head elegantly ſpotted with white; the wings extend ſix feet when ſpread. Both this ſpecies and the laſt have a joint in the upper mandible of the bill, by which they can raiſe it conſiderably from the lower one without opening the mouth.

6. The *aquilus*, or man-of-war bird, is in the body about the ſize of a large fowl; in length three feet, and in breadth 14. The bill is ſlender, five inches long, and much curved at the point; the colour is duſky; from the baſe a reddiſh dark-coloured ſkin ſpreads on each ſide of the head, taking in the eyes: from the under mandible hangs a large membranaceous bag attached ſome way down the throat, as in the pelican, and applied to the ſame uſes; the colour of this is a fine deep red, ſprinkled on the ſides with a few ſcattered feathers: the whole plumage is browniſh black, except the wing coverts, which have a rufous tinge: the tail is long and much forked: the outer feathers are 18 inches or more in length; the middle ones from ſeven to eight: the legs are ſmall, all the toes are webbed together, and the webs are deeply indented; the colour of them is duſky red.

The female differs in wanting the membranaceous pouch under the chin, and in having the belly white: in other things it is greatly like the male.

The frigate pelican, or man-of-war bird *, as it is by ſome called, is chiefly, if not wholly, met with between the tropics, and ever out at ſea, being only ſeen on the wing. It is uſual with other birds, when fatigued with flying, to reſt themſelves on the ſurface of the water; but nature, from the exceeding length of wing ordained to this, has made the riſing therefrom utterly impoſſible; at leaſt writers not only ſo inform us, but every one whom we have talked with avers the ſame; though perhaps this is no defect of nature, as it ſcarcely ſeems to require much reſt: at leaſt, from the length of wing, and its apparent eaſy gliding motion, (much like that of the kite,) it appears capable of ſuſtaining very long flights; for it is often ſeen above 100, and not unfrequently above 200, leagues from land. It has indeed been known to ſettle on the maſts of ſhips; but this is not a frequent circumſtance, though it will often approach near, and hover about the top-maſt flag. Sometimes it ſoars ſo high in the air as to be ſcarcely viſible, yet at other times approaches the ſurface of the ſea, where, hovering at ſome diſtance, the moment he ſpies a fiſh he darts down on it with the utmoſt rapidity, and ſeldom without ſucceſs, flying upwards again as quick as he deſcended. It is alſo ſeen to attack gulls and other birds which have caught a fiſh; when it obliges them to diſgorge it, and then takes care to ſeize it before it falls into the water. It is an enemy to the flying-fiſh; for, on their being attacked beneath by the dolphin and other voracious fiſh, to eſcape their jaws, theſe ſemi volatiles leap out of the water in cluſters, making uſe of their long fins as wings to buoy them up in the air, which they are enabled to do ſo long as they remain wet; but the moment they become dry are uſeleſs, and they drop into their proper element again: during their flight, the frigate darts in among the ſhoal, and ſeizes one or two at leaſt. Theſe birds know the exact place where the fiſh are to riſe, from the bubbling of the water, which directs them to the ſpot. In this they are accompanied by gulls and other birds, who act in concert with them.

Theſe birds, which, though not uncommon everywhere within the tropics, yet are leſs frequent in ſome places than others, were ſeen by Cook in 30½ degrees. In the old route of navigators, they are mentioned frequently as being met with at Aſcenſion Iſland, Ceylon, Eaſt Indies, and China †. Dampier ſaw them in great plenty in the iſland of Aves in the Weſt Indies. Our later navigators talk of them as frequenting various places of the South Sea, about the Marqueſas, Eaſter Iſles, and New Caledonia; alſo at Otaheite, though at this laſt place not in ſuch plenty as in many others. They are ſaid to make neſts on trees, if there be any within a proper diſtance; otherwiſe on the rocks. They lay one or two eggs of a fleſh-colour, marked with crimſon ſpots. The young birds are covered with greyiſh white down: the legs are of the ſame colour, and the bill is white. There is a variety of this ſpecies, which is leſs, meaſuring only two feet nine inches in length: the extent from wing to wing is five feet and a half. The bill is five inches long, and red; the baſe of it, and bare ſpace round the eye, are of the ſame colour: the noſtrils are ſufficiently apparent, and appear near the baſe; the ſhape of the bill is as in the larger one: the head, hind part of the neck, and upper parts of the body and wings, are ferruginous brown; the throat, fore part of the neck, and breaſt, are white; the tail is greatly forked, as in the other; the legs are of a dirty yellow.

"In my collection (ſays Latham) is a bird very ſimilar to this, if not the ſame: general colour of the plumage full black; breaſt and belly mottled with aſh-colour; the inner ridge of the wing the ſame; the bill has the long furrow, as is ſeen in the greater one; but the noſtrils are ſufficiently apparent, being about half an inch in length, rather broader at that part near the baſe. This has a large red pouch at the chin and throat, as in the former ſpecies. It is moſt likely that mine is the male bird, as others, ſuſpected to be of the oppoſite ſex, have little or no traces of the jugular pouch. This ſuppoſition ſeems juſtified from a pair in the Hunterian muſeum, in both of which the plumage is wholly black: the one has a large pouch, the other is deſtitute of it. Some have ſuppoſed that the greater and leſſer frigates are the ſame bird, in different periods of age."

7. The *onocrotalus*, or pelican of Aſia, Africa, and America; though Linnæus thinks that the pelican of America may poſſibly be a diſtinct variety. See plate 30. This creature, in Africa, is much larger in the body than a ſwan, and ſomewhat of the ſame ſhape and colour. Its four toes are all webbed together; and its neck in ſome meaſure reſembles that of a ſwan: but that ſingularity in which it differs from all other birds is in the bill and the great pouch underneath. This enormous bill is 15 inches from the point to the opening of the mouth, which is a good way back behind the eyes. At the baſe the bill is

*, It is alſo called *tailleur*, or tailor, by the French, from the motion of its tail repreſenting a pair of ſhears when opened; and when on the wing, it opens and ſhuts them frequently, in the manner of uſing that inſtrument.—*Ulloa, Voy.* ii. p. 304.

† Thought by Oſbeck to be one of the ſorts of birds uſed in fiſhing by the Chineſe.

ſomewhat greeniſh, but varies towards the end, being of a reddiſh blue. It is very thick in the beginning, but tapers off to the end, where it hooks downwards. The under-chap is ſtill more extraordinary; for to the lower edges of it hangs a bag, reaching the whole length of the bill to the neck, which is ſaid to be capable of containing 15 quarts of water. This bag the bird has a power of wrinkling up into the hollow of the under-chap; but by opening the bill, and putting one's hand down into the bag, it may be diſtended at pleaſure. The ſkin of which it is formed will then be ſeen of a blueiſh aſh-colour, with many fibres and veins running over its ſurface. It is not covered with feathers, but with a ſhort downy ſubſtance as ſmooth and as ſoft as ſatin, and is attached all along to the under edges of the chap, is fixed backward to the neck of the bird by proper ligaments, and reaches near half way down. When this bag is empty, it is not ſeen; but when the bird has fiſhed with ſucceſs, it is then incredible to what an extent it is often ſeen dilated. For the firſt thing the pelican does in fiſhing is to fill up the bag: and then it returns to digeſt its burden at leiſure. When the bill is opened to its wideſt extent, a perſon may run his head into the bird's mouth, and conceal it in this monſtrous pouch, thus adapted for very ſingular purpoſes. Yet this is nothing to what Ruyſch aſſures us, who avers that a man has been ſeen to hide his whole leg, boot and all, in the monſtrous jaws of one of theſe animals. At firſt appearance this would ſeem impoſſible, as the ſides of the under-chap, from which the bag depends, are not above an inch aſunder when the bird's bill is firſt opened; but then they are capable of great ſeparation; and it muſt neceſſarily be ſo, as the bird preys upon large fiſhes, and hides them by dozens in its pouch. Tertre affirms, that it will hide as many fiſh as will ſerve 60 hungry men for a meal.

This pelican was once alſo known in Europe, particularly in Ruſſia; but it ſeems to have deſerted our coaſts. This is the bird of which ſo many fabulous accounts have been propagated; ſuch as its feeding its young with its own blood, and its carrying in the Deſert a proviſion of water for them in its great reſervoir. But the abſurdity of the firſt account anſwers itſelf; and as for the latter, the pelican uſes its bag for very different purpoſes than that of filling it with water.

Clavigero, in his Hiſtory of Mexico, ſays that "there are two ſpecies, or rather varieties, of this bird in Mexico; the one having a ſmooth bill, the other a notched one. Although the Europeans are acquainted with this bird, I do not know whether they are equally well acquainted with the ſingular circumſtance of its aſſiſting the ſick or hurt of its own ſpecies; a circumſtance which the Americans ſometimes take advantage of to procure fiſh without trouble. They take a live pelican, break its wing, and, after tying it to a tree, conceal themſelves in the neighbourhood; there they watch the coming of the other pelicans with their proviſions; and as ſoon as they ſee theſe throw up the fiſh from their pouch, they run in, and, after leaving a little for the captive bird, carry off the reſt."

This amazing pouch may be conſidered as analogous to the crop in other birds; with this difference, that as theirs lies at the bottom of the gullet, ſo this is placed at the top. Thus, as pigeons and other birds macerate their food for their young in their crops, and then ſupply them; ſo the pelican ſupplies its young by a more ready contrivance, and macerates their food in its bill, or ſtores it for its own particular ſuſtenance.

The ancients were particularly fond of giving this bird admirable qualities and parental affections: ſtruck, perhaps, with its extraordinary figure, they were willing to ſupply it with as extraordinary appetites; and having found it with a large reſervoir, they were pleaſed with turning it to the moſt tender and parental uſes. But the truth is, the pelican is a very heavy, ſluggiſh, voracious bird, and very ill fitted to take thoſe flights or to make thoſe cautious proviſions for a diſtant time, which we have been told they do.

The pelican, ſays Labat, has ſtrong wings, furniſhed with thick plumage of an aſh-colour, as are the reſt of the feathers over the whole body. Its eyes are very ſmall, when compared with the ſize of its head; there is a ſadneſs in its countenance, and its whole air is melancholy. It is as dull and reluctant in its motions as the flamingo is ſprightly and active. It is ſlow in flight, and, when it riſes to fly, performs it with difficulty and labour. Nothing, as it would ſeem, but the ſpur of neceſſity, could make theſe birds change their ſituation, or induce them to aſcend into the air: but they muſt either ſtarve or fly.

They are torpid and inactive to the laſt degree, ſo that nothing can exceed their indolence but their gluttony; it is only from the ſtimulations of hunger that they are excited to labour; for otherwiſe they would continue always in fixed repoſe. When they have raiſed themſelves about 30 or 40 feet above the ſurface of the ſea, they turn their head with one eye downwards, and continue to fly in that poſture. As ſoon as they perceive a fiſh ſufficiently near the ſurface, they dart down upon it with the ſwiftneſs of an arrow, ſeize it with unerring certainty, and ſtore it up in their pouch. They then riſe again, though not without great labour, and continue hovering and fiſhing, with their head on one ſide as before.

This work they continue with great effort and induſtry till their bag is full, and then they fly to land to devour and digeſt at leiſure the fruits of their induſtry. This, however, it would appear, they are not long in performing; for towards night they have another hungry call, and they again reluctantly go to labour. At night, when their fiſhing is over, and the toil of the day crowned with ſucceſs, theſe lazy birds retire a little way from the ſhore; and, though with the webbed feet and clumſy figure of a gooſe, they will be contented to perch nowhere but upon trees among the light and airy tenants of the foreſt. There they take their repoſe for the night; and often ſpend a great part of the day, except ſuch times as they are fiſhing, ſitting in diſmal ſolemnity, and, as it would ſeem, half aſleep. Their attitude is with the head reſting upon their great bag, and that reſting upon their breaſt. There they remain without motion, or once changing their ſituation, till the calls of hunger break their repoſe, and till they find it indiſpenſably neceſſary to fill their magazine for a freſh meal. Thus their life is ſpent between ſleeping and eating; and our author adds, that they are as foul as they are voracious, as they are every moment voiding excrements in heaps as large as one's fiſt.

The ſame indolent habits ſeem to attend them even in preparing for incubation, and defending their young when excluded. The female makes no preparation for her neſt, nor ſeems to chooſe any place in preference to lay in; but drops her eggs on the bare ground, to the number of five or ſix, and there continues to hatch them. Attached to the place, without any deſire of defending her eggs or her young, ſhe tamely ſits and ſuffers them to be taken from under her. Now and then ſhe juſt ventures to peck, or to cry out when a perſon offers to beat her off.

She feeds her young with fiſh macerated for ſome time in her bag, and, when they cry, flies off for a new ſupply. Labat tells us, that he took two of theſe when very young, and tied them by the leg to a poſt ſtuck into the ground, where he had the pleaſure of ſeeing the old one for ſeveral days come to feed them, remaining with them the greateſt part of the day, and ſpending the night on the branch of a tree that hung over them. By theſe means they were all three become ſo familiar, that they ſuffered themſelves to be handled; and the young ones very

kindly accepted whatever fish he offered them. These they always put first into their bag, and then swallowed at their leisure.

It seems, however, that they are but disagreeable and useless domestics; their gluttony can scarcely be satisfied; their flesh smells very rancid, and tastes a thousand times worse than it smells. The native Americans kill vast numbers; not to eat, for they are not fit even for the banquet of a savage, but to convert their large bags into purses and tobacco-pouches. They bestow no small pains in dressing the skin with salt and ashes, rubbing it well with oil, and then forming it to their purpose. It thus becomes so soft and pliant, that the Spanish women sometimes adorn it with gold and embroidery, to make work-bags of.

Yet, with all the seeming hebetude of this bird, it is not entirely incapable of instruction in a domestic state. Father Raymond assures us, that he has seen one so tame and well educated among the native Americans, that it would go off in the morning at the word of command, and return before night to its master, with its great pouch distended with plunder; a part of which the savages would make it disgorge, and a part they would permit it to reserve for itself.

"The pelican," as Faber relates, "is not destitute of other qualifications. One of those which was brought alive to the duke of Bavaria's court, where it lived 40 years, seemed to be possessed of very uncommon sensations. It was much delighted in the company and conversation of men, and in music both vocal and instrumental; for it would willingly stand," says he, "by those that sung or sounded the trumpet; and stretching out its head, and turning its ear to the music, listened very attentively to the harmony, though its own voice was little pleasanter than the braying of an ass." Gesner tells us, that the emperor Maximilian had a tame pelican which lived for above 80 years, and that always attended his army on their march. It was one of the largest of the kind, and had a daily allowance by the emperor's orders. As another proof of the great age to which the pelican lives, Aldrovandus makes mention of one of these birds that was kept several years at Mechlin, and was verily believed to be 50 years old. We often see these birds at our shows in the metropolis.

Mr. Edwards, in his History of Birds, describes the pelican of America from one the body of which was sent him stuffed and dried. From the point of the bill to the angles of the mouth measured 13 inches, and the wing when closed measured 18 inches. The pouch when dry appeared of the consistence and colour of a brown dry ox's bladder, having fibres running its whole length, and blood-vessels crossing them; and proceeding from the sides of the lower part of the bill, which opened into this pouch, its whole length. The greater bone of the wing, being broken, was found to be light, hollow, void of marrow, and the sides of it thin as parchment. Sir Hans Sloane writes thus of it (see *Nat. Hist. of Jamaica*, vol. ii. p. 322.): "This seems to be the same with the white pelican, only of a darker colour. They are frequent in all the seas of the hot West Indies. They fish after the same manner as man-of-war birds, and come into the sheltered bays in stormy weather, where they very often perch on trees: they fly over the sea as gulls, and take the fish when they spy them, by falling down upon them, and they then rise again and do the like. They are not reckoned good food. When they are seen at sea, it is a sign of being near land." Wafer, in his voyage and description of the isthmus of America, says, "The pelican is not found on the South Sea side of the Isthmus, but they abound on the northern side: they are of a dark grey colour, and under the throat hangs a bag: the old ones are not eaten, but the young are good meat." Mr. Edwards, in another place, gives the description of a pelican, which he says is double the bigness of the largest swan. His drawing was made from the pelican shown at London in 1745, which was brought by captain Pelly from the Cape of Good Hope, where they are larger than anywhere else. The body, legs, and feet, very much resemble the pelican of America; and it differs little but in the head and neck, which last is very long, like a swan's; the bill is straighter, and the upper part only hooked at the end; the pouch is shaped something different, hanging more down in the middle. Mr. Edwards thus describes it: "From the point of the bill to the angle of the mouth is 20 inches of our English measure, which is six inches more than any natural historian has found it; the Academy of Paris having measured one which was about 14 inches, Paris measure I suppose; and our countryman Willughby measured one brought from Russia, which he makes 14 inches English. I thought it something incredible in Willughby's description, that a man should put his head into the pouch under the bill, till I saw it performed in this bird by its keeper, and am sure a second man's head might have been put in with it at the same time."

The Academy of Paris think the bird they have described is the pelican of Aristotle, and the onocrotalus of Pliny. They are also confirmed in the opinion that this is a long-lived bird; for, out of a great number kept at Versailles, none had died for more than 12 years, being the only animals kept in the menagerie of which some have not died in that time. Some authors say they live 60 or 70 years.

Capt Keeling, in his Voyage to Sierra Leona, says the pelicans there are as large as swans, of a white colour, with exceeding long bills; and M. Thevenot in his Travels to the Levant observes, that the pelicans about some part of the Nile near the Red Sea swim by the bank-side like geese, in such great numbers that they cannot be counted. Father Morolla, in his Voyage to Congo, says pelicans are often met with in the road to Singa, and are all over black, except on their breast, which is of a flesh colour like the neck of a turkey. He adds further, that father Francis de Pavia informed him, that on his journey to Singa he observed certain large white birds, with long beaks, necks, and feet, which, whenever they heard the least sound of an instrument, began immediately to dance, and leap about the rivers, where they always reside, and whereof they were great lovers: this, he said, he took a great pleasure to contemplate, and continued often upon the banks of the rivers to observe.

It would extend our article beyond all proportion, were we to touch on each individual species of this extensive genus, together with their accidental varieties. But as the genus is unquestionably very curious, we shall here subjoin a list of books which such of our readers as desire it may have recourse to for further information: *Edwards's History of Birds*; *Natural History of Jamaica*; *Mem. de l'Academie Royale des Sciences, depuis 1666 jusqu'à 1699*, tom. 3. troisieme partie, p. 186.; *Willughby*; *Pennant's British* and *Arctic Zoology*; and *Latham's Synopsis of Birds*; the last of which is the fullest and most scientifical of any we have yet seen.

PELION (Diodorus Siculus, &c.), *Pelius, mons*, understood, (Mela, Virgil, Horace, Seneca), a mountain of Thessaly near Ossa, and hanging over the Sinus Pelasgicus, or Pegasicus; its top covered with pines, the sides with oaks, (Ovid). Said also to abound in wild ash, (Val. Flaccus). From this mountain was cut the spear of Achilles, called *pelias*, which none but himself could wield, (Homer). Dicearchus, Aristotle's scholar, found this mountain 1250 paces higher than any other of Thessaly, (Pliny). *Pelius*, Cicero; *Peliacus*, (Catullus), the epithet.

PELLA (anc. geog.), a town situated on the confines of Emathia, a district of Macedonia, (Ptolemy); and therefore Herodotus allots it to Bottiæa, a maritime district on the Sinus Thermaicus. It was the royal residence, situated on an eminence, verging to the south-west, encompassed with unpassable

marſhes ſummer and winter; in which, next the town, a citadel like an iſland riſes, placed on a bank or dam, a prodigious work, both ſupporting the wall and ſecuring it from any hurt by means of the circumfluent water. At a diſtance, it ſeems cloſe to the town, but is ſeparated from it by the Ludias, running by the walls, and joined to it by a bridge, (Livy): diſtant from the ſea 120 ſtadia, the Ludias being ſo far navigable, (Strabo). Mela calls the town *Pelle*, though moſt Greek authors write *Pella*. The birth-place of Philip,, who enlarged it; and afterwards of Alexander, (Strabo, Mela). Continued to be the royal reſidence down to Perſes, (Livy). Called *Pella Colonia*, (Pliny); *Colonia Julia Auguſta*, (Coin). It afterwards came to decline, with but few and mean inhabitants, (Lucian). It is now called Τα Παλαιστια, the *Little Palace*, (Holſtenius). *Pellæus*, both the gentilitious name and the epithet, (Lucian, Juvenal, Martial).—Another PELLA, (Polybius, Pliny); a town of the Decapolis, on the other ſide the Jordan; abounding in water, like its cognominal town in Macedonia; built by the Macedonians, (Strabo); by Seleucus, (Euſebius); anciently called *Butis*, (Stephanus); *Apamea*, (Strabo); ſituated 35 miles to the north-eaſt of Geraſa, (Ptolemy). Thither the Chriſtians, juſt before the ſiege of Jeruſalem by Titus, were divinely admoniſhed to fly, (Euſebius). It was the utmoſt boundary of the Peræa, or Transjordan country, to the north, (Joſephus).

PELLETIER (JAMES), a doctor of phyſic, and an eminent mathematician, was born at Mans in 1517, and died at Paris in 1582. He was an excellent Latin and French poet, a good orator, phyſician, and grammarian. He wrote *Oeuvres Poetiques*, *Commentaires Latins ſur Euclide*, &c.

PELLETS, in heraldry, thoſe roundles that are black; called alſo *ogreſſes* and *gunſtones*, and by the French *torteaux de ſable*.

PELLICLE, among phyſicians, denotes a thin film or fragment of a membrane. Among chemiſts it ſignifies a thin ſurface of cryſtals uniformly ſpread over a ſaline liquor evaporated to a certain degree.

PELLISON, or PELLISON FONTANIER, (PAUL), one of the fineſt geniuſes of the 17th century, was the ſon of James Pelliſon counſellor at Caſtres. He was born at Beziers in 1624, and educated in the Proteſtant religion. He ſtudied with ſucceſs the Latin, Greek, French, Spaniſh, and Italian tongues, and applied himſelf to the reading the beſt authors in theſe languages; after which he ſtudied the law at Caſtres with reputation. In 1652 he purchaſed the poſt of ſecretary to the king, and five years after became firſt deputy to M. Fouquet. He ſuffered by the diſgrace of that miniſter; and in 1661 was confined in the Baſtile, from whence he was not diſcharged till four years after. During his confinement he applied himſelf to the ſtudy of controverſy; and in 1670 abjured the Proteſtant religion. Louis XIV. beſtowed upon him an annual penſion of 2000 crowns; and he likewiſe enjoyed ſeveral poſts. In 1676 he had the abbey of Giment, and ſome years after the priory of St. Orens at Auch. He died in 1693. His principal works are, 1. The Hiſtory of the French Academy. 2. Reflections on religious diſputes, &c. in 4 vols. 12 mo. 3. The Hiſtory of Louis XIV. 4. Hiſtorical Letters and Miſcellanies, in 3 vols. 12mo.

PELOPIA, a feſtival obſerved by the Eleans in honour of Pelops. A ram was ſacrificed on the occaſion, which both prieſts and people were prohibited from partaking of, on pain of excommunication from Jupiter's temple: the neck only was allotted to the officer who provided wood for the ſacrifice. This officer was called Ξυλευς; and white poplar was the only wood made uſe of at this ſolemnity.

PELOPONNESUS, (Dionyſius), a large peninſula to the ſouth of the reſt of Greece; called, as it were, *Pelopis neſus* or *inſula*, though properly not an iſland, but a peninſula; yet wanting but little to be one, viz. the iſthmus of Corinth, ending in a point like the leaf of the platane or plane-tree. Anciently called *Apia* and *Pelaſgia*; a peninſula ſecond to no other country for nobleneſs; ſituated between two ſeas, the Egean and Ionian, and reſembling a platane-leaf, on account of its angular receſſes or bays, (Pliny, Strabo, Mela). Strabo adds from Homer, that one of its ancient names was *Argos*, with the epithet *Achaicum*, to diſtinguiſh it from Theſſaly, called *Pelaſgicum*. Divided into ſix parts; namely, Argolis, Laconica, Meſſenia, Elis, Achaia, and Arcadia, (Mela). Now called the *Morea*.

PELOPS, in fabulous hiſtory, the ſon of Tantalus king of Phrygia, went into Elis, where he married Hippodamia the daughter of Œnomaus king of that country; and became ſo powerful, that all the territory which lies beyond the Iſthmus, and compoſes a conſiderable part of Greece, was called *Peloponneſus*, that is, the *iſland of Pelops*, from his name and the word Νεσος.

PELTA, a ſmall, light, manageable buckler, uſed by the ancients. It was worn by the Amazons. The pelta is ſaid by ſome to have reſembled an ivy leaf in form; by others it is compared to the leaf of an Indian fig-tree; and by Servius to the moon in her firſt quarter.

PELTARIA, in botany: A genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and in the natural method ranking under the 39th order, *Siliquoſæ*. The ſilicula is entire, and nearly orbiculated, compreſſed-plane, and not opening.

PELUSIUM (anc. geog.), a noble and ſtrong city of Egypt, without the Delta, diſtant 20 ſtadia from the ſea; ſituated amidſt marſhes; and hence its name and its ſtrength. Called the *key* or *inlet of Egypt* (Diodorus, Hirtius); which being taken, the reſt of Egypt lay quite open and expoſed to an enemy. Called *Sin* (Ezekiel). *Peluſiacus* the epithet, (Virgil, Diodorus). From its ruins aroſe Damietta. E. lon. 32. N. lat. 31.

Mr. Savary gives us the following account of this place: "The period of its foundation, as well as that of the other ancient cities of Egypt, is loſt in the obſcurity of time. It flouriſhed long before Herodotus. As it commanded the entrance of the country on the ſide of Aſia, the Pharaohs rendered it a conſiderable fortreſs: one of them raiſed a rampart of 30 leagues in length from the walls of this town to Heliopolis. But we find from the hiſtory of nations that the long wall of China, thoſe which the weakneſs of the Greek emperors led them to build round Conſtantinople, and many others, built at an immenſe expence, were but feeble barriers againſt a warlike people: theſe examples have taught us, that a ſtate, to be in ſecurity againſt a foreign yoke, muſt form warriors within itſelf, and that men muſt be oppoſed to men. This rampart, which covered Peluſium, did not ſtop Cambyſes, who attacked it with a formidable army. The feeble character of the ſon of Amaſis, unable to prevent the deſertion of 200,000 Egyptians, who went to found a colony beyond the cataracts, had not force ſufficient to oppoſe that torrent which broke in upon his country. Cambyſes, after a bloody battle, wherein he cut his enemies to pieces, entered Peluſium in triumph. That memorable day, which ſaw the deſertion of one part of the Egyptian militia and the ruin of the other, is the true epoch of the ſubjugation of that rich country. Since that period, it has paſſed under the yoke of the Perſians, the Macedonians, the Romans, the Greeks, the Arabs, and the Turks. A continued ſlavery of more than 2000 years ſeems to ſecure them an eternal bondage.

"Herodotus, who viſited Peluſium ſome years after the conqueſt of Cambyſes, relates an anecdote which I cannot omit: 'I ſurveyed (ſays he) the plain where the two armies had fought. It was covered with human bones collected in heaps. Thoſe of the Perſians were on one ſide, thoſe of the Egyptians

on the other, the inhabitants of the country having taken care to ſeparate them after the battle. They made me take notice of a fact which would have appeared very aſtoniſhing to me without their explanation of it. The ſkulls of the Perſians, which were ſlight and fragile, broke on being lightly ſtruck with a ſtone; thoſe of the Egyptians, thicker and more compact, reſiſted the blows of flint. This difference of ſolidity they attributed to the cuſtom the Perſians have of covering their heads from their infancy with the tiara, and to the Egyptian cuſtom of leaving the heads of their children bare and ſhaved, expoſed to the heat of the ſun. This explanation appeared ſatisfactory to me.' Mr. Savary aſſures us that the ſame cuſtoms ſtill ſubſiſt in Egypt, of which he frequently had ocular demonſtration.

"Peluſium (continues he), after paſſing under the dominion of Perſia, was taken by Alexander. The brave Antony, general of cavalry under Gabinius, took it from his ſucceſſors, and Rome reſtored it to Ptolemy Auletes. Pompey, whoſe credit had eſtabliſhed this young prince on the throne of Egypt, after the fatal battle of Pharſalia took refuge at Peluſium. He landed at the entrance of the harbour; and on quitting his wife Cornelia and his ſon, he repeated the two following verſes of Sophocles: 'The free man who ſeeks an aſylum at the court of a king will meet with ſlavery and chains.' He there found death. Scarcely had he landed on the ſhore, when Theodore the rhetorician, of the iſle of Chio, Septimius the courtier, and Achillas the eunuch, who commanded his troops, wiſhing for a victim to preſent to his conqueror, ſtabbed him with their ſwords. At the ſight of the aſſaſſins Pompey covered his face with his mantle, and died like a Roman. They cut off his head, and embalmed it, to offer it to Cæſar, and left his body naked on the ſhore. It was thus that this great man, whoſe warlike talents had procured the liberty of the ſeas for the Romans, and added whole kingdoms to their extended empire, was baſely ſlain in ſetting foot on the territory of a king who owed to him his crown. Philip his freedman, collecting together, under favour of the night, the wreck of a boat, and ſtripping off his own cloak to cover the ſad remains of his maſter, burnt them according to the cuſtom. An old ſoldier, who had ſerved under Pompey's colours, came to mingle his tears with thoſe of Philip, and to aſſiſt him in performing the laſt offices to the manes of his general. Peluſium was often taken and pillaged during the wars of the Romans, the Greeks, and the Arabs. But in ſpite of ſo many diſaſters, ſhe preſerved to the time of the Cruſades her riches and her commerce. The Chriſtian princes, having taken it by ſtorm, ſacked it. It never again roſe from its ruins; and the inhabitants went to Damietta." See DAMIETTA.

PELVIS, in anatomy. See ANATOMY.

PEMBROKE (MARY, Counteſs of). See HERBERT.

PEMBROKE, in Pembrokeſhire, in England, is the principal town in the county. It is ſituated upon a creek of Milford-Haven, and in the moſt pleaſant part of Wales, being about 256 miles diſtant from London. It is the county-town, and has two handſome bridges over two ſmall rivers which run into a creek, forming the weſt ſide of a promontory. It is well inhabited, has ſeveral good houſes, and but one church. There is alſo a cuſtom-houſe in it. There are ſeveral merchants in it, who, favoured by its ſituation, employ near 200 ſail on their own account; ſo that, next to Caermarthen, it is the largeſt and richeſt town in South Wales. It has one long ſtraight ſtreet, upon a narrow part of a rock; and the two rivers ſeem to be two arms of Milford-Haven, which ebbs and flows cloſe up to the town. It is governed by a mayor, bailiffs, and burgeſſes; and was in former times fortified with walls, and a magnificent caſtle ſeated on a rock at the weſt end of the town. In this rock, under the chapel, is a natural cavern called *Wogan*, remarked for having a very fine echo: this is ſuppoſed to have been a ſtore-room for the garriſon, as there is a ſtaircaſe leading into it from the caſtle: it has alſo a wide mouth towards the river. This ſtructure being burnt a few years after it was erected, it was rebuilt: It is remarkable for being the birth-place of Henry VII. and for the brave defence made by the garriſon for Charles I.

PEMBROKESHIRE, a county of Wales, bounded on all ſides by the Iriſh ſea, except on the eaſt, where it joins to Caermarthenſhire, and on the north-eaſt to Cardiganſhire. It lies the neareſt to Ireland of any county in Wales; and extends in length from north to ſouth 35 miles, and from eaſt to weſt 29, and is about 140 in circumference. It is divided into ſeven hundreds, contains about 420,000 acres, one city, eight market-towns, two foreſts, 145 pariſhes, about 2300 houſes, and 25,900 inhabitants. It lies in the province of Canterbury, and dioceſe of St. David's. It ſends three members to parliament, viz. one for the ſhire, one for Haverfordweſt, and one for the town of Pembroke.

The air of Pembrokeſhire, conſidering its ſituation, is good; but it is in general better the farther from the ſea. As there are but few mountains, the ſoil is generally fruitful, eſpecially on the ſea-coaſts; nor are its mountains altogether unprofitable, but produce paſture ſufficient to maintain great numbers of ſheep and goats. Its other commodities are corn, cattle, pit-coal, marl, fiſh, and fowl. Among theſe laſt are falcons, called here *peregrins*. Amongſt the birds common here are migratory ſea-birds, that breed in the Iſle of Ramſay, and in the adjoining rocks called *The Biſhop and his Clerks*. About the beginning of April ſuch flocks of birds, of ſeveral ſorts, reſort to theſe rocks, as appear incredible to thoſe who have not ſeen them. They come to them in the night-time, and alſo leave them then; for, in the evening, the rocks may be ſeen covered with them, and the next morning not one be ſeen at all. In like manner, not a ſingle bird ſhall appear in the evening, and the next morning the rocks ſhall be covered with them. They alſo generally make a viſit about Chriſtmas, ſtaying a week or longer; and then take their leave till breeding-time. Among theſe birds are the eligug, razor-bill, puffin, and harry-bird. The eligug lays only one egg, which, as well as thoſe of the puffin and razor-bill, is as big as a duck's, but longer, and ſmaller at one end. She never leaves it till it is hatched, nor then till the young one is able to follow her; and ſhe is all this time fed by the male. This and the razor-bill breed upon the bare rocks, without any kind of neſt. The puffin and harry-bird breed in holes, and commonly in the holes of rabbits; but ſometimes they dig holes for themſelves with their beaks. The harry-birds are never ſeen on land but when taken. All the four kinds cannot raiſe themſelves to fly away when they are on land, and therefore they creep or waddle to the cliffs, and throwing themſelves off, take wing. The eligug is the ſame bird which they call in Cornwall a *kiddaw*, and in Yorkſhire a *ſcout*. The razor-bill is the *merre* of Cornwall. The puffin is the *arctic duck* of Cluſius, and the harry-bird the *ſhire-water* of Sir Thomas Brown. The inhabitants of this county make a very pleaſant durable fire of culm, which is the duſt of coal made up into balls with a third part of mud. The country is well watered by the rivers Clethy, Dougle-dye, Cledhew, and Teive; which laſt parts it from Cardiganſhire. There is a diviſion of the county ſtyled *Rhos* in the Welch, by which is meant a large green plain. This is inhabited by the deſcendants of the Flemings, placed there by Henry I. to curb the Welch, who were never able to expel them, though they often attempted it. On the coaſts of this county, as well as on thoſe of Glamorganſhire and the Severn Sea, is found a kind of alga or laver, the *lactuca marina* of Camden, being a marine plant or weed. It is gathered in ſpring; of which the inhabitants make a ſort of food, called in Welch *lhavan*, and in Engliſh *black-butter*. Having waſhed

it clean, they lay it to ſweat between two flat ſtones, then ſhred it ſmall, and knead it well, like dough for bread, and then make it up into great balls or rolls, which is by ſome eaten raw, and by others fryed with oatmeal and butter. It is accounted excellent againſt all diſtempers of the liver and ſpleen; and ſome affirm that they have been relieved by it in the ſharpeſt fits of the ſtone.

PEN, a town of Somerſetſhire, in England, on the north-eaſt ſide of Wincanton, where Kenwald a Weſt Saxon king ſo totally defeated the Britons, that they were never after able to make head againſt the Saxons; and where, many ages after this, Edmund Ironſide gained a memorable victory over the Danes, who had before, *i. e.* in 1001, defeated the Saxons in that ſame place.

PEN, a little inſtrument, uſually formed of a quill, ſerving to write with. Pens are alſo ſometimes made of ſilver, braſs, or iron.

Dutch PENS are made of quills that have paſſed through hot aſhes, to take off the groſſer fat and moiſture, and render them more tranſparent and brittle.

Fountain PEN, is a pen made of ſilver, braſs, &c. contrived to contain a conſiderable quantity of ink, and let it flow out by gentle degrees, ſo as to ſupply the writer a long time without being under the neceſſity of taking freſh ink.

The fountain pen is compoſed of ſeveral pieces, as in Pl. 31, where the middle piece F carries the pen, which is ſcrewed into the inſide of a little pipe, which again is ſoldered to another pipe of the ſame bigneſs as the lid G; in which lid is ſoldered a male ſcrew, for ſcrewing on the cover, as alſo for ſtopping a little hole at the place and hindering the ink from paſſing through it. At the other end of the piece F is a little pipe, on the outſide of which the top-cover H may be ſcrewed. In the cover there goes a port-crayon, which is to be ſcrewed into the laſt-mentioned pipe, in order to ſtop the end of the pipe, into which the ink is to be poured by a funnel. To uſe the pen, the cover G muſt be taken off, and the pen a little ſhaken, to make the ink run more freely.

There are, it is well known, ſome inſtruments uſed by practical mathematicians, which are called *pens*, and which are diſtinguiſhed according to the uſe to which they are principally applied; as for example, the drawing pen, &c. an inſtrument too common to require particular deſcription in this place. But it may be proper to take ſome notice of the geometric pen, as it is not ſo well known, nor are the principles on which it depends ſo obvious.

The *geometric* PEN is an inſtrument in which, by a circular motion, a right line, a circle, an ellipſe, and other mathematical figures, may be deſcribed. It was firſt invented and explained by John Baptiſt Suardi, in a work entitled *Nuovo Iſtromenti per la Deſcrizzione di diverſe Curve Antichi e Moderne*, &c. Several writers had obſerved the curves ariſing from the compound motion of two circles, one moving round the other; but Suardi firſt realized the principle, and firſt reduced it to practice. It has been lately introduced with ſucceſs into the ſteam-engine by Watt and Bolton. The number of curves this inſtrument can deſcribe is truly amazing; the author enumerates not leſs than 1273, which (he ſays) can be deſcribed by it in the ſimple form. We ſhall give a ſhort deſcription of it from Adams's Geometrical and Graphical Eſſays.

"Plate 31, fig. 1. repreſents the geometric pen; A, B, C, the ſtand by which it is ſupported; the legs A, B, C are contrived to fold one within the other for the convenience of packing. A ſtrong axis D is fitted to the top of the frame; to the lower part of this axis any of the wheels (as *i*) may be adapted; when ſcrewed to it they are immoveable. EG is an arm contrived to turn round upon the main axis D; two ſliding boxes are fitted to this arm; to theſe boxes any of the wheels belonging to the geometric pen may be fixed, and then ſlid ſo that the wheels may take into each other and the immoveable wheel *i*: it is evident, that by making the arm EG revolve round the axis D, theſe wheels will be made to revolve alſo, and that the number of their revolutions will depend on the proportion between the teeth. *Fg* is an arm carrying the pencil; this arm ſlides backwards and forwards in the box *c d*, in order that the diſtance of the pencil from the centre of the wheel *h* may be eaſily varied; the box *c d* is fitted to the axis of the wheel *h*, and turns round with it, carrying the arm *f g* along with it: it is evident, therefore, that the revolutions will be fewer or greater in proportion to the difference between the numbers of the teeth in the wheels *h* and *i*; this bar and ſocket are eaſily removed for changing the wheels. When two wheels only are uſed, the bar *fg* moves in the ſame direction with the bar EG; but if another wheel is introduced between them, they move in contrary directions.

"The number of teeth in the wheels, and conſequently the relative velocity of the epicycle or arm *f g*, may be varied *in infinitum*. The numbers we have uſed are 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96.

"The conſtruction and application of this inſtrument is ſo evident from the figure, that nothing more need be pointed out than the combinations by which various figures may be produced. We ſhall take two as examples:

"The radius of EG (fig. 2.) muſt be to that of *f g* as 10 to 5 nearly; their velocities, or the number of teeth in the wheels, to be equal; the motion to be in the ſame direction.

"If the length of *f g* be varied, the looped figure delineated at fig. 3. will be produced. A circle may be deſcribed by equal wheels, and any radius, but the bars muſt move in contrary directions.

"*To deſcribe by this circular motion a ſtraight line and an ellipſis.* For a ſtraight line, equal radii, the velocity as 1 to 2, the motion in a contrary direction; the ſame data will give a variety of ellipſes, only the radii muſt be unequal; the ellipſes may be deſcribed in any direction." See fig. 4.

PEN, or *Penſtock*. See PENSTOCK.

Sea-PEN. See PENNATULA.

PENANCE, a puniſhment, either voluntary or impoſed by authority, for the faults a perſon has committed. Penance is one of the ſeven ſacraments of the Romiſh church. Beſides faſting, alms, abſtinence, and the like, which are the general conditions of penance, there are others of a more particular kind; as the repeating a certain number of ave-marias, paternoſters, and credos, wearing a hair-ſhirt, and giving one's ſelf a certain number of ſtripes. In Italy and Spain it is uſual to ſee Chriſtians almoſt naked, loaded with chains and a croſs, and laſhing themſelves at every ſtep.

PENATES, in Roman antiquity, a kind of tutelar deities, either of countries or particular houſes; in which laſt ſenſe they differed in nothing from the lares. See LARES. The *penates* were properly the tutelar gods of the Trojans, and were only adopted by the Romans, who gave them the title of *penates*.

PENCIL, an inſtrument uſed by painters for laying on their colours. Pencils are of various kinds, and made of various materials; the largeſt ſorts are made of boars' briſtles, the thick ends of which are bound to a ſtick, bigger or leſs according to the uſes they are deſigned for: theſe, when large, are called *bruſhes*. The finer ſorts of pencils are made of camels', badgers', and ſquirrels' hair, and of the down of ſwans; theſe are tied at the upper end with a piece of ſtrong thread, and incloſed in the barrel of a quill. All good pencils, on being drawn between the lips, come to a fine point.

PENCIL, is alſo an inſtrument uſed in drawing, writing, &c. made of long pieces of black-lead or red chalk, placed in a

groove cut in a ſlip of cedar; on which other pieces of cedar being glued, the whole is planed round, and one of the ends being cut to a point, it is fit for uſe.

Black-lead in fine powder, ſtirred into melted ſulphur, unites with it ſo uniformly, and in ſuch quantity, in virtue perhaps of its abounding with ſulphur, that though the compound remains fluid enough to be poured into moulds, it looks nearly like the coarſer ſorts of black-lead itſelf. Probably the way which prince Rupert is ſaid to have had, mentioned in the third volume of Dr. Birch's Hiſtory of the Royal Society, of making black-lead run like a metal in a mould, ſo as to ſerve for black-lead again, conſiſted in mixing with it ſulphur or ſulphureous bodies.

On this principle the German black-lead pencils are ſaid to be made; and many of thoſe which are hawked about by certain perſons among us are prepared in the ſame manner: their melting or ſoftening, when held to a candle, or applied to a red-hot iron, and yielding a blueiſh flame, with a ſtrong ſmell like that of burning brimſtone, betrays their compoſition: for black lead itſelf yields no ſmell or fume, and ſuffers no apparent alteration in that heat. Pencils made with ſuch additions are of a very bad kind; they are hard, brittle, and do not caſt or make a mark freely either on paper or wood, rather cutting or ſcratching them than leaving a coloured ſtroke.

The true Engliſh pencils (which Vogel in his Mineral Syſtem, and ſome other foreign writers, imagine to be prepared alſo by melting the black-lead with ſome additional ſubſtances, and caſting it into a mould) are formed of black-lead alone ſawed into ſlips, which are fitted into a groove made in a piece of wood, and another ſlip of wood glued over them: the ſofteſt wood, as cedar, is made choice of, that the pencil may be the eaſier cut; and a part at one end, too ſhort to be conveniently uſed after the reſt has been worn and cut away, is left unfilled with the black-lead, that there may be no waſte of ſo valuable a commodity. Theſe pencils are greatly preferable to the others, though ſeldom ſo perfect as could be wiſhed, being accompanied with ſome degree of the ſame inconveniences, and being very unequal in their quality, on account of different ſorts of the mineral being fraudulently joined together in one pencil, the fore-part being commonly pretty good, and the reſt of an inferior kind. Some, to avoid theſe imperfections, take the finer pieces of black-lead itſelf, which they ſaw into ſlips, and fix for uſe in port-crayons: this is doubtleſs the ſureſt way of obtaining black-lead crayons whoſe goodneſs can be depended on.

PENDANT, an ornament hanging at the ear, frequently compoſed of diamonds, pearls, and other jewels.

Pendants, in heraldry, parts hanging down from the label, to the number of three, four, five, or ſix at moſt, reſembling the drops in the Doric frieze. When they are more than three, they muſt be ſpecified in blazoning.

Pendants *of a Ship*, are thoſe ſtreamers, or long colours, which are ſplit and divided into two parts, ending in points, and hung at the head of maſts, or at the yard-arm ends.

PENDENÉ-Vow, in Cornwall, in England, on the north coaſt, by Mervath. There is here an unfathomable cave under the earth, into which the ſea flows at high-water. The cliffs between this and St. Ives ſhine as if they had ſtore of copper, of which indeed there is abundance within-land.

PENDENNIS, in Cornwall, at the mouth of Falmouth-haven, is a peninſula of a mile and a half in compaſs. On this Henry VIII. erected a caſtle, oppoſite to that of St. Maw's, which he likewiſe built. It was fortified by queen Elizabeth, and ſerved then for the governor's houſe. It is one of the largeſt caſtles in Britain, and is built on a high rock. It is ſtronger by land than St. Maw's, being regularly fortified, and having good outworks.

PENDULOUS, a term applied to any thing that bends or hangs downwards.

PENDULUM, a vibrating body ſuſpended from a fixed point. For the hiſtory of this invention, ſee the article Clock. The theory of the pendulum depends on that of the inclined plane. Hence, in order to underſtand the nature of the pendulum, it will be neceſſary to premiſe ſome of the properties of this plane; referring, however, to *Inclined* Plane, and ſection vi. in the article Mechanics, for the demonſtration.

I. Let AC (pl. 31. fig. 1.) be an inclined plane, AB its perpendicular height, and D any heavy body; then the force which impels the body D to deſcend along the inclined plane AC, is to the abſolute force of gravity as the height of the plane AB is to its length AC; and the motion of the body will be uniformly accelerated.

II. The velocity acquired in any given time by a body deſcending on an inclined plane AC, is to the velocity acquired in the ſame time by a body falling freely and perpendicularly as the height of the plane AB to its length AC. The final velocities will be the ſame; the ſpaces deſcribed will be in the ſame ratio; and the times of deſcription are as the ſpaces deſcribed.

III. If a body deſcend along ſeveral contiguous planes, AB, BC, CD, (fig. 2.) the final velocity, namely, that at the point D, will be equal to the final velocity in deſcending through the perpendicular AE, the perpendicular heights being equal. Hence, if theſe planes be ſuppoſed indefinitely ſhort and numerous, they may be conceived to form a curve; and therefore the final velocity acquired by a body in deſcending through any curve AF, will be equal to the final velocity acquired in deſcending through the planes AB, BC, CD, or to that in deſcending through AE, the perpendicular heights being equal.

IV. If from the upper or lower extremity of the vertical diameter of a circle a cord be drawn, the time of deſcent along this cord will be equal to the time of deſcent through the vertical diameter; and therefore the times of deſcent through all cords in the ſame circle, drawn from the extremity of the vertical diameter, will be equal.

V. The times of deſcent of two bodies through two planes equally elevated will be in the ſubduplicate ratio of the lengths of the planes. If, inſtead of one plane, each be compoſed of ſeveral contiguous planes ſimilarly placed, the times of deſcent along theſe planes will be in the ſame ratio. Hence, alſo, the times of deſcribing ſimilar arches of circles ſimilarly placed will be in the ſubduplicate ratio of the lengths of the arches.

VI. The ſame things hold good with regard to bodies projected upward, whether they aſcend upon inclined planes or along the arches of circles.

The point or axis of ſuſpenſion of a pendulum is that point about which it performs its vibrations, or from which it is ſuſpended.

The centre of oſcillation is a point in which, if all the matter in a pendulum were collected, any force applied at this centre would generate the ſame angular velocity in a given time as the ſame force when applied at the centre of gravity.

The length of a pendulum is equal to the diſtance between the axis of ſuſpenſion and centre of oſcillation

Let PN (fig. 3.) repreſent a pendulum ſuſpended from the point P; if the lower part of N of the pendulum be raiſed to A, and let fall, it will by its own gravity deſcend through the circular arch AN, and will have acquired the ſame velocity at the point N that a body would acquire in falling perpendicularly from C to N, and will endeavour to go off with that velocity in the tangent ND; but, being prevented by the rod or cord, will move through the arch NB to B, where loſing all

its velocity, it will by its gravity deſcend through the arch BN, and, having acquired the ſame velocity as before, will aſcend to A. In this manner it will continue its motion forward and backward along the arch ANB, which is called an *oſcillatory* or *vibratory* motion; and each ſwing is called a *vibration*.

Prop. I. If a pendulum vibrates in very ſmall circular arches, the times of vibration may be conſidered as equal, whatever be the proportion of the arches.

Let PN (fig. 4.) be a pendulum; the time of deſcribing the arch AB will be equal to the time of deſcribing CD; theſe arches being ſuppoſed very ſmall.

Join AN, CN; then, ſince the times of deſcent along all cords in the ſame circles, drawn from one extremity of the vertical diameter, are equal; therefore the cords AN, CN, and conſequently their doubles, will be deſcribed in the ſame time; but the arches AN, CN being ſuppoſed very ſmall, will therefore be nearly equal to their cords: hence the times of vibrations in theſe arches will be nearly equal.

Prop. II. Pendulums which are of the ſame length vibrate in the ſame time, whatever be the proportion of their weights.

This follows from the property of gravity, which is always proportional to the quantity of matter, or to its inertia. When the vibrations of pendulums are compared, it is always underſtood that the pendulums deſcribe either ſimilar finite arcs, or arcs of evaneſcent magnitude, unleſs the contrary is mentioned.

Prop. III. If a pendulum vibrates in the ſmall arc of a circle, the time of one vibration is to the time of a body's falling perpendicularly through half the length of the pendulum as the circumference of a circle is to its diameter.

Let PE (fig. 5.) be the pendulum which deſcribes the arch ANC in the time of one vibration; let PN be perpendicular to the horizon, and draw the cords AC, AN; take the arc E e infinitely ſmall, and draw EFG, ef g perpendicular to PN, or parallel to AC; deſcribe the ſemicircle BGN, and draw er, gs perpendicular to EG: now let t = time of deſcending through the diameter 2PN, or through the cord AN: Then the velocities gained by falling through 2PN, and by the pendulum's deſcending through the arch AE, will be as $\sqrt{2PN}$ and $\sqrt{BF}$; and the ſpace deſcribed in the time t, after the fall through 2PN, is 4PN. But the times are as the ſpaces divided by the velocities.

Therefore $\frac{4PN}{\sqrt{2PN}}$ or $2\sqrt{2PN} : t :: \frac{E\,e}{\sqrt{BF}}$: time of deſcribing $Ee = \frac{t \times E\,e}{2\sqrt{2PN \times BF}}$. But in the ſimilar triangles PEF, Eer, and KGF, Ggs,

As PE = PN : EF :: Ee : er = $\frac{EF}{PN} \times E\,e$;

And KG = KD : FG :: Gg : Gs = $\frac{FG}{KD} \times G\,g$.

But er = Gs; therefore $\frac{EF}{PN} \times E\,e = \frac{FG}{KD} \times G\,g$.

Hence $E\,e = \frac{PN \times FG}{KD \times EF} \times G\,g$.

And by ſubſtituting this value of E e in the former equation, we have the time of deſcribing $Ee = \frac{t \times PN \times FG \times G\,g}{2KD \times EF \times \sqrt{BF \times 2PN}}$.

But by the nature of the circle $FG = \sqrt{BF \times FN}$, and $EF = \sqrt{PN + PF \times FN}$. Hence, by ſubſtitution, we obtain the time of deſcribing

$$E\,e = \frac{t \times PN \times \sqrt{BF \times FN} \times G\,g}{2KD \times \sqrt{PN + PF \times FN \times \sqrt{BF} \times 2PN}} = \frac{t \times \sqrt{PN} \times G\,g}{2\,KD \times \sqrt{PN + PF} \times \sqrt{2}} = \frac{t \times \sqrt{2PN} \times G\,g}{4KD \times \sqrt{PN + PF}} = \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NF}} \times G\,g.$$

But NF, in its mean quantity for all the arches Gg, is nearly equal to NK; therefore the time of deſcribing $Ee = \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NK}} \times G\,g$. Whence the time of deſcribing the arch AED = $\frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NK}}$ × BGN; and the time of deſcribing the whole arch ADC, or the time of one vibration, is = $\frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NK}} \times$ 2BGN. But when the arch ANC is very ſmall, NK vaniſhes, and then the time of vibration in a very ſmall arc is = $\frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN}} \times 2BGN = \frac{1}{2}t \times \frac{2BGN}{BN}$. Now if t be the time of deſcent through 2PN; then ſince the ſpaces deſcribed are as the ſquares of the times, $\frac{1}{2}t$ will be the time of deſcent through $\frac{1}{2}$ PN: therefore the diameter BN is to the circumference 2BGN, as the time of falling through half the length of the pendulum is to the time of one vibration.

Prop. IV. The length of a pendulum vibrating ſeconds, is to twice the ſpace through which a body falls in one ſecond, as the ſquare of the diameter of a circle is to the ſquare of its circumference.

Let d = diameter of a circle = 1, c = circumference = 3.14159, &c. t to the time of one vibration, and p the length of the corrupody pendulum; then by laſt propoſition $c^2 : d :: 1'' : \frac{d}{c}$ = time of falling through half the length of the pendulum.

Let s = ſpace deſcribed by a body falling perpendicularly in the firſt ſecond: then ſince the ſpaces deſcribed are in the ſubduplicate ratio of the times of deſcription, therefore

$1'' : \frac{d}{c} :: \sqrt{s} : \sqrt{\frac{1}{2}p}$. Hence $c^2 : d^2 :: 2s : p$.

It has been found by experiment, that in latitude $51\frac{1}{2}^\circ$ a body falls about 16.11 feet in the firſt ſecond: hence the length of a pendulum vibrating ſeconds in that latitude is =

$\frac{32.22}{3.14159^2}$ = 3 feet 3.174 inches.

Prop. V. The times of the vibrations of two pendulums in ſimilar arcs of circles are in a ſubduplicate ratio of the lengths of the pendulums.

Let PN, PO (fig. 6.) be two pendulums vibrating in the ſimilar arcs AB, CD: the time of a vibration of the pendulum PN is to the time of a vibration of the pendulum PO in a ſubduplicate ratio of PN to PO.

Since the arcs AN, CO are ſimilar and ſimilarly placed, the time of deſcent through AN will be to the time of deſcent through CO in the ſubduplicate ratio of AN to CO: but the times of deſcent through the arcs AN and CO are equal to half the times of vibration of the pendulums PN, PO reſpectively. Hence the time of vibration of the pendulum PN in the arch AB is to the time of vibration of the pendulum PO in the ſimilar arc CD in the ſubduplicate ratio of AN to

CO : and since the radii PN, PO are proportional to the similar arcs AN, CO, therefore the time of vibration of the pendulum PN will be to the time of vibration of the pendulum PO in a subduplicate ratio of PN to PO.

If the length of a pendulum vibrating seconds be 39.174 inches, then the length of a pendulum vibrating half seconds will be 9.793 inches. For $1'' : \frac{1}{2}'' :: \sqrt{39.174} : \sqrt{x}$; and $1 : \frac{1}{4} :: 39.174 : x$. Hence $x = \frac{39.174}{4} = 9.793$.

Prop. VI. The lengths of pendulums vibrating in the same time, in different places, will be as the forces of gravity.

For the velocity generated in any given time is directly as the force of gravity, and inversely as the quantity of matter. See Mechanics. Now the matter being supposed the same in both pendulums, the velocity is as the force of gravity; and the space passed through in a given time will be as the velocity: that is, as the gravity.

Cor. Since the lengths of pendulums vibrating in the same time in small arcs are as the gravitating forces, and as gravity increases with the latitude on account of the spheroidal figure of the earth and its rotation about its axis; hence the length of a pendulum vibrating in a given time will be variable with the latitude, and the same pendulum will vibrate slower the nearer it is carried to the equator.

Prop. VII. The times of vibrations of pendulums of the same length, acted upon by different forces of gravity, are reciprocally as the square roots of the forces.

For, when the matter is given, the velocity is as the force and time; and the space described by any given force is as the force and square of the time. Hence the lengths of pendulums are as the forces and the squares of the times of falling through them. But these times are in a given ratio to the times of vibration; whence the lengths of pendulums are as the forces and the squares of the times of vibration. Therefore, when the lengths are given, the forces will be reciprocally as the square of the times, and the times of vibration reciprocally as the square roots of the forces.

Cor. Let p = length of pendulum, g = force of gravity, and t = time of vibration. Then since $p = g \times t^2$. Hence $g = p \times \frac{1}{t^2}$; and $t = \sqrt{p \times \frac{1}{g}}$.

That is, the forces in different places are directly as the lengths of the pendulums, and inversely as the square roots of the times of vibration; and the times of vibration are directly as the square-roots of the lengths of the pendulums, and inversely as the square roots of the gravitating forces.

Prop. VIII. A pendulum which vibrates in the arch of a cycloid describes the greatest and least vibrations in the same time.

This property is demonstrated only on a supposition that the whole mass of the pendulum is concentrated in a point: but this cannot take place in any really vibrating body; and when the pendulum is of finite magnitude, there is no point given in position which determines the length of the pendulum; on the contrary, the centre of oscillation will not occupy the same place in the given body, when describing different parts of the track it moves through, but will continually be moved in respect of the pendulum itself during its vibration. This circumstance has prevented any general determination of the time of vibration in a cycloidal arc, except in the imaginary case referred to.

There are many other obstacles which concur in rendering the application of this curve to the vibration of pendulums designed for the measures of time, the source of errors far greater than those which by its peculiar property it is intended to obviate; and it is now wholly disused in practice.

Although the times of vibration of a pendulum in different arches be nearly equal, yet from what has been said it will appear, that if the ratio of the least of these arches to the greatest be considerable, the vibrations will be performed in different times; and the difference, though small, will become sensible in the course of one or more days. In clocks used for astronomical purposes, it will therefore be necessary to observe the arc of vibration; which if different from that described by the pendulum when the clock keeps time, there a correction must be applied to the time shown by the clock. This correction, expressed in seconds of time, will be equal to the half of three times the difference of the square of the given arc, and of that of the arc described by the pendulum when the clock keeps time, these arcs being expressed in degrees; and so much will the clock gain or lose according as the first of these arches is less or greater than the second.

Thus, if a clock keeps time when the pendulum vibrates in an arch of 3°, it will lose $10\frac{1}{2}$ seconds daily in an arch of 4 degrees.

For $\sqrt{4^2 - 3^2} \times \frac{3}{2} = 7 \times \frac{3}{2} = 10\frac{1}{2}$ seconds.

The length of a pendulum rod increases with heat; and the quantity of expansion answering to any given degree of heat is experimentally found by means of a pyrometer, (see Pyrometer); but the degree of heat at any given time is shown by a thermometer: hence that instrument should be placed within the clock-case at a height nearly equal to that of the middle of the pendulum; and its height, for this purpose, should be examined at least once a day. Now by a table constructed to exhibit the daily quantity of acceleration or retardation of the clock answering to every probable height of the thermometer, the corresponding correction may be obtained. It is also necessary to observe, that the mean height of the thermometer during the interval ought to be used. In Six's thermometer this height may be easily obtained; but in thermometers of the common construction it will be more difficult to find this mean.

It had been found, by repeated experiments, that a brass rod equal in length to a second pendulum will expand or contract $\frac{1}{10000}$ part of an inch by a change of temperature of one degree in Fahrenheit's thermometer; and since the times of vibration are in a subduplicate ratio of the lengths of the pendulum, hence an expansion or contraction of $\frac{1}{10000}$ part of an inch will answer nearly to one second daily: therefore a change of one degree in the thermometer will occasion a difference in the rate of the clock equal to one second daily. Whence, if the clock be so adjusted as to keep time when the thermometer is at 55°, it will lose 10 seconds daily when the thermometer is at 65°, and gain as much when it is at 45°.

Hence the daily variation of the rate of the clock from summer to winter will be very considerable. It is true indeed that most pendulums have a nut or regulator at the lower end, by which the bob may be raised or lowered a determinate quantity; and therefore, while the height of the thermometer is the same, the rate of the clock will be uniform. But since the state of the weather is ever variable, and as it is impossible to be raising or lowering the bob of the pendulum at every change of the thermometer, therefore the correction formerly mentioned is to be applied. This correction, however, is in some measure liable to a small degree of uncertainty; and in order to avoid it altogether, several contrivances have been proposed by constructing a pendulum of different materials, and so disposing them that their effects may be in opposite directions, and thereby counterbalance each other; and by this means the pendulum will continue of the same length.

Mercurial Pendulum. The first of these inventions is that by the celebrated Mr. George Graham. In this, the rod of the pendulum is a hollow tube, in which a sufficient quantity of mercury is put. Mr. Graham first used a glass tube, and the clock to which it was applied was placed in the most exposed

part of the houſe. It was kept conſtantly going, without having the hands or pendulum altered, from the 9th of June 1722 to the 14th of October 1725, and its rate was determined by tranſits of fixed ſtars. Another clock made with extraordinary care, having a pendulum of about 60 pounds weight, and not vibrating above one degree and a half from the perpendicular, was placed beſide the former, in order the more readily to compare them with each other, and that they might both be equally expoſed. The reſult of all the obſervations was this, that the irregularity of the clock with the quickſilver pendulum exceeded not, when greateſt, a ſixth part of that of the other clock with the common pendulum, but for the greateſt part of the year not above an eighth or ninth part; and even this quantity would have been leſſened, had the column of mercury been a little ſhorter: for it differed a little the contrary way from the other clock, going faſter with heat and ſlower with cold. To confirm this experiment more, about the beginning of July 1723, Mr. Graham took off the heavy pendulum from the other clock, and made another with mercury, but with this difference, that inſtead of a glaſs tube he uſed a braſs one, and varniſhed the inſide to ſecure it from being injured by the mercury. This pendulum he uſed afterwards, and found it about the ſame degree of exactneſs as the other.

The *Gridiron* PENDULUM is an ingenious contrivance for the ſame purpoſe. Inſtead of one rod, this pendulum is compoſed of any convenient odd number of rods, as five, ſeven, or nine; being ſo connected, that the effect of one ſet of them counteracts that of the other ſet; and therefore, if they are properly adjuſted to each other, the centres of ſuſpenſion and oſcillation will always be equidiſtant. Fig. 7. pl. 31. repreſents a gridiron pendulum compoſed of nine rods, ſteel and braſs alternately. The two outer rods, AB, CD, which are of ſteel, are faſtened to the croſs pieces AC, BD, by means of pins. The next two rods, EF, GH, are of braſs, and are faſtened to the lower bar BD, and to the ſecond upper bar EG. The two following rods are of ſteel, and are faſtened to the croſs bars EG and IK. The two rods adjacent to the central rod being of braſs, are faſtened to the croſs pieces IK and LM; and the central rod, to which the ball of the pendulum is attached, is ſuſpended from the croſs piece LM, and paſſes freely through a perforation in each of the croſs bars IK, BD. From this diſpoſition of the rods, it is evident that, by the expanſion of the extreme rods, the croſs piece BD, and the two rods attached to it, will deſcend: but ſince theſe rods are expanded by the ſame heat, the croſs piece EG will conſequently be raiſed, and therefore alſo the two next rods: but becauſe theſe rods are alſo expanded, the croſs bar IK will deſcend; and by the expanſion of the two next rods, the piece LM will be raiſed a quantity ſufficient to counteract the expanſion of the central rod. Whence it is obvious, that the effect of the ſteel rods is to increaſe the length of the pendulum in hot weather, and to diminiſh it in cold weather, and that the braſs rods have a contrary effect upon the pendulum. The effect of the braſs rods muſt, however, be equivalent not only to that of the ſteel rods, but alſo to the part above the frame and ſpring, which connects it with the cock, and to that part between the lower part of the frame and the centre of the ball.

Another excellent contrivance for the ſame purpoſe is deſcribed by M. Thiout, a French author on clock-making. It was uſed in the north of England by an ingenious artiſt about 40 years ago. This invention is as follows: A bar of the ſame metal with the rod of the pendulum, and of the ſame dimenſions, is placed againſt the back part of the clock-caſe: from the top of this a part projects, to which the upper part of the pendulum is connected by two fine pliable chains or ſilken ſtrings, which juſt below paſs between two plates of braſs, whoſe lower edges will always terminate the length of the pendulum at the upper end. Theſe plates are ſupported on a pedeſtal fixed to the back of the caſe. The bar reſts upon an immoveable baſe at the lower part of the caſe, and is inſerted into a groove; by which means it is always retained in the ſame poſition. From this conſtruction, it is evident that the extenſion or contraction of this bar, and of the rod of the pendulum, will be equal, and in contrary directions. For, ſuppoſe the rod of the pendulum to be expanded any given quantity by heat; then, as the lower end of the bar reſts upon a fixed point, the bar will be expanded upwards, and raiſe the upper end of the pendulum juſt as much as its length was increaſed; and hence its length below the plates will be the ſame as before.

Of this pendulum, ſomewhat improved by Mr. Croſthwaite, watch and clock-maker, Dublin, we have the following deſcription in the Tranſactions of the Royal Iriſh Academy, 1788.—"A and B (fig. 8.) are two rods of ſteel forged out of the ſame bar, at the ſame time, of the ſame temper, and in every reſpect ſimilar. On the top of B is formed a gibbet C: this rod is firmly ſupported by a ſteel bracket D, fixed on a large piece of marble E, firmly ſet into the wall F, and having liberty to move freely upwards between croſs ſtaples of braſs, 1, 2, 3, 4, which touch only in a point in front and rear (the ſtaples having been carefully formed for that purpoſe); to the other rod is firmly fixed by its centre the lens G, of 24 pounds weight, although it ſhould in ſtrictneſs be a little below it. This pendulum is ſuſpended by a ſhort ſteel ſpring on the gibbet at C; all which is entirely independent of the clock. To the back of the clock-plate I are firmly ſcrewed two cheeks nearly cycloidal at K, exactly in a line with the centre of the verge L. The maintaining power is applied by a cylindrical ſteel-ſtud, in the uſual way of regulators, at M. Now, it is very evident, that any expanſion or contraction that takes place in either of theſe exactly ſimilar rods, is inſtantly counteracted by the other; whereas in all *compenſation* pendulums compoſed of different materials, however juſt calculation may ſeem to be, that can never be the caſe, as not only different metals, but alſo different bars of the ſame metal that are not manufactured at the ſame time, and exactly in the ſame manner, are found by a good pyrometer to differ materially in their degrees of expanſion and contraction, a very ſmall change affecting one and not the other."

The expanſion or contraction of ſtraight-grained fir wood lengthwiſe, by change of temperature, is ſo ſmall, that it is found to make very good pendulum rods. The wood called *ſapadillo* is ſaid to be ſtill better. There is good reaſon to believe, that the previous baking, varniſhing, gilding, or ſoaking of theſe woods in any melted matter, only tends to impair the property that renders them valuable. They ſhould be ſimply rubbed on the outſide with wax and a cloth. In pendulums of this conſtruction the error is greatly diminiſhed, but not taken away.

Angular PENDULUM, is formed of two pieces or legs like a ſector, and is ſuſpended by the angular point. This pendulum was invented with a view to diminiſh the length of the common pendulum, but at the ſame time to preſerve or even increaſe the time of vibration. In this pendulum, the time of vibration depends on the length of the legs, and on the angle contained between them conjointly, the duration of the time of vibration increaſing with the angle. Hence a pendulum of this conſtruction may be made to oſcillate in any given time. At the lower extremity of each leg of the pendulum is a ball or bob as uſual. It may be eaſily ſhown, that in this kind of pendulum, the ſquares of the times of vibration are as the ſecants of half the angle contained by the legs: hence, if a pendulum of this conſtruction vibrates half ſeconds when its legs are cloſe, it will vibrate whole ſeconds when the legs are opened, ſo as to contain an angle equal to 151° 2½′.

The Conical or Circular PENDULUM, is ſo called from the figure deſcribed by the ſtring or ball of the pendulum. This pendulum was invented by Mr. Huygens, and is alſo claimed by Dr. Hook.

In order to underſtand the principles of this pendulum, it will be neceſſary to premiſe the following lemma, *viz.* The times of all the circular revolutions of a heavy globular body, revolving within an inverted hollow paraboloid, will be equal, whatever be the radii of the circles deſcribed by that body.

In order, therefore, to conſtruct the pendulum ſo that its ball may always deſcribe its revolutions in a paraboloid ſurface, it will be neceſſary that the rod of the pendulum be flexible, and that it be ſuſpended in ſuch a manner as to form the evolute of the given parabola. Hence, let KH (fig. 9. pl. 31.) be an axis perpendicular to the horizon, having a pinion at K moved by the laſt wheel in the train of the clock; and a hardened ſteel point at H moving in an agate pivot, to render the motion as free as poſſible. Now, let it be required that the pendulum ſhall perform each revolution in a ſecond, then the paraboloid ſurface it moves in muſt be ſuch whoſe *latus rectum* is double the length of the common half ſecond pendulum. Let O be the focus of the parabola MEC, and MC the *latus rectum*; and make AE = MO = $\frac{1}{2}$MC = the length of a common half ſecond pendulum. At the point A of the verge, let a thin plate AB be fixed at one end, and at the other end B let it be faſtened to a bar or arm BD perpendicular to DH, and to which it is fixed at the point D. The figure of the plate AB is that of the evolute of the given parabola MEC.

The equation of this evolute, being alſo that of the ſemicubical parabola, is $\frac{27}{16}px^2 = y^3$.—Let $\frac{27}{16}p = P$; then $Px^2 = y^3$, and in the focus $P = 2y$. In this caſe $2x^2 = y^3 = \frac{1}{4}P^2$: hence $x^2 = \frac{1}{8}P^2$, and $x = P\sqrt{\frac{1}{8}} = \frac{27}{16}p\sqrt{\frac{1}{8}}$ = the diſtance of the focus from the vertex A. By aſſuming the value of x, the ordinates of the curve may be found; and hence it may be eaſily drawn.

The ſtring of the pendulum muſt be of ſuch a length, that when one end is fixed at B, it may lie over the plate AB, and then hang perpendicular from it, ſo that the centre of the bob may be at E when at reſt. Now the verge KH being put into motion, the ball of the pendulum will begin to gyrate, and thereby conceive a centrifugal force which will carry it out from the axis to ſome point F, where it will circulate ſeconds or half ſeconds, according as the line AE is 9.8 inches, or 2$\frac{1}{4}$ inches, and AB anſwerable to it.

One advantage poſſeſſed by a clock having a pendulum of this conſtruction is, that the ſecond hand moves in a regular and uniform manner, without being ſubject to thoſe jerks or ſtarts as in common clocks; and the pendulum is entirely ſilent.

Theory has pointed out ſeveral other pendulums, known by the names of *Elliptic, Horizontal, Rotulary*, &c. pendulums. Theſe, however, have not as yet attained that degree of perfection as to ſupplant the common pendulum.

Beſides the uſe of the pendulum in meaſuring time, it has alſo been ſuggeſted to be a proper ſtandard for meaſures of length. See the article MEASURE.

PENEA, in botany: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking with thoſe of which the order is doubtful. The calyx is diphyllous; the corolla campanulated; the ſtyle quadrangular; the capſule tetragonal, quadrilocular, and octoſpermous.

PENELOPE, in fabulous hiſtory, the daughter of Icarus, married Ulyſſes, by whom ſhe had Telemachus. During the abſence of Ulyſſes, who was gone to the ſiege of Troy, and who ſtaid 20 years from his dominions, ſeveral princes, charmed with Penelope's beauty, told her that Ulyſſes was dead, offered to marry her, and preſſed her to declare in their favour. She promiſed them compliance, on condition that they would give her time to finiſh a piece of tapeſtry ſhe was weaving; but at the time ſhe undid in the night what ſhe had done in the day, and by this artifice eluded their importunity till Ulyſſes's return.

PENELOPE, in ornithology: A genus of birds of the order of *gallinæ*, the characters of which are: The beak is bare at the baſe; the head is covered with feathers; the neck is quite bare; the tail conſiſts of twelve principal feathers; and the feet are for the moſt part bare. See Pl. 30. Linnæus, in the *Syſtema Naturæ*, enumerates ſix ſpecies. 1. *Meleagris ſatyra*, or horned pheaſant. Latham calls it the horned turkey. This ſpecies is larger than a fowl, and ſmaller than a turkey. The colour of the bill is brown; the noſtrils, forehead and ſpace round the eyes are covered with ſlender black hairy feathers; the top of the head is red. Behind each eye there is a fleſhy callous blue ſubſtance like a horn, which tends backward. On the fore-part of the neck and throat there is a looſe flap of a fine blue colour, marked with orange ſpots, the lower part of which is beſet with a few hairs; down the middle it is ſomewhat looſer than on the ſides, being wrinkled. The breaſt and upper part of the back are of a full red colour. The neck and breaſt are inclined to yellow. The other parts of the plumage and tail are of a ruſous brown, marked all over with white ſpots encompaſſed with black. The legs are ſomewhat white, and furniſhed with a ſpur behind each. A head of this bird, Mr. Latham tells us, was ſent to Dr. Mead from Bengal, together with a drawing of the bird, which was called *napaul-pheaſant*. It is a native of Bengal.

2. The *meleagris criſtata*, called by Ray *penelope jacupeme*, and by Edwards the *guan*, or *quan*, is about the ſize of a fowl, being about two feet ſix inches long. The bill is two inches long, and of a black colour; the irides are of a dirty orange colour; the ſides of the head are covered with a naked purpliſh blue ſkin, in which the eyes are placed: beneath the throat, for an inch and a half, the ſkin is looſe, of a fine red colour, and covered only with a few hairs. The top of the head is furniſhed with long feathers, which the bird can erect as a creſt at pleaſure; the general colour of the plumage is browniſh black, gloſſed over with copper in ſome lights; but the wing coverts have a greeniſh and violet gloſs. The quills moſtly incline to a purple colour; the fore-part of the neck, breaſt, and belly, are marked with white ſpots; the thighs, under tail coverts, and the tail itſelf, are browniſh black; the legs are red; the claws black. Some of theſe birds have little or no creſt, and are thence ſuppoſed to be females. They inhabit Braſil and Guiana, where they are often made tame. They frequently make a noiſe not unlike the word *jacu*. Their fleſh is much eſteemed.

3. *Crax Cumanenſis*, called by Latham, &c. *yacou*. It is bigger than a common fowl. The bill is black; the head feathers are long, pointed, and form a creſt, which can be erected at pleaſure. The irides are of a pale ruſous colour; the ſpace round the eyes is naked, ſimilar to that of a turkey. It has alſo a naked membrane, or kind of *wattle*, of a dull black colour. The blue ſkin comes forward on the bill, but is not liable to change colour like that of the turkey. The plumage has not much variation; it is chiefly brown, with ſome white markings on the neck, breaſt, wing coverts, and belly; the tail is compoſed of twelve feathers, pretty long, and even at the end; the legs are red. This ſpecies inhabits Cayenne, but is a very rare bird, being met with only in the inner parts, or about the Amazons country, though in much greater plenty up the river Oyapoc, eſpecially towards Camoupi; and indeed thoſe which

are ſeen at Cayenne are moſtly tame ones, for it is a familiar bird, and will breed in that ſtate, and mix with other poultry. It makes the neſt on the ground, and hatches the young there, but is at other times moſtly ſeen on trees. It frequently erects the creſt, when pleaſed, or taken notice of, and likewiſe ſpreads the tail upright like a fan, in the manner of the turkey. It has two kinds of cry; one like that of a young turkey, the other lower and more plaintive; the firſt of theſe is thought by the Indians to expreſs the word *couyouroit*, the other *yacou*.

4. The *pipile*, or, as it is called, *crax pipile*, is black in the belly, and the back brown ſtained with black. The fleſh on the neck is of a green colour. It is about the bigneſs of the former, and has a hiſſing noiſe. The head is partly black and partly white, and is adorned with a ſhort creſt. The ſpace about the eyes, which are black, is white; the feet are red. It inhabits Guiana.

5. The *marail* is about the ſize of a fowl, and ſhaped ſomewhat like it. The bill and irides are blackiſh; the ſpace round the eyes is bare, and of a pale red; the chin, throat, and fore-part of the neck are ſcarcely covered with feathers; but the throat itſelf is bare, and the membrane elongated to half an inch or more; both this and the ſkin round the eyes change colour, and become deeper and thicker when the bird is irritated. The head feathers are longiſh, ſo as to appear like a creſt when raiſed up, which the bird often does when agitated; at which time it alſo erects thoſe of the whole body, and ſo diſfigures itſelf as to be ſcarce known: the general colour of the plumage is a greeniſh black; the fore-part of the neck is tipped with white; the wings are ſhort; the tail is long, conſiſting of 12 feathers, which are even at the end, and commonly pendent, but can be lifted up, and ſpread out like that of the turkey; the legs and toes are of a bright red; the claws are crooked, and ſomewhat ſharp. In a collection (ſays Latham) from Cayenne was a bird, I believe, of this very ſpecies. It was 28 inches long; the bill is like that of a fowl, brown, and rather hooked; round the eye bare; the head is creſted; the feathers of the fore-part of the neck are tipped with white; the breaſt and belly are rufous brown; the reſt of the plumage is greeniſh brown; the tail is 11 inches long, and rounded at the end; the quills juſt reach beyond the rump; the legs are brown, and the claws hooked. This ſpecies is common in the woods of Guiana, at a diſtance from the ſea, though it is much leſs known than could be imagined; and found in ſmall flocks for the moſt part, except in breeding-time, when it is only ſeen by pairs, and then frequently on the ground, or on low ſhrubs; at other times on high trees, where it rooſts at night. The female makes her neſt on ſome low buſhy tree, as near the trunk as poſſible, and lays three or four eggs. When the young are hatched, they deſcend with their mother, after 10 or 12 days. The mother acts as other fowls, ſcratching on the ground like a hen, and brooding the young, which quit their nurſe the moment they can ſhift for themſelves. They have two broods in a year; one in December or January, the other in May or June. The beſt time of finding theſe birds is morning or evening, being then met with on ſuch trees whoſe fruit they feed on, and are diſcovered by ſome of it falling to the ground. The young birds are eaſily tamed, and ſeldom forſake the places where they have been brought up: they need not be houſed, as they prefer the rooſting on tall trees to any other place. Their cry is not inharmonious, except when irritated or wounded, when it is harſh and loud. Their fleſh is much eſteemed.

Buffon ſuppoſes this bird to be the female of the yacou, or at leaſt a variety; but that this cannot be, the anatomical inſpection will at once determine. The windpipe of this bird has a ſingular conſtruction, paſſing along the neck to the entrance of the breaſt, where it riſes on the outſide of the fleſh, and, after going a little way downwards, returns, and then paſſes into the cavity of the lungs. It is kept in its place on the outſide by a muſcular ligament, which is perceivable quite to the breaſt-bone. This is found to be the caſe in both male and female, and plainly proves that it differs from the yacou, whoſe windpipe has no ſuch circumvolution in either ſex.

If this be the bird mentioned by Fermin, in his Hiſtory of Guiana, p. 176, he ſays that the creſt is cuneiform, and of a black and white colour; and obſerves that they are ſcarce at Surinam; but it does not ſeem quite certain whether he means this ſpecies or the yacou.

Bancroft mentions a bird of Guiana by the name of *Marrodie*, which he ſays is wholly of a browniſh black; the bill the ſame; and the legs grey. Theſe, he ſays, are common, and make a noiſe not unlike the name given it, perching on trees. The Indians imitate their cry ſo exactly, as to lead to the diſcovery of the place the birds are in, by their anſwering it. The fleſh of them is like that of a fowl: it is therefore moſt likely the marail.

6. The *vociferating penelope*. The bill of this bird is of a greeniſh colour: the back is brown, the breaſt green, and the belly of a whitiſh brown. Latham calls it the *crying curaſſow*. It is about the bigneſs of a crow.

PENESTICA, (Antonine), a town of the Helvetii, ſituated between the Lacus Lauſonius and Salodurum; called *Petenifca* by Peutinger. Thought now to be *Biel*, (Cluverius); the capital of a ſmall territory in Swiſſerland.

PENEUS, (Strabo); a river running through the middle of Theſſaly, from weſt to eaſt, into the Sinus Thermaicus, between Olympus and Oſſa, near Tempe of Theſſaly, riſing in mount Pindus, (Ovid, Val. Flaccus).

PENETRALE, a ſacred room or chapel in private houſes, which was ſet apart for the worſhip of the houſehold gods among the ancient Romans. In temples alſo there were *penitralia*, or apartments of diſtinguiſhed ſanctity, where the images of the gods were kept, and certain ſolemn ceremonies performed.

PENGUIN, or PINGUIN. See PINGUIN.

PENICILLUS, among the old ſurgeons, was uſed for a tent to be put into wounds or ulcers.

PENIEL, or PENUEL, a city beyond Jordan, near the ford or brook Jabbok. This was the occaſion of its name. Jacob, upon his return from Meſopotamia, (Gen. xxxii. 24, &c.) made a ſtop at the brook Jabbok: and very early the next morning, after he had ſent all the people before, he remained alone, and behold an angel came, and wreſtled with him till the day began to appear. Then the angel ſaid to Jacob, Let me go, for the morning begins to appear. Jacob anſwered, I ſhall not let you go from me till you have given me your bleſſing. The angel bleſſed him then in the ſame place; which Jacob thence called Peniel, ſaying, I have ſeen God face to face, yet continue alive.

In following ages the Iſraelites built a city in this place, which was given to the tribe of Gad. Gideon, returning from the purſuit of the Midianites, overthrew the tower of Peniel, (Judges viii. 17), and put all the inhabitants of the city to death, for having refuſed ſuſtenance to him and his people, and having anſwered him in a very inſulting manner. Jeroboam the ſon of Nebat rebuilt the city of Peniel, (1 Kings xii. 25.). Joſephus ſays, that this prince there built himſelf a palace.

PENINNAH, the ſecond wife of Elkanah, the father of Samuel. Peninnah had ſeveral children, (1 Sam. i. 2, 3, &c.); but Hannah, who afterwards was mother of Samuel, was for a great while barren. Peninnah, inſtead of giving the glory to God, the author of fruitfulneſs, was elevated with pride, and inſulted her rival Hannah. But the Lord having viſited Hannah, Peninnah was thereupon humbled; and ſome interpreters think, that God took away her children from her, or at leaſt that

ſhe had no more after this time, according to the words of the ſong of Hannah, (1 Sam. ii. 5.), "The barren hath borne ſeven, and ſhe that hath many children is waxed feeble."

PENINSULA, in geography, a portion or extent of land joining to the continent by a narrow neck or iſthmus, the reſt being encompaſſed with water.

PENIS, in anatomy. See ANATOMY.

PENITENCE, is ſometimes uſed for a ſtate of repentance, and ſometimes for the act of repenting. See REPENTANCE. It is alſo uſed for a diſcipline, or puniſhment attending repentance; more uſually called *penance*. It alſo gives title to ſeveral religious orders, conſiſting either of converted debauchees and reformed proſtitutes, or of perſons who devote themſelves to the office of reclaiming them. Of this latter kind is the

Order of PENITENCE *of St. Magdalen*, eſtabliſhed about the year 1272 by one Bernard, a citizen of Marſeilles, who devoted himſelf to the work of converting the courtezans of that city. Bernard was ſeconded by ſeveral others; who, forming a kind of ſociety, were at length erected into a religious order by pope Nicholas III. under the rule of St. Auguſtine. F. Geſnay ſays, that they alſo made a religious order of the penitents, or women they converted, giving them the ſame rules and obſervances which they themſelves kept.

Congregation of PENITENCE *of St. Magdalen at Paris*, owed its riſe to the preaching of F. Tiſſeran, a Franciſcan, who converted a vaſt number of courtezans about the year 1492. Louis duke of Orleans gave them his houſe for a monaſtery; or rather, as appears by their conſtitutions, Charles VIII. gave them the hotel called *Bochaigne*, whence they were removed to St. George's chapel in 1572. By virtue of a brief of pope Alexander, Simon biſhop of Paris, in 1497, drew them up a body of ſtatutes, and gave them the rule of St. Auguſtine. It was neceſſary, before a woman could be admitted, that ſhe had firſt committed the ſin of the fleſh. None were admitted who were above 35 years of age. Till the beginning of the laſt century, none but penitents were admitted; but ſince its reformation by Mary Alvequin, in 1616, none have been admitted but maids, who, however, ſtill retain the ancient name penitents.

PENITENTS, an appellation given to certain fraternities of penitents, diſtinguiſhed by the different ſhape and colour of their habits. Theſe are ſecular ſocieties, who have their rules, ſtatutes, and churches, and make public proceſſions under their particular croſſes or banners. Of theſe there are more than a hundred, the moſt conſiderable of which are as follow: The white penitents, of which there are ſeveral different ſorts at Rome, the moſt ancient of which was conſtituted in 1264: the brethren of this fraternity every year give portions to a certain number of young girls, in order to their being married: their habit is a kind of white ſackcloth, and on the ſhoulder is a circle, in the middle of which is a red and white croſs. Black penitents, the moſt conſiderable of which are the brethren of mercy, inſtituted in 1488 by ſome Florentines, in order to aſſiſt criminals during their impriſonment, and at the time of their death: on the day of execution they walk in proceſſion before them, ſinging the ſeven penitential pſalms and the litanies; and after they are dead, they take them down from the gibbet and bury them; their habit is black ſackcloth. There are others whoſe buſineſs it is to bury ſuch perſons as are found dead in the ſtreets: theſe wear a death's head on one ſide of their habit. There are alſo blue, grey, red, green, and violet penitents; all which are remarkable for little elſe beſides the different colours of their habits. Mabillon tells us, that at Turin there are a ſet of penitents kept in pay to walk through the ſtreets in proceſſion, and cut their ſhoulders with whips, &c.

PENITENTS, or *Converts of the Name of Jeſus*, a congregation of religious at Seville in Spain, conſiſting of women who had led a licentious life, founded in 1550. This monaſtery is divided into three quarters: one for profeſſed religious; another for novices; a third for thoſe who are under correction. When theſe laſt give ſigns of a real repentance, they are removed into the quarter of the novices, where if they do not behave themſelves well, they are remanded to their correction. They obſerve the rule of St. Auguſtine.

PENITENTS *of Orvieto*, are an order of nuns inſtituted by Antony Simoncelli, a gentleman of Orvieto in Italy. The monaſtery he built was at firſt deſigned for the reception of poor girls, abandoned by their parents, and in danger of loſing their virtue. In 1662 it was erected into a monaſtery, for the reception of ſuch as, having abandoned themſelves to impurity, were willing to take up, and conſecrate themſelves to God by ſolemn vows. Their rule is that of the Carmelites. Theſe religious have this in peculiar, that they undergo no noviciate. All required is, that they continue a few months in the monaſtery in a ſecular habit; after which they are admitted to the vows.

PENITENTIAL, an eccleſiaſtical book retained among the Romaniſts; in which is preſcribed what relates to the impoſition of penance and the reconciliation of penitents. See PENANCE. There are various penitentials, as the Roman penitential, that of the venerable Bede, that of Pope Gregory III. &c.

PENITENTIARY, in the ancient Chriſtian church, a name given to certain preſbyters or prieſts, appointed in every church to receive the private confeſſions of the people, in order to facilitate public diſcipline, by acquainting them what ſins were to be expiated by public penance, and to appoint private penance for ſuch private crimes as were not proper to be publicly cenſured.

PENITENTIARY, at the court of Rome, is an office in which are examined and delivered out the ſecret bulls, graces, or diſpenſations relating to caſes of conſcience, confeſſions, &c.

PENITENTIARY, is alſo an officer, in ſome cathedrals, veſted with power from the biſhop to abſolve, in caſes reſerved to him. The pope has at preſent his grand penitentiary, who is a cardinal, and the chief of the other penitentiary-prieſts eſtabliſhed in the church of Rome, who conſult him in all difficult caſes. He preſides in the penitentiary, diſpatches diſpenſations, abſolutions, &c. and has under him a regent and 24 proctors, or advocates of the ſacred penitentiary.

PENMAN-MAWR, a mountain in Caernarvonſhire, 1400 feet high. It hangs perpendicularly over the ſea, at ſo vaſt a height, that few ſpectators are able to look down the dreadful ſteep. On the ſide which is next the ſea, there is a road cut out of the ſide of the rock, about ſix or ſeven feet wide, which winds up a ſteep aſcent, and uſed to be defended on one ſide only by a ſlight wall, in ſome parts about a yard high, and in others by only a bank, that ſcarce roſe a foot above the road. The ſea was ſeen daſhing its waves 40 fathoms below, with the mountain riſing as much above the traveller's head. This dangerous road was a few years ago ſecured by a wall breaſt-high, to the building of which the city of Dublin largely contributed, it being in the high road to Holyhead.

PENN (SIR WILLIAM), was born at Briſtol in 1621, and inclined from his youth to maritime affairs. He was made captain at 21 years of age, rear-admiral of Ireland at 23, vice-admiral of Ireland at 25, admiral to the Straits at 29, vice-admiral of England at 31, and general in the firſt Dutch war at 32. Whence returning in 1655, he was choſen repreſentative for the town of Weymouth; and in 1660 was made commiſſioner of the admiralty and navy, governor of the town and fort of Kinſale, vice-admiral of Munſter, and a member of that provincial council. In 1664 he was choſen great captain-commander under the duke of York, and diſtinguiſhed himſelf in an engagement againſt the Dutch fleet; after which he took leave of the ſea, but continued in his other employments till 1669. He died in 1670.

PENN (William), an eminent writer among the Quakers, and the planter and legiſlator of Penſylvania, was the ſon of the above Sir William Penn, and was born at London in 1644. In 1660 he was entered a gentleman commoner of Chriſt-church in Oxford; but having before received an impreſſion from the preaching of one Thomas Loe a Quaker, withdrew with ſome other ſtudents from the national worſhip, and held private meetings, where they preached and prayed amongſt themſelves. This giving great offence to the heads of the college, Mr. Penn, though but 16 years of age, was fined for nonconformity; and continuing his religious exerciſes, was at length expelled his college. Upon his return home, he was, on the ſame account, treated with great ſeverity by his father, who at laſt turned him out of doors; but his reſentment afterwards abating, he ſent him to France in company with ſome perſons of quality; where he continued a conſiderable time, and returned not only well ſkilled in the French language, but a polite and accompliſhed gentleman. About the year 1666 his father committed to his care a conſiderable eſtate in Ireland. Being found in one of the Quakers' meetings in Cork, he, with many others, was thrown into priſon; but, on his writing to the earl of Orrery, was ſoon diſcharged. However, his father being informed he ſtill adhered to his opinions, ſent for him to England, and, finding him inflexible to all his arguments, turned him out of doors a ſecond time. About the year 1668 he became a public preacher among the Quakers; and that year was committed cloſe priſoner to the Tower, where he wrote ſeveral treatiſes. Being diſcharged after ſeven months impriſonment, he went to Ireland, where he alſo preached amongſt the Quakers. Returning to England, he was in 1670 committed to Newgate, for preaching in Gracechurch-ſtreet meeting-houſe, London; but, being tried at the ſeſſions-houſe in the Old Bailey, he was acquitted. In September the ſame year his father died; and, being perfectly reconciled to him, left him both his paternal bleſſing and a plentiful eſtate. But his perſecutions were not yet at an end; for in 1671 he was committed to Newgate for preaching at a meeting in Wheeler-ſtreet, London; and during his impriſonment, which continued ſix months, he alſo wrote ſeveral treatiſes. After his diſcharge he went into Holland and Germany; and in the beginning of the year 1672 married, and ſettled with his family at Rickmanſworth in Hertfordſhire. The ſame year he publiſhed ſeveral pieces; and particularly one againſt Reeve and Muggleton. In 1677, he again travelled into Holland and Germany in order to propagate his opinions; and had frequent converſations with the princeſs Elizabeth, daughter to the queen of Bohemia, and ſiſter to the princeſs Sophia, mother to king George I. In 1681, king Charles II. in conſideration of the ſervices of Mr. Penn's father, and ſeveral debts due to him from the crown at the time of his deceaſe, granted Mr. Penn and his heirs the province lying on the weſt ſide of the river Delaware in North America, which from thence obtained the name of *Penſylvania*. Upon this Mr. Penn publiſhed a brief account of that province, with the king's patent; and propoſing an eaſy purchaſe of lands, and good terms of ſettlement for ſuch as were inclined to remove thither, many went over. Theſe having made and improved their plantations to good advantage, the governor, in order to ſecure the planters from the native Indians, appointed commiſſioners to purchaſe the land he had received from the king, of the native Indians, and concluded a peace with them. The city of Philadelphia was planned and built; and he himſelf drew up the fundamental conſtitutions of Penſylvania in 24 articles. In 1681 he was elected a member of the Royal Society; and the next year he embarked for Penſylvania, where he continued about two years, and returned to England in Auguſt 1684. Upon the acceſſion of king James to the throne, he was taken into a great degree of favour with his majeſty, which expoſed him to the imputation of being a Papiſt; but from which he fully vindicated himſelf. However, upon the Revolution, he was examined before the council in 1688, and obliged to give ſecurity for his appearance on the firſt day of next term; which was afterwards continued. He was ſeveral times diſcharged and examined: and at length warrants being iſſued out againſt him, he was obliged to conceal himſelf for two or three years. Being at laſt permitted to appear before the king and council, he repreſented his innocence ſo effectually that he was acquitted. In Auguſt 1699, he, with his wife and family, embarked for Penſylvania; whence he returned in 1701, in order to vindicate his proprietary right, which had been attacked during his abſence. Upon queen Anne's acceſſion to the crown, he was in great favour with her, and was often at court. But in 1707 he was involved in a law-ſuit with the executors of a perſon who had been formerly his ſteward; and, though many thought him aggrieved, the court of chancery did not think proper to relieve him; upon which account he was obliged to live within the rules of the Fleet for ſeveral months, till the matter in diſpute was accommodated. He died in 1718.

At one period of his life, Penn lodged in a houſe in Norfolk-ſtreet in the Strand. In the entrance to it he had a peeping-hole, through which he could ſee any perſon that came to him. A creditor one day ſent in his name; and having been made to wait more than a reaſonable time, he knocked for the ſervant, whom he aſked, "Will not thy maſter ſee me?" "Friend, (anſwered the ſervant) he has ſeen thee, but he does not like thee."

Mr. Penn's friendly and pacific manner of treating the Indians produced in them an extraordinary love for him and his people; ſo that they have maintained a perfect amity with the Engliſh in Penſylvania ever ſince. He was the greateſt bulwark of the Quakers; in whoſe defence he wrote numberleſs pieces. Beſides the above works, he wrote a great number of others; the moſt eſteemed of which are, 1. His Primitive Chriſtianity revived. 2. His defence of a paper entitled *Goſpel Truths, againſt the Exceptions of the Biſhop of Cork*. 3. His Perſuaſive to Moderation. 4. His Good Advice to the Church of England, Roman Catholic, and Proteſtant Diſſenter. 5. The Sandy Foundation ſhaken. 6. No Croſs, no Crown. 7. The great Caſe of Liberty of Conſcience debated. 8. The Chriſtian Quaker and his Teſtimony ſtated and vindicated. 9. A Diſcourſe of the general Rule of Faith and Practice, and Judge of Controverſy. 10. England's preſent Intereſt conſidered. 11. An Addreſs to Proteſtants. 12. His Reflections and Maxims. 13. His Advice to his Children. 14. His Riſe and Progreſs of the People called *Quakers*. 15. A Treatiſe on Oaths. Moſt of theſe have paſſed ſeveral editions, ſome of them many. The letters between William Penn and Dr. Tillotſon, and William Penn and William Popple, Eſq. together with Penn's letters to the princeſs Elizabeth of the Rhine, and the counteſs of Hornes, as alſo one to his wife on his going to Penſylvania, are inſerted in his works, which were firſt collected and publiſhed in 2 vols. folio; and the parts ſince ſelected and abridged into 1 vol. folio, are very much and deſervedly admired for the good ſenſe they contain.

PENNATULA, or SEA-PEN, in natural hiſtory, a genus of zoophyte, which, though it ſwims about freely in the ſea, approaches near to the gorgonia. This genus hath a bone along the middle of the inſide, which is its chief ſupport; and this bone receives the ſupply of its oſſeous matter by the ſame polype mouths that furniſh it with nouriſhment. Linnæus reckons ſeven ſpecies. The name *zoophytes*, under which this genus is ranked, it is well known, ſignifies, that the creature partakes both of the animal and vegetable nature; but ſome have ſuppoſed it to be nothing but a fucus or ſea-plant. It is certainly an animal, however, and as ſuch is free or loco-

motive. Its body generally expands into proceſſes on the upper parts, and theſe proceſſes or branches are furniſhed with rows of tubular denticles: they have a polype head proceeding from each tube.

The ſea-pen is not a coralline, but diſtinguiſhed from it by this ſpecific difference: corals, corallines, alcyoonia, and all that order of beings, adhere firmly by their baſes to ſubmarine ſubſtances, but the ſea-pen either ſwims about in the water or floats upon the ſurface.

The Honourable Dr. Coote Moleſworth lately ſent one of theſe animals to the ingenious Mr. Ellis, the author of many curious papers on the nature of corallines, which was taken in a trawl in 72 fathoms water, near the harbour of Breſt in France: the ſame ſpecies are frequently found in the ocean from the coaſt of Norway to the Mediterranean ſea, ſometimes at conſiderable depths, and ſometimes floating on the ſurface. Mr. Ellis's deſcription of that ſent him by Dr. Moleſworth is as follows:

Its general appearance greatly reſembles that of a quill feather of a bird's wing (ſee Plate 32. fig. 1.); it is about four inches long, and of a reddiſh colour; along the back there is a groove from the quill part to the extremity of the feathered part, as there is in a pen; the feathered part conſiſts of fins proceeding from the ſtem, as expreſſed in the figure. The fins move the animal backward and forward in the water, and are furniſhed with ſuckers or mouths armed with filaments, which appear magnified as fig. 2. There is no perforation at the bottom, and therefore Mr. Ellis is of opinion, that the exuvia of the animals upon which it feeds are diſcharged by the ſame apertures at which the food is taken in; and in this it is not ſingular, Nature having obſerved the ſame œconomy in the Greenland polype, deſcribed by Mr. Ellis in his Eſſay on Corallines. Each ſucker has eight filaments, which are protruded when prey is to be caught; but at other times they are drawn back into their caſes, which are furniſhed at the end with *ſpicula*, that cloſe together round the entrance, and defend this tender part from external injuries.

Dr. Bohadſch of Prague had an opportunity of obſerving one of theſe animals alive in the water, and he gives the following account of what he ſaw: "A portion of the ſtem contracted, and became of a ſtrong purple colour, ſo as to have the appearance of a ligature round it; this apparent ligature, or zone, moved upwards and downwards ſucceſſively through the whole length of the ſtem, as well the feathered as the naked part; it began at the bottom, and moving upwards to the other extremity, it there diſappeared, and at the ſame inſtant appeared again at the bottom, and aſcended as before; but as it aſcended through the feathered or pinnated part, it became paler. When this zone is much conſtricted, the trunk above it ſwells, and acquires the form of an onion; the conſtriction of the trunk gives the colour to the zone, for the intermediate parts are paler in proportion as the zone becomes deeper. The end of the naked trunk is ſometimes curved like a hook; and at its extremity there is a ſinus or chink, which grows deeper while the purple ring is aſcending, and ſhallower as it is coming down. The fins have four motions, upward and downward, and backward and forward, from right to left, and from left to right. The fleſhy filaments, or claws, move in all directions; and with the cylindrical part from which they proceed are ſometimes protruded from the fins, and ſometimes hidden with them.

Upon diſſecting this animal the following phenomena were diſcovered: When the trunk was opened lengthwiſe, a ſaltiſh liquor flowed out of it, ſo viſcid as to hang down an inch. The whole trunk of the ſtem was found to be hollow, the outward membrane being very ſtrong, and about a tenth part of an inch thick: within this membrane appeared another much thinner; and between theſe two membranes, in the pinnated part of the trunk, innumerable little yelloviſh eggs, about the ſize of a white poppy-ſeed, were ſeen floating in a whitiſh liquor; about three parts of the cavity within the inner membrane is filled by a kind of yelloviſh bone: this bone is about two inches and a half long, and one twentieth of an inch thick; in the middle it is four ſquare, but towards the ends it grows round and very taper, that end being fineſt which is next the pinnated part of the trunk. This bone is covered in its whole length with a clear yelloviſh ſkin, which at each end runs out into a ligament; one is inſerted in the top of the pinnated trunk, and the other in the top of the naked trunk: by the help of the upper ligament the end of the bone is either bent into an arch, or diſpoſed in a ſtraight line. The fins are compoſed of two ſkins; the outward one is ſtrong and leathery, and covered over with an infinite number of crimſon ſtreaks; the inner ſkin is thin and tranſparent: the ſuckers are alſo in the ſame manner compoſed of two ſkins, but the outward ſkin is ſomething ſofter. Both the fins and ſuckers are hollow, ſo that the cavity of the ſuckers may communicate with thoſe of the fins, as the cavity of the fins does with that of the trunk.

Dr. Shaw, in the Hiſtory of Algiers, ſays, that theſe animals are ſo luminous in the water, that in the night the fiſhermen diſcover fiſhes ſwimming about in various depths of the ſea by the light they give. From this extraordinary quality Linnæus calls this ſpecies of the ſea-pen *pennatula phoſphorea*; and remarks, after giving the ſynonyms of other authors, *Habitat in oceano fundum illuminans*.

There are other kinds of ſea-pens, or ſpecies of this animal, which have not a reſemblance to a pen. There is the kidney-ſhaped ſea-pen, (ſee fig. 3.) the feather of the peacock-fiſh, (ſee fig. 4.) the pennatula filoſa of Linnæus, (ſee fig. 5.) his pennatula fagita, (ſee fig. 6.) his pennatula mirabilis, (ſee fig. 7.) and the finger-ſhaped ſea-pen, (ſee fig. 8.) The kidney-ſhaped ſea-pen was diſcovered ſome time ago on the coaſt of South Carolina, and ſent to Mr. Ellis by John Gregg, Eſq. of Charleſtown. It is of a fine purple colour; the kidney part is about an inch from end to end, and about half an inch wide in the narroweſt part; a tail proceeds from the middle of the body, which is roundiſh, and about an inch long; is alſo full of rings like an earth-worm, and along the middle both of the upper and under part of it there is a ſmall groove which runs from one end to the other, but there is no perforation at either extremity. The upper part of the body is convex, and about an inch thick: the whole ſurface is covered with ſmall yellow ſtarry openings, through which little ſuckers are protruded, each furniſhed with ſix tentacula or filaments, like what are obſerved on ſome corals; the under part of the body is quite flat, and is full of ramifications of fleſhy fibres; which proceeding from the inſertion of the tail, as a common centre, branch out ſo as to communicate with the ſtarry openings on the exterior edge and upper ſurface of the animal. Of all the pennatulæ yet known, the feather-ſhaped one, or, as it is called, the *ſilver ſea-pen*, (ſee fig. 1.) is the largeſt as well as the moſt ſpecious in its appearance. It is of a beautiful ſilvery white, elegantly ſtriated on each of the feather-like proceſſes with lines or ſtreaks of the deepeſt black. It is very rare, and is a native of the Indian ſeas. There is a very fine ſpecimen of this ſpecies in the Britiſh Muſeum.

PENNI (Giovanni Francisco), born at Florence in 1488. was the diſciple of Raphael; who, obſerving his genius and integrity, intruſted his domeſtic concerns entirely to his management; by which means he got the appellation of *il fatore*, or the "ſteward," which he retained ever after. The genius of Penni was univerſal; but his greateſt pleaſure was in painting landſcapes and buildings: he was an excellent de-

ſigner, and coloured extremely well in oil, diſtemper, and freſco. He painted portraits in an exquiſite ſtyle; and had ſuch happy natural talents, that Raphael left him heir to his fortune in partnerſhip with Julio Romano his fellow-diſciple. After Raphael's death, Penni painted many pictures at Rome, particularly in the palace of Chigi, ſo exactly in the ſtyle of his maſter, that they might not undeſervedly have been imputed to him. He finiſhed, in conjunction with Julio and Pierino del Vaga, the celebrated deſigns of the battles of Conſtantine, and others, which Raphael had left imperfect; but differing with them about a copy of the Tranſfiguration, which the pope intended for the king of France, they ſeparated. Penni went to Naples; but the air of that country diſagreeing with his conſtitution, he died ſoon after in 1528. He had a brother called *Lucca Penni*, who worked at Genoa and other parts of Italy in conjunction with Pierino del Vaga, who married his ſiſter; he went thence to England, where he worked for Henry VIII. and for ſeveral merchants; was employed by Francis I. at Fontainebleau; but at laſt quitted the pencil, and devoted himſelf to engraving.

PENNY, or PENY, in commerce, an ancient Engliſh coin, which had formerly conſiderable courſe; but is now generally dwindled into an imaginary money, or money of account. Camden derives the word from the Latin *pecunia*, "money."

The ancient Engliſh penny, penig, or pening, was the firſt ſilver coin ſtruck in England; nay, and the only one current among our Saxon anceſtors; as is agreed by Camden, Spelman, Dr. Hicks, &c. The penny was equal in weight to our threepence: five of them made one ſhilling, or ſcilling Saxon; 30 a mark or mancuſe, equal to our 7*s.* 6*d.* Till the time of king Edward I. the penny was ſtruck with a croſs, ſo deeply indented in it, that it might be eaſily broke, and parted, on occaſion, into two parts, thence called *half pennies*; or into four, thence called *fourthings*, or *farthings*. But that prince coined it without indenture; in lieu of which he firſt ſtruck round halfpence and farthings.

He alſo reduced the weight of the penny to a ſtandard; ordering that it ſhould weigh 32 grains of wheat, taken out of the middle of the ear.—This penny was called the *penny ſterling*.—Twenty of theſe pence were to weigh an ounce; whence the penny became a weight as well as a coin. See STERLING and PENNY-WEIGHT.

The penny ſterling is now nigh diſuſed as a coin; and ſcarce ſubſiſts but as a money of account, containing the twelfth part of a ſhilling, or the 240th part of a pound.

PENNY, in ancient ſtatutes, &c. is uſed for all ſilver money; and hence the *ward-penny*, *aver-penny*, *hundred-penny*, *tithing-penny*, and *brothal-penny*.

PENNY-*Weight*, a Troy weight, containing 24 grains; each grain weighing a grain of wheat gathered out of the middle of the ear, well dried. The name took its riſe hence, that this was anciently the weight of one of our ancient ſilver pennies. See PENNY.—Twenty of theſe penny-weights make an ounce Troy.

PENRITH, an ancient town of the county of Cumberland in England, ſeated under a hill called *Penrith-Fell*, near the rivers Eamont and Lowther. It is a great thoroughfare for travellers; but has little other trade, except tanning, and a ſmall manufacture of checks. Formerly it had a caſtle, but it is now in ruins. In the church-yard is a monument of great antiquity, conſiſting of two ſtone pillars, 11 feet 6 inches high, and 5 in circumference in the lower part, which is rounded; the upper is ſquare, and tapers to a point: in the ſquare part is ſome fret-work, and the relievo of a croſs; and on the interior ſide of one is the faint repreſentation of ſome animal. But theſe ſtones are mortiſed at their lower part into a round one. They are about 15 feet aſunder, and the ſpace between them is encloſed on each ſide with two very large, but thin, ſemicircular ſtones; ſo that there is left, between pillar and pillar, a walk of two feet in breadth. Two of theſe leſſer ſtones are plain; the others have certain figures, at preſent ſcarce intelligible. Not far from theſe pillars is another called the *giant's thumb*, five feet eight inches high, with an expanded head, perforated on both ſides: from the middle the ſtone riſes again into a leſſer head, rounded at top; but no part has a tendency to the figure of a croſs, being in no part mutilated. The pillars are ſaid to have been ſet up in memory of Sir Owen Cæſarius, a famous warrior buried here, who killed ſo many wild bears, which much infeſted this county, that the figures of bears, cut out in ſtone, on each ſide of his grave, were ſet there in remembrance of the execution he made among thoſe beaſts; and it is likewiſe ſaid his body extended from one pillar to the other. In the market-place there is a town houſe of wood, beautified with bears climbing up a ragged ſtaff. There is a memorandum on the north ſide of the veſtry without, that, in 1598, 2266 perſons died here of the plague. There is a charity ſchool in this place for 20 boys, and another for 30 girls, maintained by 55*l.* a year, by the ſacrament-money and pariſh ſtock. In 1715 the Scotch Highlanders entered this town, and quartered in it for a night, in their way to Preſton, without doing much harm; but in the laſt rebellion, in 1745, they were, it is ſaid, very rapacious and cruel. Its handſome ſpacious church has been lately rebuilt, and the roof ſupported by pillars, whoſe ſhafts are of one entire reddiſh ſtone, dug out of a neighbouring quarry. On the eaſt part of the pariſh, upon the north bank of the river Eamont, there are two caves or grottos, dug out of the ſolid rock, and ſufficient to contain 100 men. The paſſage to them is very narrow and dangerous; and it is poſſible that its perilous acceſs may have given it the name of *Iſis Parlis*; though the vulgar tell ſtrange ſtories of one Iſis, a giant, who lived there in former times, and, like Cacus of old, uſed to ſeize men and cattle, and draw them into his den to devour them. But it is highly probable that theſe ſubterraneous chambers were made for a ſecure retreat in time of ſudden danger; and the iron gates, which were taken away not long ago, ſeem to confirm that ſuppoſition. W. lon. 3. 16. N. lat. 54. 35.

PENROSE (THOMAS), was the ſon of the Reverend Mr. Penroſe, rector of Newbury, Berks; a man of high character and abilities, deſcended from an ancient Corniſh family, beloved and reſpected by all who knew him. Mr. Penroſe, jun. being intended for the church, purſued his ſtudies with ſucceſs, at Chriſt-church, Oxon, until the ſummer of 1762; when his eager turn to the naval and military line overpowering his attachment to his real intereſt, he left his college, and embarked in the unfortunate expedition againſt Nova Colonia, in South America, under the command of Captain Macnamara. The iſſue was fatal. The Clive, the largeſt veſſel, was burnt; and though the Ambuſcade eſcaped, (on board of which Mr. Penroſe, acting as lieutenant of marines, was wounded,) yet the hardſhips which he afterwards ſuſtained in a prize-ſloop, in which he was ſtationed, utterly ruined his conſtitution. Returning to England with ample teſtimonials of his gallantry and good behaviour, he finiſhed, at Hertford College, Oxon, his courſe of ſtudies; and, having taken orders, accepted the curacy of Newbury; the income of which, by the voluntary ſubſcription of the inhabitants, was conſiderably augmented. After he had continued in that ſtation about nine years, it ſeemed as if the clouds of diſappointment, which had hitherto overſhadowed his proſpects, and tinctured his poetical eſſays with gloom, were clearing away; for he was then preſented by a friend, who knew his worth and honoured his abilities, to a living worth near 500*l. per annum*. It came, however, too

late; for the ſtate of Mr. Penroſe's health was now ſuch as left little hope, except in the aſſiſtance of the waters of Briſtol. Thither he went; and there he died in 1779, aged 36 years. In 1768 he married Miſs Mary Slocock of Newbury, by whom he had one child, Thomas, who was educated at Winton College.

Mr. Penroſe was reſpected for his extenſive erudition, admired for his eloquence, and equally beloved and eſteemed for his ſocial qualities. By the poor, towards whom he was liberal to his utmoſt ability, he was venerated to the higheſt degree. In oratory and compoſition his talents were great. His pencil was ready as his pen, and on ſubjects of humour had uncommon merit. To his poetical abilities the public, by their reception of his Flights of Fancy, &c. have given a favourable teſtimony. To ſum up the whole, his figure and addreſs were as pleaſing as his mind was ornamented.

PENRYN, a town of Cornwall, in England, ſeated on a hill at the entrance of Falmouth-haven by Pendennis caſtle. It conſiſts of about 300 houſes; and the ſtreets are broad and well paved. There are ſo many gardens and orchards in it, that it reſembles very much a town in a wood. It is well watered with rivulets, and has an arm of the ſea on each ſide of it, with a good cuſtom-houſe and quay, and other neat buildings. It drives a conſiderable trade in pilchards, and in the Newfoundland fiſhery. It was anciently governed by a portreeve; but James I. made it a corporation, conſiſting of a mayor, 11 aldermen, 12 common-councilmen, with a recorder, ſteward, &c. an office of record every three weeks, with a priſon, and power to try felons in their juriſdiction. And he granted, that the mayor and two aldermen ſhould be juſtices of the peace, and that they ſhould have a guildhall. There was once a monaſtery in this place, which was a cell to Kirton; and there are ſtill to be ſeen a tower, and part of the garden walls, the ruins of a collegiate church. It has neither church nor chapel, but belongs to the pariſh of Gluvias, a quarter of a mile off. It has ſent members to parliament ever ſince the firſt year of queen Mary; and James II. granted it a new charter, whereby their election was veſted in the magiſtracy only; but it was never made uſe of, all the inhabitants that pay ſcot and lot, who are not much above 100, being the electors. Mr. Rymer gives a very remarkable account how Penryn was once ſaved by a company of ſtrolling players. He ſays, that towards the latter end of the 16th century the Spaniards were landing to burn the town juſt as the players were ſetting Samſon upon the Philiſtines; which performance was accompanied with ſuch drumming and ſhouting, that the Spaniards thought ſome ambuſh was laid for them, and ſcampered back to their ſhips. Queen Elizabeth founded a free-ſchool in this place. W. lon. 5. 35. N. lat. 50. 23.

PENSACOLA, a ſettlement in North America, ſituated at the mouth of a river on the gulf of Mexico. It was eſtabliſhed by the French, and ceded to Great Britain in 1763. Its firſt diſcoverer was Sebaſtian Cabot in 1497.

The year 1781, ſo diſaſtrous to Britain in other reſpects, was alſo remarkable for the reduction of Penſacola by the Spaniards under Don Bernardo Galvez. Great preparations for this expedition had been making at the Havannah; but it was for ſome time retarded by a dreadful hurricane which attacked the Spaniſh fleet, and by which four ſhips of the line, beſides others of inferior note, were loſt, together with the people on board, to the amount of more than 2000. By this diſaſter the remainder were obliged to put back to the Havannah to repair; but as ſoon as the fleet was judged capable of again putting to ſea, an embarkation was made of near 8000 men, with Don Bernardo at their head, together with five ſhips of the line, who arrived at Penſacola on the 9th of March 1781. This force was ſoon augmented by ten ſhips of the line and ſix frigates; while general Campbell, the Britiſh governor, could oppoſe ſuch a formidable armament with few more than 1000 men, conſiſting of ſome regulars and ſeamen, with the inhabitants. The entrance of the harbour, which was the principal object of defence, was guarded by two ſmall armed veſſels, but they were inſufficient to ſecond the batteries that had been erected for its protection; and theſe, without the aſſiſtance of ſome ſhips of force, were incapable of reſiſting a vigorous attack. Notwithſtanding this prodigious odds, however, the Spaniards met with the moſt determined oppoſition. Every inch of ground was diſputed with the greateſt reſolution. The harbour was not forced without the greateſt difficulty, nor could the veſſels be taken that defended it: the companies belonging to them, after ſetting them on fire, retired on ſhore.

The Spaniards, now in poſſeſſion of the harbour, inveſted the place in form, and made their approaches in a cautious and regular manner; while, on the other hand, the beſieged were no leſs active and vigilant in their own defence. Sallies were made occaſionally with great ſucceſs, at the ſame time that an uninterrupted fire was kept up in ſuch a manner as not only greatly to annoy, but even to ſtrike the beſiegers with aſtoniſhment. This incenſed the Spaniſh general the more, as he knew that the garriſon could expect no relief, and therefore that all their efforts could only prolong the date of their ſurrender. The reſiſtance was the more mortifying, as he was perfectly conſcious of the bravery of his troops; and he had artillery, as his officers expreſſed themſelves, "fit to be employed againſt Gibraltar." With all theſe advantages, however, ſo reſolute was the defence of the garriſon, that, after the ſiege had continued for two months, very little hope could be entertained of its ſpeedy termination. As they deſpaired therefore of making any effectual impreſſion by means of their cannon, they erected a battery of mortars, with which they bombarded a redoubt that commanded the main avenue to the place; and in this they were favoured by an unexpected accident. On the 8th of May a ſhell burſt open the door of the powder magazine under the redoubt, by which it was blown up, with the loſs of near 100 men killed and wounded. Fortunately for the garriſon, however, two flank-works ſtill remained entire, from both which ſo heavy a fire was kept up, that, though an aſſault was immediately given, the aſſailants were repulſed with great ſlaughter. This afforded leiſure to the garriſon to carry off the wounded men, with ſome of the artillery, and to ſpike up the reſt. As the enemy, however, ſoon recovered themſelves, and prepared for a general ſtorm, it was thought proper to abandon the flank works, and retire into the body of the place. The poſſeſſion of theſe outworks, however, gave the enemy ſuch advantages, that the place was no longer tenable. Their ſituation, on a riſing ground, enabled them to command the battery oppoſite to their chief approach with ſmall arms, and to ſingle out the men at their guns. A capitulation therefore became abſolutely neceſſary, which was obtained on honourable terms. The town, with the whole province of Weſt Florida, was confirmed to the Spaniards by the treaty of 1783. W. lon. 87. 20. N. lat. 30. 22.

PENSANCE, a town of Cornwall, in England, at the bottom of Mountſbay, about ten miles from the Land's End. It was burnt in 1595 by the Spaniards, who, with four galleys, ſurpriſed this part of the coaſt, and ſet fire to ſeveral villages and farms: but it was ſoon after rebuilt, made one of the coinage towns, and has now a conſiderable trade. It lies in the pariſh of Madern, noted for its reſtorative ſpring, very effectual in the cure of lameneſs as well as the colic, &c. It is well-built and populous, and has many ſhips belonging to it. The ſhore abounds ſo with lead, tin, and copper ore, that the veins thereof appear on the utmoſt extent of land at low water mark.

PENSILES HORTI, in antiquity, *Hanging Gardens*, &c.

cribed in the accounts given of the city of BABYLON by the authors of the Univerſal Hiſtory.

PENSILVANIA, late one of the principal Britiſh colonies in North America, had its name from the famous Quaker William Penn, ſon of Sir William, commander of the Engliſh fleet in Oliver Cromwell's time, and in the beginning of Charles II.'s reign, who obtained a grant of it in 1679. It is bounded on the eaſt by Delaware bay and river, and the Atlantic ocean; on the north by the country of the Iroquois, or five nations; and on the ſouth and weſt by Maryland. Its extent from north to ſouth is about 200 miles; but its breadth varies greatly, from 15, and even leſs, to near 200.

The air in Penſilvania is ſweet and clear. The fall, or autumn, begins about the 20th of October, and laſts till the beginning of December, when the winter ſets in, which continues till March, and is ſometimes extremely cold and ſevere; but the air is then generally dry and healthy. The river Delaware, though very broad, is often frozen over. From March to June, that is, in the ſpring, the weather is more inconſtant than in the other ſeaſons. In the months of July, Auguſt, and September, the heats would be almoſt intolerable, if they were not mitigated by frequent cool breezes. The wind during the ſummer is generally ſouth-weſt; but in the winter blows for the moſt part from the north-weſt, over the ſnowy frozen mountains and lakes of Canada, which occaſions the exceſſive cold during that ſeaſon. On the whole, the climate of this ſtate differs not materially from that of Connecticut, except that on the weſt ſide of the mountains the weather is much more regular. The inhabitants never feel thoſe quick tranſitions from cold to heat, by a change of the wind from north to ſouth, as thoſe ſo frequently experience who live eaſtward of the mountains and near the ſea. The hot ſouthwardly winds get chilled by paſſing over the long chain of Allegany mountains.

Longevity, when tolerably aſcertained, is doubtleſs the trueſt mark of the healthineſs of any country; but this ſtate, which has not been ſettled above 100 years, is not ſufficiently old to determine from facts the ſtate of longevity. Among the people called Quakers, who are the oldeſt ſettlers, there are inſtances of longevity, occaſioned by their living in the old cultivated counties, and the temperance impoſed on them by their religion. There are fewer long-lived people among the Germans than among other nations, occaſioned by their exceſs of labour and low diet. They live chiefly upon vegetables and watery food, that affords too little nouriſhment to repair the waſte of their ſtrength by hard labour. Nearly one-half of the children born in Philadelphia die under two years of age, and chiefly with a diſeaſe in the ſtomach and bowels. Very few die at this age in the country.

As to the face of this country, towards the coaſt, like the adjacent colonies, it is flat, but riſes gradually to the Apalachian mountains on the weſt. As much as nearly one-third of this ſtate may be called mountainous; particularly the counties of Bedford, Huntingdon, Cumberland, part of Franklin, Dauphin, and part of Bucks and Northampton, through which paſs, under various names, the numerous ridges and ſpurs, which collectively form what we chooſe to call, for the ſake of clearneſs, *the great range of Allegany mountains*. There is a remarkable difference between the country on the eaſt and weſt ſide of the range of mountains we have juſt been deſcribing. Between theſe mountains and the lower falls of the rivers which run into the Atlantic, not only in this but in all the ſouthern ſtates, are ſeveral ranges of ſtones, ſand, earths, and minerals, which lie in the utmoſt confuſion. Beds of ſtone, of vaſt extent, particularly of limeſtone, have their ſeveral layers broken in pieces, and the fragments thrown confuſedly in every direction. Between theſe lower falls and the ocean is a very extenſive collection of ſand, clay, mud, and ſhells, partly thrown up by the waves of the ſea, partly brought down by floods from the upper country, and partly produced by the decay of vegetable ſubſtances. The country weſtward of the Allegany mountains, in theſe reſpects, is totally different. It is very irregular, broken, and variegated, but there are no mountains; and when viewed from the moſt weſtern ridge of the Allegany, it appears to be a vaſt extended plain. All the various ſtrata of ſtone appear to have lain undiſturbed in the ſituation wherein they were firſt formed. The layers of clay, ſand, and coal, are nearly horizontal. Scarcely a ſingle inſtance is to be found to the contrary. Every appearance, in ſhort, tends to confirm the opinion, that the original cruſt, in which the ſtone was formed, has never been broken up on the weſt ſide of the mountains, as it evidently has been eaſtward of them.

The chief rivers are three, Delaware, Suſquehanna, and Skoolkil. The Delaware, riſing in the country of the Iroquois, takes its courſe ſouthward; and after dividing this province from that of New Jerſey, falls into the Atlantic ocean between the promontories or capes May and Henlopen, forming at its mouth a large bay, called from the river *Delaware Bay*. This river is navigable above 200 miles. The Suſquehanna riſes alſo in the country of the Iroquois, and, running ſouth through the middle of the province, falls into the bay of Cheſapeak, being navigable a great way for large ſhips. The Skoolkil has its ſource in the ſame country as the other two, and alſo runs ſouth, almoſt parallel to them; till at length, turning to the eaſtward, it falls into the Delaware at the city of Philadelphia. It is navigable for boats above 100 miles. Theſe rivers, with the numerous creeks and harbours in Delaware bay, capable of containing the largeſt fleets, are extremely favourable to the trade of this province.

As to the ſoil, produce, and traffic of Penſilvania, we refer the reader to the articles NEW-YORK and the JERSEYS, ſince what is there ſaid on thoſe heads is equally applicable to this province; and if there is any difference, it is on the ſide of this province. They have ſome rice here, but in no great quantities; and ſome tobacco, but it is not equal to that of Virginia. From the premiums offered by the Society of Arts in London, it appears that the ſoil and climate of this province are looked upon as proper for the cultivation of ſome ſpecies of vines. The trade carried on from hence and the other colonies to the French and Dutch iſlands and Surinam, was greatly to the diſadvantage of Britain, and very deſtructive to the ſugar-colonies: for they take molaſſes, rum, and other ſpirits, with a great many European goods, from thoſe foreigners; carrying them horſes, proviſions, and lumber in return; without which the French could not carry on their ſugar-manufactures to that advantage they do.

New York, the Jerſeys, and Penſilvania, were diſcovered, with the reſt of the continent of North America, in the reign of Henry VII. by Sebaſtian Cabot, for the crown of England; but Sir Walter Raleigh was the firſt adventurer that attempted to plant colonies on theſe ſhores, in the reign of queen Eliſabeth; and, in honour of that princeſs, gave all the eaſtern coaſt of North America the name of *Virginia*. Mr. Hudſon, an Engliſhman, ſailing to that part of the coaſt which lies between Virginia and New England, in the beginning of the reign of James I. and being about to make a ſettlement at the mouth of Hudſon's river, the Dutch gave him a ſum of money to diſpoſe of his intereſt in this country to them. In the year 1608 they began to plant it; and, by virtue of this purchaſe, laid claim to all thoſe countries which are now denominated *New York*, *New Jerſey*, and *Penſilvania*; but there remaining ſome part of this coaſt which was not planted by the Hollanders, the Swedes ſent a fleet of ſhips thither, and took poſſeſſion of it for that crown; but the Dutch, having a ſuperior force in the neighbourhood, compelled the Swedes to ſubmit to their dominion, allow-

ing them, however, to enjoy the plantations they had ſettled. The Engliſh, not admitting that either the Dutch or Swedes had any right to countries firſt diſcovered and planted by a ſubject of England, and part of them at that time poſſeſſed by the ſubjects of Great Britain, under charter from queen Elizabeth and king James I; king Charles II. during the firſt Dutch war in 1664, granted the countries of New York, the Jerſeys, and Penſilvania, of which the Dutch had uſurped the poſſeſſion, to his brother James duke of York; and ſir Robert Carr being ſent over with a ſquadron of men of war and land forces, and ſummoning the Dutch governor of the city of New Amſterdam, now New York, to ſurrender, he thought fit to obey the ſummons, and yield that capital to the Engliſh; the reſt of the places in the poſſeſſion of the Dutch and Swedes followed his example; and theſe countries were confirmed to the Engliſh by the Dutch at the next treaty of peace between the two nations. The duke of York afterwards parcelled them out to under proprietors; ſelling, in particular, to William Penn the elder, in 1683, the town of Newcaſtle, *alias* Delaware, and a diſtrict of 12 miles round the ſame; to whom, his heirs and aſſigns, by another deed of the ſame date, he made over all that tract of land from 12 miles ſouth of Newcaſtle to the Whore-hills, otherwiſe called *Cape Henlopen*, now divided into the two counties of Kent and Suſſex, which, with Newcaſtle diſtrict, are commonly known by the name of the *Three Lower Counties upon Delaware River*. All the reſt of the under-proprietors, ſometime after, ſurrendered their charters to the crown; whereby New York and the Jerſeys became royal governments; but Penn retained that part of the country which had been ſold to him by the duke of York, together with what had been granted to him before in 1680-1, which now conſtitutes the province of Penſilvania. As ſoon as Penn had got his patent, he began to plant the country. Thoſe who went over from England were generally Diſſenters and Quakers, whoſe religion is eſtabliſhed by law here, but with a toleration of all other Proteſtant ſects. The Dutch and Swedes, who were ſettled here before Mr. Penn became proprietor, chooſing ſtill to reſide in this country, as they did in New York and the Jerſeys, obtained the ſame privileges as the reſt of his majeſty's ſubjects; and their deſcendants are now in a manner the ſame people with the Engliſh, ſpeaking their language, and being governed by their laws and cuſtoms. Mr. Penn, however, not ſatisfied with the title granted him by king Charles II. and his brother, bought the lands alſo of the Indians for a valuable conſideration, or what they eſteemed ſuch (though 20 miles were purchaſed, at firſt, for leſs than an acre about Philadelphia would pay now), paying them in cloth, tools, and utenſils, to their entire ſatisfaction; for they had not hands to cultivate the hundredth part of their lands; and if they could have raiſed a product, there was nobody to buy: the purchaſe, therefore, was all clear gain to them; and, by the coming of the Engliſh, their peltry trade became ſo profitable, that they ſoon found their condition much altered for the better; and are now as well clothed and fed as the European peaſantry in many places.

Penſilvania is one of the moſt flouriſhing colonies in North America, having never had any quarrel with the natives. Whenever they deſire to extend their ſettlements, they purchaſe new lands of the ſachems, never taking any by force; but the Indians now ſet a very high price upon their lands, in compariſon of what they did at firſt, and will hardly part with them at any rate. In an eſtimate of the proprietary eſtate of the province, publiſhed above 50 years ago, we find, that the proprietaries, who alone can purchaſe lands here from the natives, had bought ſeven millions of acres for no more than 750l. ſterling, which the proprietaries afterwards ſold at the rate of 15l. for every 100 acres. The Indian council at Onandago, however, diſapproved of their deputies parting with ſo much land; and, in the year 1755, obliged the proprietaries to reconvey great part of the ſame to the Indians.

A diſpute ſubſiſted a long time between the proprietaries of this province and lord Baltimore, proprietary of Maryland, about the right to certain lands; which was at laſt amicably adjuſted, though greatly in favour of the Penns.

About the year 1704 there happened ſome alteration in the conſtitution of the province. The eſtabliſhment that took place, and ſubſiſted till the American war broke out, conſiſted of a governor, council, and aſſembly, each with much the ſame power and privileges as in the neighbouring colony of New York. The lieutenant-governor and council were appointed by the proprietors Thomas and Richard Penn, with his majeſty's approbation; but if the laws enacted here were not repealed within ſix months after they had been preſented to the king for his approbation or diſallowance, they were not repealable by the crown after that time.

By the preſent conſtitution of Penſilvania, which was eſtabliſhed in September 1776, all legiſlative powers are lodged in a ſingle body of men, which is ſtyled, *The general aſſembly of repreſentatives of the freemen of Penſilvania*. The qualification required to render a perſon eligible to this aſſembly is, two years reſidence in the city or county for which he is choſen. The qualifications of the electors are, full age, and one year's reſidence in the ſtate, with payment of public taxes during that time. But the ſons of freeholders are entitled to vote for repreſentatives, without any qualification except full age. No man can be elected as a member of the aſſembly more than four years in ſeven. The repreſentatives are choſen annually on the ſecond Tueſday in October, and they meet on the fourth Monday of the ſame month. The ſupreme executive power is lodged in a preſident, and a council conſiſting of a member from each county. The preſident is elected annually by the joint ballot of the aſſembly and council, and from the members of council. A vice-preſident is choſen at the ſame time. The counſellors are choſen by the freemen every third year; and having ſerved three years, they are ineligible for the four ſucceeding years. The appointments of one third only of the members expire every year; by which rotation only one third can be new members.

With reſpect to population, Morſe informs us, that in 1787 the inhabitants in Penſilvania were reckoned at 360,000. It is probable they are now more numerous, perhaps 400,000. If we fix them at this, the population for every ſquare mile will be only nine; by which it appears that Penſilvania is only one fifth as populous as Connecticut. But Connecticut was ſettled nearly half a century before Penſilvania; ſo that, in order to do juſtice to Penſilvania in the compariſon, we muſt anticipate her probable population 50 years hence. Theſe inhabitants conſiſt of emigrants from England, Ireland, Germany, and Scotland. The Friends and Epiſcopalians are chiefly of Engliſh extraction, and compoſe about one third of the inhabitants. They live principally in the city of Philadelphia, and in the counties of Cheſter, Philadelphia, Bucks, and Montgomery. The Iriſh are moſtly Preſbyterians. Their anceſtors came from the north of Ireland, which was originally ſettled from Scotland; hence they have ſometimes been called Scotch Iriſh, to denote their double deſcent. But they are commonly and more properly called Iriſh, or the deſcendants of people from the north of Ireland. They inhabit the weſtern and frontier counties, and are numerous. The Germans compoſe one quarter at leaſt, if not a third, of the inhabitants of Penſilvania. They inhabit the north parts of the city of Philadelphia, and the counties of Philadelphia, Montgomery, Bucks, Dauphin, Lancaſter, York, and Northampton; moſtly in the four laſt. They conſiſt of Lutherans (who are the moſt numerous ſect), Calviniſts, Moravians, mennoniſts, Tunkers (corruptly called Dunkers), and Swing-felters, who are a ſpecies of Quakers. Theſe are all diſtinguiſhed for their

temperance, induſtry, and economy. The Germans have uſually 15 of 69 members in the aſſembly: and ſome of them have ariſen to the firſt honours in the ſtate, and now fill a number of the higher offices. Yet the lower claſs are very ignorant and ſuperſtitious. It is not uncommon to ſee them going to market with a little bag of ſalt tied to their horſes' manes, for the purpoſe, they ſay, of keeping off the witches.

The Baptiſts (except the Mennoniſt and Tunker Baptiſts, who are Germans) are chiefly the deſcendants of emigrants from Wales, and are not numerous. A proportionate aſſemblage of the national prejudices, the manners, cuſtoms, religions, and political ſentiments of all theſe, will form the Penſilvania character. As the leading traits in this character, thus conſtituted, we may venture to mention induſtry, frugality bordering in ſome inſtances on parſimony, enterpriſe, a taſte and ability for improvements in mechanics, in manufactures, in agriculture, in commerce, and in the liberal ſciences; temperance, plainneſs, and ſimplicity in dreſs and manners; pride and humility in their extremes; inoffenſiveneſs and intrigue; in regard to religion, variety and harmony; liberality, and its oppoſites, ſuperſtition and bigotry; and in politics an unhappy jargon. Such appear to be the diſtinguiſhing traits in the collective Penſilvanian character.

Of the great variety of religious denominations in Penſilvania, the Friends or Quakers are the moſt numerous. They were the firſt ſettlers of Penſilvania in 1682 under William Penn, and have ever ſince flouriſhed in the free enjoyment of their religion. They neither give titles nor uſe compliments in their converſation or writings, believing that *whatſoever is more than yea, yea, and nay, nay, cometh of evil.* They conſcientiouſly avoid, as unlawful, kneeling, bowing, or uncovering the head to any perſon. They diſcard all ſuperfluities in dreſs or equipage; all games, ſports, and plays, as unbecoming the Chriſtian. *Swear not at all*, is an article of their creed literally obſerved in its utmoſt extent. They believe it unlawful to fight in any caſe whatever; and think that if their enemy *ſmite them on the one cheek, they ought to turn to him the other alſo.* They are generally honeſt, punctual, and even punctilious in their dealings; provident for the neceſſities of their poor; friends to humanity, and of courſe enemies to ſlavery; ſtrict in their diſcipline; careful in the obſervance even of the punctilios in dreſs, ſpeech, and manners, which their religion enjoins; faithful in the education of their children; induſtrious in their ſeveral occupations. In ſhort, whatever peculiarities and miſtakes thoſe of other denominations have ſuppoſed they have fallen into in point of religious doctrines, they have proved themſelves to be good citizens. Next to the Quakers, the Preſbyterians are the moſt numerous. There are upwards of 60 miniſters of the Lutheran and Calviniſt religion, who are of German extraction, now in this ſtate; all of whom have one or more congregations under their care; and many of them preach in ſplendid and expenſive churches; and yet the firſt Lutheran miniſter, who arrived in Penſilvania about 40 years ago, was alive in 1787, and probably is ſtill, as was alſo the ſecond Calviniſtical miniſter. The Lutherans do not differ in any thing eſſential from the Epiſcopalians, nor do the Calviniſts from the Preſbyterians.

The Moravians are of German extraction. Of this religion there are about 1300 ſouls in Penſilvania, *viz.* between 500 and 600 in Bethlehem, 450 in Nazareth, and upwards of 300 at Litiz in Lancaſter county. They call themſelves the *United Brethren of the Proteſtant Epiſcopal church.* They are called *Moravians*, becauſe the firſt ſettlers in the Engliſh dominions were chiefly migrants from Moravia. See HERNHUTTERS, and UNITAS *Fratrum*; and for the Mennonites, ſee MENNONITES. They were introduced into America by count Zinzendorf, and ſettled at Bethlehem, which is their principal ſettlement in America, as early as 1741. For the Tunkers, ſee TUNKERS.

There are a great many literary, humane, and other uſeful ſocieties in Penſilvania; more, it is ſaid, than in any of the United Provinces. There are ſeveral univerſities and colleges at Philadelphia and other places: See PHILADELPHIA. Lancaſter, Carliſle, and Pittſburgh, are the chief towns after Philadelphia.

Penſilvania is divided into ſeven counties; four of which are called the *Upper* and three the *Lower*. Of the upper, *viz.* Buckingham, Philadelphia, Cheſter, and Lancaſter, the three firſt are the lands included in king Charles II.'s grant, and deſigned *Penſilvania*; the lower, *viz.* thoſe of Newcaſtle, Kent, and Suſſex, were called *Nova Belgia* before the duke of York ſold them, as we obſerved above, to Mr. Penn. The upper counties end at Marcus Hook, four miles below Cheſter town, where the lower begin, and run along the coaſt near 100 miles. Each of theſe counties had a ſheriff, with a quarterly and monthly ſeſſion, and aſſizes twice a year.

In the Philoſophical Tranſactions for 1757, there is an account of a copper ſpring in Penſilvania. This ſpring riſes from a copper mine, and will diſſolve iron in leſs time by three-fourths than the waters of Wicklow in Ireland, lately deſcribed by Dr. William Henry and Dr Bond. From the ſolution of iron in theſe waters, about half the quantity of pure copper is procured by melting it in a crucible: but though theſe waters melt iron ſooner than the Iriſh waters, yet the ſolution does not produce ſo great a proportion of copper; for the pure copper procured from the ſolution of iron in the Iriſh waters is to the ſolution as 16 to 20. In the neighbourhood of this ſpring, which ſupplies 800 hhds. in 24 hours, are many ores of vitriol and ſulphur; the water is of a pale green colour, of an acid, ſweet, auſtere, inky, and nauſeous taſte. It is very heavy; for the hydrometer, which was immerſed in it, ſtood at the ſame height as in a ſolution of one ounce ſix drams of Engliſh vitriol in a quart of water. A very ſmall quantity of the ſolution of potaſhes inſtantly precipitates the metallic parts of this water in three different colours; ochre at the top, green in the middle, and white at bottom; a clean knife kept in it a few minutes is covered with a bright copper-colour. But beſides a large proportion of copper, this water contains alſo a large proportion of vitriol of iron. A pint of it exhaled by a ſlow fire left 400 grains of ſolid contents, which appeared to be chiefly ſaline; for 196 grains of it, diſſolved and filtered, did not leave above four grains of indiſſoluble matter. It appears therefore, that the proportion of vitriolic parts in this water is ſix drams to a pint; conſequently it is a ſtronger ſolution of vitriol than ſea water is of marine ſalt. So that, beſides the copper to be obtained by a ſolution of iron, it will afford great quantities of vitriol, and the great plenty both of water and fuel will make the eſtabliſhment of a copperas work extremely cheap and commodious. This water mixed with common water is frequently uſed as an emetic and cathartic by the country people, and is found very efficacious in the cure of cutaneous diſorders and ſore eyes.

Amongſt the other curioſities of this province may be reckoned another ſpring about 14 feet deep and about 100 ſquare, in the neighbourhood of Reading. A full mill ſtream iſſues from it. The waters are clear and full of fiſhes. From appearances it is probable that this ſpring is the opening or outlet of a very conſiderable river, which a mile and an half or two miles above this place ſinks into the earth, and is conveyed to this outlet in a ſubterraneous channel. In the northern parts of Penſilvania there is a creek called *Oil creek*, which empties into the Allegany river. It iſſues from a ſpring, on the top of which floats an oil ſimilar to that called Barbadoes tar, and from which one man may gather ſeveral gallons in a day. The troops ſent to guard the weſtern poſts halted at this ſpring, collected ſome of the oil, and bathed their joints with it. This gave them great

relief from the rheumatic complaints with which they were affected. The waters, of which the troops drank freely, operated as a gentle purge.

There are three remarkable grottoes or caves in this ſtate: one near Carliſle, in Cumberland county; one in the townſhip of Durham, in Bucks county; and the other at Swetara, in Lancaſter county. Of the two former there are no particular deſcriptions. The latter is on the eaſt bank of Swetara river, about two miles above its confluence with the Suſquehanna. Its entrance is ſpacious, and deſcends ſo much as that the ſurface of the river is rather higher than the bottom of the cave. The vault of this cave is of ſolid limeſtone rock, perhaps 20 feet thick. It contains ſeveral apartments, ſome of them very high and ſpacious. The water is inceſſantly percolating through the roof, and falls in drops to the bottom of the cave. Theſe drops petrify as they fall, and have gradually formed ſolid pillars, which appear as ſupports to the roof. Thirty years ago there were ten ſuch pillars, each ſix inches in diameter, and ſix feet high; all ſo ranged that the place they incloſed reſembled a ſanctuary in a Roman church. No royal throne ever exhibited more grandeur than this *luſus naturæ*. The reſemblances of ſeveral monuments are found indented in the walls on the ſides of the cave, which appear like the tombs of departed heroes. Suſpended from the roof is the *bell* (which is nothing more than a ſtone projected in an unuſual form), ſo called from the ſound that it occaſions when ſtruck, which is ſimilar to that of a bell. Some of the ſtalactites are of a colour like ſugarcandy, and others reſemble loaf ſugar; but their beauty is much defaced by the country people. The water, which percolates through the roof, ſo much of it as is not petrified in its courſe, runs down the declivity, and is both pleaſant and wholeſome to drink. There are ſeveral holes in the bottom of the cave, deſcending perpendicularly, perhaps into an abyſs below, which renders it dangerous to walk without a light. At the end of the cave is a petty brook, which, after a ſhort courſe, loſes itſelf among the rocks. Beyond this brook is an outlet from the cave by a very narrow aperture. Through this the vapours continually paſs outwards with a ſtrong current of air, and aſcend, reſembling at night the ſmoke of a furnace. Part of theſe vapours and fogs appear on aſcending to be condenſed at the head of this great alembic, and the more volatile parts to be carried off, through the aperture communicating with the exterior air before mentioned, by the force of the air in its paſſage.

PENSION, a ſum of money paid annually for ſervices or conſiderations already paſt. The yearly payment of each member to the houſes of the inns of court is likewiſe named *penſion*; and the yearly aſſembly of the ſociety of Gray's Inn, to conſult on the affairs of the houſe, is alſo called a *Penſion*.

PENSIONARY, or PENSIONER, a perſon who has an appointment or yearly ſum, payable during life, by way of acknowledgment, charged on the eſtate of a prince, company, or particular perſon.

Grand PENSIONARY, an appellation given, before the ſurrender of that place to the French, to the firſt miniſter of the States of Holland. The grand penſionary was chairman in the aſſemblies of the ſtates of that province: he propoſed the matters to be conſulted on; collected the votes; formed and pronounced the reſolutions of the ſtates; opened letters; conferred with foreign miniſters, &c. His buſineſs was alſo to inſpect the finances, to maintain the authority of the ſtates, and to ſee that the laws were obſerved; and he was perpetual Deputy of the States General of the United Provinces. His commiſſion was, however, given him only for five years; after which it was deliberated whether or not it ſhould be renewed; but there is no inſtance of its being revoked; therefore death only put an end to the functions of this important miniſter.

PENSIONARY was alſo the firſt miniſter of the regency of each city in Holland. His office was to give his advice in affairs relating to the government, either of the ſtate in general, or of the city in particular; and in aſſemblies of the ſtates of the province, he was ſpeaker in behalf of his city. The function, however, of theſe penſionaries was not everywhere alike; in ſome cities they only gave their advice, and were never found in aſſemblies of the magiſtrates, except when expreſsly called thither: in others they attended conſtantly; and in others they made the propoſitions on the part of the burgomaſters, drew up their concluſions, &c. They were called *penſionaries*, becauſe they received an appointment or penſion.

PENSIONER, in general, denotes a perſon who receives a penſion, yearly ſalary, or allowance. Hence,

The Band of Gentlemen PENSIONERS, the nobleſt ſort of guard to the king's perſon, conſiſts of 40 gentlemen, who receive a yearly penſion of 100l.

This honourable band was firſt inſtituted by king Henry VIII. and their office is to attend the king's perſon, with their battle-axes, to and from his chapel-royal, and to receive him in the preſence-chamber, or coming out of his privy-lodgings; they are alſo to attend at all great ſolemnities, as coronations, St. George's feaſt, public audiences of ambaſſadors, at the ſovereign's going to parliament, &c.

They are each obliged to keep three double horſes and a ſervant, and ſo are properly a troop of horſe. They wait half at a time quarterly; but on Chriſtmas-day, Eaſter-day, Whitſunday, &c. and on extraordinary occaſions, they are all obliged to give their attendance. They have likewiſe the honour to carry up the ſovereign's dinner on the coronation-day and St. George's feaſt; at which times the king or queen uſually confers the honour of knighthood on two ſuch gentlemen of the band as their captain preſents. Their arms are gilt battle-axes; and their weapons, on horſeback, in time of war, are cuiraſſiers-arms, with ſword and piſtols. Their ſtandard in time of war is, argent, a croſs gules. Their captain is always a nobleman, who has under him a lieutenant, a ſtandard-bearer, a clerk of the check, ſecretary, pay-maſter, and harbinger.

PENSIONER, in the univerſity of Cambridge and in that of Dublin, has a very peculiar meaning; for thoſe ſtudents, either under-graduates or bachelors of arts, are called *penſioners* who live wholly at their own expence, and who receive no emolument whatever from the college of which they are members. They are divided into two kinds, the *greater* and the *leſs*; the former of which are generally called *fellow-commoners*, becauſe they eat with the fellows of their college; the latter are always called *penſioners*, and eat with the ſcholars, who are thoſe ſtudents of the college, either under-graduates or bachelors, who are upon the foundation, who receive emoluments from the ſociety, and who are capable of being elected fellows. See SERVITOR and SIZAR.

PENSTOCK, a ſluice or flood-gate, ſerving to retain or let go at pleaſure the water of a mill-pond, or the like.

PENTACEROS, in natural hiſtory, a name given by Linkius and ſome other authors to a kind of *ſtella marina* or ſea ſtar-fiſh, compoſed of five principal rays, with ſeveral tranſverſe hairy or downy proceſſes.

PENTACHORD, (compounded of πεντε *five*, and χορδη *ſtring*), an ancient muſical inſtrument with five ſtrings. The invention of the pentachord is referred to the Scythians; the ſtrings were of bullock's leather, and they were ſtruck with a plectrum made of goats' horn.

PENTACROSTIC, in poetry, a ſet of verſes ſo diſpoſed, as that there are always five acroſtics of the ſame name, in five diviſions of each verſe. See ACROSTIC.

PENTACTINODOS, in natural hiſtory, a name given by ſome authors to thoſe ſpecies of ſtar-fiſh which are compoſed of a body divided into five rays.

PENTADACTYLON, FIVE FINGERS, in botany, a name given by ſome authors to the *ricinus* or *palma Chriſti*, from the figure of its leaf.

PENTADACTYLOS PISCIS, the *five-fingered fiſh*, in ichthyology, the name of a fiſh common in all the ſeas about the Eaſt Indies, and called by the Dutch there *viif vinger viſch*. See Plate 19.

It has this name from five black ſtreaks which it has on each ſide, reſembling the prints of five fingers. Its head is flat, convex at the bottom, plain in the ſides, and inclined in the forepart. The ſnout is thick, obtuſe, and round; the lower jaw at its extremity bent and rounded; the noſtrils are double; the balls of the eyes oval; the iris of a ſilver colour; the firſt fin of the back is ſmall, the ſecond is more elevated; thoſe of the breaſt are inſerted obliquely, that of the anus is greatly extended, and that of the tail much ſloped. The whole body is covered with ſcales of a moderate ſize, thin, flexible, and ſlightly indented on their hinder edge; the back is reddiſh, the ſides of a ſilver colour, and the fins white. The fiſh is deſcribed by ſome as about nine inches long; by others as a foot and a half. It is a dry but not ill-taſted fiſh.

PENTÆDROSTYLA, in natural hiſtory, the name of a genus of ſpars: (See SPAR). The bodies of this genus are ſpars in form of pentagonal columns, terminated by pentangular pyramids at one end, and regularly affixed at the other to ſome ſolid body.

PENTAGON, in geometry, a figure of five ſides and five angles. See GEOMETRY. In fortification, pentagon denotes a fort with five baſtions.

PENTAGONOTHECA, in botany, the name given by Vaillant to the plant called by Linnæus, Plumier, Houſton, and others, *piſonia*.

PENTAGRAPH, an inſtrument deſigned for drawing figures in what proportion you pleaſe, without any ſkill in the art.

The inſtrument is otherwiſe called a *parallelogram*. The common pentagraph (Plate 34, fig. 14.) conſiſts of four braſs or wooden rulers, two of them from 15 to 18 inches long, the other two half that length. At the ends, and in the middle, of the longer rulers, as alſo at the ends of the ſhorter, are holes, upon the exact fixing whereof the perfection of the inſtrument chiefly depends. Thoſe in the middle of the long rulers are to be at the ſame diſtance from thoſe at the end of the long ones and thoſe of the ſhort ones; ſo that when put together they may always make a parallelogram.

The inſtrument is fitted together for uſe by ſeveral little pieces, particularly a little pillar, N° 1. having at one end a ſcrew and nut, whereby the two long rulers are joined; and at the other a little knot for the inſtrument to ſlide on. The piece N° 2. is a rivet with a ſcrew-and nut, wherewith each ſhort ruler is faſtened to the middle of each long one. The piece N° 3. is a pillar, one end whereof, being hollowed into a ſcrew, has a nut fitted to it. At the other end is a worm to ſcrew into the table; when the inſtrument is to be uſed, it joins the ends of the two ſhort rulers. The piece N° 4. is a pen, portcrayon, or pencil, ſcrewed into a little pillar. Laſtly, the piece N° 5. is a braſs point, moderately blunt, ſcrewed likewiſe into a little pillar.

Uſe of the PENTAGRAPH, or *Parallelogram*. 1. To copy a deſign in the ſame ſcale or bigneſs as the original: ſcrew the worm N° 3. into the table; lay a paper under the pencil N° 4. and the deſign under the point N° 5. This done, conducting the point over the ſeveral lines and parts of the deſign, the pencil will draw or repeat the ſame on the paper.

2. If the deſign be to be reduced—*e. gr.* into half the ſpace, the worm muſt be placed at the end of the long ruler, N° 4. and the paper and pencil in the middle. In this ſituation conduct the braſs point over the ſeveral lines of the deſign, as before; and the pencil at the ſame time will draw its copy in the proportion required; the pencil here only moving half the lengths that the point moves.

Hence, on the contrary, if the deſign be to be enlarged by one half, the braſs point, with the deſign, muſt be placed in the middle, at N° 3. the pencil and paper at the end of the long ruler, and the worm at the other.

3. To enlarge or reduce in other proportions, there are holes drilled at equal diſtances on each ruler, *viz.* all along the ſhort ones, and half way of the long ones, in order for placing the braſs point, pencil, and worm, in a right line therein; *i. e.* if the piece carrying the point be put in the third hole, the two other pieces muſt be put in its third hole.

If, then, the point and deſign be placed at any hole of the great rulers, and the pencil with the paper at any hole of the ſhort ruler, which forms the angle therewith, the copy will be leſs than half the original. On the contrary, if it be placed at one of the holes of that ſhort ruler, which is parallel to the long ruler, the copy will be greater than half the original.

The conſtruction of this inſtrument requires a degree of accuracy which moſt of our inſtrument-makers are ſtrangers to; for which reaſon there are very few of the inſtruments that ſucceed. Few will do any thing tolerably but ſtraight lines; and many of them not even thoſe.

In order to prove that the figure deſcribed by a pentagraph is ſimilar to the given figure, let C (fig. 15.) be the fixed centre of motion; P the pencil for tracing the given figure PP, and *p* the pencil which traces the other figure *pp*; *p*, &c. muſt be ſo adjuſted, that *p*, C, and P, may lie in one ſtraight line; then, ſince B*p* : A*p* : : BP : AC, whatever be the ſituation of the pentagraph, the angles PCP and *p*C*p* are vertical; and therefore PC*p* will in every poſition of the inſtrument be a right line: but PC : *p*C : : BA : A*p*, in each of the two poſitions in the figure, and conſequently the triangles PCP, *p*C*p*, are ſimilar; and PP : *pp* (: : PC : *p*C) : : BA : A*p*, or in a given ratio. Hence it appears, that, by moving the pencil *p*, A*p* may be equal to BA, or leſs in any proportion; and conſequently *pp* may be equal to PP, or leſs, in the ſame proportion.

PENTAMETER, in ancient poetry, a kind of verſe, conſiſting of five feet, or metres; whence the name. The two firſt feet may be either dactyls or ſpondees at pleaſure; the third is always a ſpondee; and the two laſt anapeſtes: ſuch is the following verſe of Ovid:

1 2 3 4 5
Carmini|bus vi|ves tem'pus in o|mne meis.

A pentameter verſe ſubjoined to an hexameter conſtitutes what is called *elegiac*. See ELEGIAC.

PENTANDRIA, (from πεντε *five*, and ανηρ *a man* or *huſband*); the name of the fifth claſs in Linnæus's ſexual method, conſiſting of plants which have hermaphrodite flowers, with five ſtamina or male organs. See BOTANY.

PENTAPETALOUS, an appellation given to flowers which conſiſt of five petals or leaves.

PENTAPETES, in botany: A genus of the dodecandria order, belonging to the monadelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The calyx is quinquepartite; the ſtamina are 20 in number, of which five are caſtrated and long; the capſule quinquelocular and polyſpermous. There is but one ſpecies known in the gardens of this country, *viz.* the phœnicia, with halbert-pointed, ſpear-ſhaped, ſawed leaves. It is an annual plant, a native of India, and riſes to the height of two or three feet, adorned with fine ſcarlet flowers, conſiſting of one petal cut into five ſegments. In the centre of the flower ariſes a ſhort thick column, to which adhere 15 ſhort ſtamina. It is a tender plant, and muſt be brought up in the hot-houſe.

PENTAPOLIS. This name is given to the five cities, Sodom, Gomorrah, Adamah, Zeboim, and Zoar, (Wiſdom, x. 6.) They were all five condemned to utter deſtruction; but Lot interceded for the preſervation of Zoar, otherwiſe called *Bala*. Sodom, Gomorrah, Adamah, and Zeboim, were all conſumed by fire from heaven; and in the place where they ſtood was made the lake Aſphaltites, or the lake of Sodom.

Pentapolis (Ptolemy), a diſtrict of Cyrenaica, ſituated on the Mediterranean; denominated from its five cities, namely, Berenice, Arſinoe, Ptolemais, Cyrene, and Apollonia.

Pentapolis *of the Philiſtines* (Joſephus); taking name from five principal cities, Gaza, Gath, Aſcalon, Azotus, and Ekron.

PENTATEUCH. This word, which is derived from the Greek Πενταteυχος, from πενὲ *five*, and τευχος an *inſtrument* or *volume*, ſignifies the collection of the five inſtruments or books of Moſes, which are Geneſis, Exodus, Leviticus, Numbers, and Deuteronomy; each of which books we have given an account of under their ſeveral names.

There are ſome modern critics who have diſputed Moſes's right to the pentateuch. They obſerve, that the author ſpeaks always in the third perſon. "Now the man Moſes was very meek, above all the men which were upon the face of the earth. The Lord ſpake unto Moſes, ſaying, &c. Moſes ſaid to Pharaoh, &c." Thus they think he would never have ſpoken of himſelf, but would at leaſt ſometimes have mentioned himſelf in the firſt perſon. Beſides this, ſay they, the author of the pentateuch ſometimes abridges his narration, like a writer who collected from ſome ancient memoirs. Sometimes he interrupts the thread of his diſcourſe; for example, he makes Lamech the bigamiſt to ſay, (Gen. iv. 23.) "Hear my voice, ye wives of Lamech, hearken unto my ſpeech; for I have ſlain a man to my wounding, and a young man to my hurt:" without informing us before-hand to whom this is related. Theſe obſervations, for example, (Gen. xii. 6.) "And the Canaanite was then in the land," cannot be reconciled to the age of Moſes, ſince the Canaanites continued to be the maſters of Paleſtine all the time of Moſes. The paſſage out of the book of the wars of the Lord, quoted in the Book of Numbers (xxi. 14), ſeems to have been clapped in afterwards, as alſo the firſt verſes of Deuteronomy. The account of the death of Moſes, which is at the end of the ſame book, cannot certainly belong to this legiſlator; and the ſame judgment may be made of other paſſages, wherein it is ſaid, that the places mentioned lay beyond Jordan; that the bed of Og was at Ramah to this day; that the havoth of Jair, or the cities of Jair, were known to the author, though probably they had not that name till after Moſes's time (Numb. xxxii. 41. Deut. iii. 14.)

It is obſerved alſo, in the text of the pentateuch, that there are ſome places that are defective; for example, (in Exodus (xii. 8.) we ſee Moſes ſpeaking to Pharaoh, where the author omits the beginning of his diſcourſe. The Samaritan inſerts in the ſame place what is wanting in the Hebrew. In other places, the ſame Samaritan copy adds what is deficient in the Hebrew text; and what it contains more than the Hebrew ſeems ſo well connected with the reſt of the diſcourſe, that it would be difficult to ſeparate them. Laſtly, they believe that they obſerve certain ſtrokes in the pentateuch which can hardly agree with Moſes, who was born and bred in Egypt; as what he ſays of the earthly paradiſe, of the rivers that watered it, and ran through it; of the cities of Babylon, Erech, Reſen, and Calneh; of the gold of Piſon, of the bdellium, of the ſtone of Sohem, or onyx-ſtone, which was to be found in that country. Theſe particulars, obſerved with ſuch curioſity, ſeem to prove, that the author of the pentateuch lived beyond the Euphrates. Add what he ſays concerning the ark of Noah, of its conſtruction, of the place where it reſted, of the wood wherewith it was built, of the bitumen of Babylon, &c. But in anſwer to all theſe objections, we may obſerve in general, from an eminent writer of our own country, that theſe books are, by the moſt ancient writers, aſcribed to Moſes; and it is confirmed by the authority of heathen writers themſelves, that they are of his writing: beſides this, we have the unanimous teſtimony of the whole Jewiſh nation, ever ſince Moſes's time, from the firſt writing of them. Divers texts of the pentateuch imply that it was written by Moſes; and the Book of Joſhua, and other parts of Scripture, import as much; and though ſome paſſages have been thought to imply the contrary, yet this is but a late opinion, and has been ſufficiently confuted by ſeveral learned men. The Samaritans receive no other Scriptures but the pentateuch, rejecting all the other books which are ſtill in the Jewiſh canon.

PENTATHLON, in antiquity, a general name for the five exerciſes performed at the Grecian games, *viz.* wreſtling, boxing, leaping, running, and playing at the diſcus.

PENTECOST, a ſolemn feſtival of the Jews, ſo called becauſe it was celebrated on the 50th day after the 16th of Niſan, which was the ſecond day of the paſſover. The Hebrews called it *the feaſt of weeks*, becauſe it was kept ſeven weeks after the paſſover. They then offered the firſt-fruits of the wheat harveſt, which was then completed; beſides which, they preſented at the temple ſeven lambs of that year, one calf, and two rams, for a burnt-offering; two lambs for a peace offering; and a goat for a ſin-offering; (Levit. xxiii. 15, 16; Exod. xxxiv. 22; and Deut. xvi. 9, 10.) The feaſt of the pentecoſt was inſtituted among the Iſraelites, firſt to oblige them to repair to the temple of the Lord, there to acknowledge his abſolute dominion over the whole country, and to offer him the firſt-fruits of their harveſt; and, ſecondly, that they might call to mind, and give thanks to God for, the law which he had given them from Mount Sinai, on the 50th day after their coming out of Egypt.

The modern Jews celebrate the pentecoſt for two days. They deck the ſynagogue and their own houſes with garlands of flowers. They hear a ſermon or oration in praiſe of the law, which they ſuppoſe to have been delivered on this day. The Jews of Germany make a very thick cake, conſiſting of ſeven layers of paſte, which they call *Sinai*. The ſeven layers repreſent the ſeven heavens, which they think God was obliged to reaſcend from the top of this mountain. See *Leo of Modena* and *Buxtorf's Synag. Jud.*

It was on the feaſt of pentecoſt that the Holy Ghoſt miraculouſly deſcended on the apoſtles of our Lord, who were aſſembled together after his aſcenſion in a houſe at Jeruſalem. (Acts ii.)

PENTHESILEA, queen of the Amazons, ſucceeded Orythia, and gave proofs of her courage at the ſiege of Troy, where ſhe was killed by Achilles. Pliny ſays that ſhe invented the battle-axe.

PENTHORUM, in botany; a genus of the pentagynia order, belonging to the pentandria claſs of plants. The calyx is quinquefid; there are either five petals or none; the capſule is five-pointed and quinquelocular.

PENTLAND or Pictland Frith is a narrow ſtrait of ſix miles between the mainland of Scotland and the Orkney iſles. This ſtrait is the great thoroughfare of ſhipping between the eaſtern and weſtern ſeas, the terror of the boldeſt mariners, and the grave of thouſands; where the winter's ſtorms afford many natives on the oppoſite ſhores a better livelihood than they could obtain by fiſhing or huſbandry. They ſearch from place to place, and from one cavern to another, in the hopes of finding timber, caſks, and other floating articles of the wrecked veſſels, of which ſix or eight are thus ſacrificed ſometimes in

one night. The navigation of this paſs is rendered more dangerous by the iſland of Stroma, and two rocks called the *Skerries*, lying near the middle of it. See PICTLAND.

PENULA, among the ancient Romans, was a coarſe garment or cloak worn in cold or rainy weather. It was ſhorter than the lacerna, and therefore more proper for travellers. It was generally brown, and ſucceeded the toga after the ſtate became monarchical. Auguſtus aboliſhed the cuſtom of wearing the penula over the toga, conſidering it as too effeminate for Romans; and the ædiles had orders to ſuffer none to appear in the circus or forum with the lacerna or penula. Writers are not agreed as to the preciſe difference between theſe two articles of dreſs; but we are told that they were chiefly worn by the lower orders of people. See LACERNA.

PENULTIMA, or PENULTIMATE *Syllable*, in grammar, denotes the laſt ſyllable but one of a word; and hence the antepenultimate ſyllable is the laſt but two, or that immediately before the penultima.

PENUMBRA, in aſtronomy, a partial ſhade obſerved between the perfect ſhadow and the full light in an eclipſe. It ariſes from the magnitude of the ſun's body; for, were he only a luminous point, the ſhadow would be all perfect; but, by reaſon of the diameter of the ſun, it happens that a place which is not illuminated by the whole body of the ſun does yet receive rays from a part thereof.

PEON, in the language of Hindoſtan, means a foot-ſoldier armed with ſword and target. In common uſe it is a footman, ſo armed, employed to run before a palanquin. *Piadah* is the proper word, from which *peon* is a corruption.

PEOR, a famous mountain beyond Jordan, which Euſebius places between Heſhbon and Livias. The mountains Nebo, Piſgah, and Peor, were near one another, and probably made but the ſame chain of mountains. It is very likely that Peor took its name from ſome deity of the ſame name, which was worſhipped there; for Peor, Phegor, or Baal peor, was known in this country. See Numb. xxv. 3; Deut. iv. 3; Pſ. cv. 28.

PEOR was a city of the tribe of Judah, which is not read in the Hebrew, nor in the Vulgate, but only in the Greek of the Septuagint, (Joſh. xv. 60). Euſebius ſays it was near Bethlehem; and Jerom adds, that in his time it was called *Paora*.

PEPIN DE HERISTAL, or LE GROS, mayor of the palace under Clovis III. Childebert, and Dagobert. The power of theſe mayors in France was ſo great, that they left the ſovereign only the empty title, and in the end ſeized on the throne itſelf.

PEPIN *le Brief*, or *le Petit*, grandſon to Pepin le Gros, and firſt king of the ſecond race of French monarchs, was mayor of the palace to Childeric III. a weak prince. He contrived to confine him and his ſon Thierri in different monaſteries; and then, with the aſſiſtance of pope Stephen III. he uſurped the ſovereign power. He died in 768, aged 54.

PEPLIS, in botany; a genus of the monogynia order, belonging to the hexandria claſs of plants, and in the natural method ranking under the 17th order, *Calycanthemæ*. The perianthium is campanulated; the mouth cleft in 12 parts; there are ſix petals inſerted into the calyx; the capſule is bilocular.

PEPLUS, a long robe worn by the women in ancient times, reaching down to the feet, without ſleeves, and ſo very fine that the ſhape of the body might be ſeen through it. The Athenians uſed much ceremony in making the peplus, and dreſſing the ſtatue of Minerva with it. Homer makes frequent mention of the peplus of that goddeſs.

PEPPER, PIPER, in natural hiſtory, an aromatic berry of a hot dry quality, chiefly uſed in ſeaſoning. We have three kinds of pepper at preſent uſed in the ſhops; the black, the white, and the long pepper. 1. Black pepper is the fruit of the piper, and is brought from the Dutch ſettlements in the Eaſt-Indies. (See PIPER.) 2. The common white pepper is factitious, being prepared from the black in the following manner: they ſteep this in ſea-water, expoſed to the heat of the ſun for ſeveral days, till the rind or outer bark looſens; they then take it out, and, when it is half dry, rub it till the rind falls off; then they dry the white fruit, and blow the remains of the rind away like chaff. A great deal of the heat of the pepper is taken off by this proceſs, ſo that the white kind is more fit for many purpoſes than the black. However, there is a ſort of native white pepper produced on a ſpecies of the ſame plant, which is much better than the factitious, and indeed little inferior to the black. 3. The long pepper is a dried fruit, of an inch or an inch and a half in length, and about the thickneſs of a large gooſe-quill: it is of a browniſh grey colour, cylindrical in figure, and ſaid to be produced on a plant of the ſame genus.

Pepper is principally uſed by us in food, to aſſiſt digeſtion; but the people in the Eaſt-Indies eſteem it as a ſtomachic, and drink a ſtrong infuſion of it in water by way of giving them an appetite. They have alſo a way of making a fiery ſpirit of fermented freſh pepper with water, which they uſe for the ſame purpoſes. They have alſo a way of preſerving the common and long pepper in vinegar, and eating them afterwards at meals.

Jamaica PEPPER, or *Pimento*. See PIMENTO.

PEPPER-*Mint*. See MENTHA.

PEPPER-*Pot*. See CAPSICUM.

PEPPER-*Water*, a liquor prepared in the following manner, for microſcopical obſervations: Put common black pepper, groſsly powdered, into an open veſſel, ſo as to cover the bottom of it half an inch thick, and put to it rain or river water, till it covers it an inch: ſhake or ſtir the whole well together at the firſt mixing, but never diſturb it afterwards. Let the veſſel be expoſed to the air uncovered, and in a few days there will be ſeen a pellicle or thin ſkin ſwimming on the ſurface of the liquor, looking of ſeveral colours.

This is a congeries of multitudes of ſmall animals; and being examined by the microſcope, will be ſeen all in motion: the animals, at firſt ſight, are ſo ſmall as not to be diſtinguiſhable, unleſs to the greateſt magnifier; but they grow daily till they arrive at their full ſize. Their numbers are alſo continually increaſing, till the whole ſurface of the liquor is full of them, to a conſiderable depth. When diſturbed, they will ſometimes all dart down to the bottom; but they ſoon after come up to the ſurface again. The ſkin appears ſooneſt in warm weather, and the animals grow the quickeſt: but in the ſevereſt cold it will ſucceed, unleſs the water freezes.

About the quantity of a pin's head of this ſcum, taken up on the nib of a new pen, or the tip of a hair pencil, is to be laid on a plate of clear glaſs; and if applied firſt to the third magnifier, then to the ſecond, and finally to the firſt, will ſhow the different animalcules it contains, of ſeveral kinds and ſhapes as well as ſizes.

PEPPERMINT-TREE, in botany; the *Eucalyptus piperita*. See Plate 32. In a journal of a voyage to New South Wales, by John White, Eſq. we have a plate of this tree, with the following account of it: "This tree grows to the height of more than 100 feet, and is above 30 feet in circumference. The bark is very ſmooth, like that of the poplar. The younger branches are long and ſlender, angulated near the top; but as they grow older, the angles diſappear. Their bark is ſmooth, and of a reddiſh brown. The leaves are alternate, lanceolate, pointed, very entire, ſmooth on both ſides, and remarkably unequal or oblique at their baſe; the veins alternate, and not very conſpicuous. The whole ſurface of both ſides of the leaves is marked with numerous minute reſinous ſpots, in which the eſſen-

tial oil reſides. The footſtalks are about half an inch in length, round on the under ſide, angular above, quite ſmooth. The flowers we have not ſeen. What Mr. White has ſent as the ripe capſules of this tree (although not attached to the ſpecimens of the leaves) grow in cluſters, from ſix to eight in each, ſeſſile and conglomerated. Theſe cluſters are ſupported on angular alternate footſtalks, which form a kind of panicle. Each capſule is about the ſize of an hawthorn berry, globular, but as it were cut off at the top, rugged on the outſide, hard and woody, and of a dark-brown colour. At the top is a large orifice, which ſhows the internal part of the capſule divided into four cells, and having a ſquare column in the centre, from which the partitions of the cell ariſe. Theſe partitions extend to the rim of the capſule, and terminate in four ſmall projections, which look like the teeth of a calyx. The ſeeds are numerous, ſmall, and angular.

"The name of *peppermint tree* has been given to this plant by Mr. White, on account of the very great reſemblance between the eſſential oil drawn from its leaves and that obtained from the peppermint *(mentha piperita)* which grows in England. This oil was found by Mr. White to be much more efficacious in removing all colicky complaints than that of the Engliſh peppermint, which he attributes to its being leſs pungent, and more aromatic. A quart of the oil has been ſent by him to Mr. Wilſon.

"The tree above deſcribed appears to be undoubtedly of the ſame genus with that cultivated in ſome greenhouſes in England, which Mr. L'Heritier has deſcribed in his *Sertum Anglicum* by the name of *Eucalyptus obliqua*, though it is commonly called in the gardens *Metroſideros obliqua*; but we dare not aſſert it to be the ſame ſpecies, nor can this point be determined till the flowers and every part of both be ſeen and compared; we have compared the beſt ſpecimens we could procure of each, and find no ſpecific difference. The eucalyptus obliqua has, when dried, an aromatic flavour, ſomewhat ſimilar to our plant. We have remarked, indeed, innumerable minute white ſpots, beſides the reſinous ones, on both ſurfaces of the leaves in ſome ſpecimens of the garden plant, which are not to be ſeen in ours; and the branches of the former are rough, with ſmall ſcaly tubercles. But how far theſe are conſtant, we cannot tell. The obliquity in the leaves, one ſide being ſhorter at the baſe than the other, as well as ſomewhat narrower all the way up, as in the *Begonia nitida* of the *Hortus Kewenſis*, is remarkable in both plants.

"The figure repreſents a branch of the peppermint tree in leaf: on one ſide of it part of a leaf ſeparate, bearing the gall of ſome inſect; on the other the fruit above deſcribed."

PERA, one of the ſuburbs of Conſtantinople, where ambaſſadors and chriſtians uſually reſide. See CONSTANTINOPLE.

PERAMBULATOR, in ſurveying, an inſtrument for meaſuring diſtances, called alſo *pedometer*, *way-wiſer*, and *ſurveying-wheel*. See PEDOMETER and Pl. 24.

It conſiſts of a wheel AA, two feet ſeven inches and a half in diameter; conſequently half a pole, or eight feet three inches, in circumference. On one end of the axis is a nut, three quarters of an inch in diameter, and divided into eight teeth; which, upon moving the wheel round, fall into the eight teeth of another nut *c*, fixed on one end of an iron-rod Q, and thus turn the rod once round in the time the wheel makes one revolution. This rod, lying along a groove in the ſide of the carriage of the inſtrument, under the dotted line, has at its other end a ſquare hole, into which is fitted the end *b* of a ſmall cylinder P. This cylinder is diſpoſed under the dial-plate of a movement, at the end of the carriage B, in ſuch a manner as to be moveable about its axis: its end *a* is cut into a perpetual ſcrew, which falling into the 32 teeth of a wheel perpendicular thereto, upon driving the inſtrument forward, that wheel makes a revolution each 16th pole. On the axis of this wheel is a pinion with ſix teeth, which, falling into the teeth of another wheel of 60 teeth, carries it round every 160th pole, or half a mile.

This laſt wheel, carrying a hand or index round with it over the diviſions of a dial-plate, whoſe outer limb is divided into 160 parts, correſponding to the 160 poles, points out the number of poles paſſed over. Again, on the axis of this laſt wheel is a pinion, containing 20 teeth, which falling into the teeth of a third wheel which hath 40 teeth, drives it once round in 320 poles, or a mile. On the axis of this wheel is a pinion of 12 teeth, which, falling into the teeth of a fourth wheel having 72 teeth, drives it once round in 12 miles.

This fourth wheel, carrying another index over the inner limb of the dial-plate, divided into 12 for miles, and each mile ſubdivided into halves, quarters, and furlongs, ſerves to regiſter the revolutions of the other hand, and to keep account of the half miles and miles paſſed over as far as 12 miles.

The uſe of this inſtrument is obvious from its conſtruction. Its proper office is in the ſurveying of roads and large diſtances, where a great deal of expedition, and not much accuracy, is required. It is evident, that driving it along and obſerving the hands, has the ſame effect as dragging the chain, and taking account of the chains and links.

Its advantages are its hardineſs and expedition; its contrivance is ſuch, that it may be fitted to the wheel of a coach, in which ſtate it performs its office, and meaſures the road without any trouble at all.

PERCA, the PERCH; a genus of fiſhes belonging to the order of thoracici. The head is furniſhed with ſcaly and ſerrated opercula; there are ſeven rays in the membrane of the gills; and the fins on the back are prickly. There are 38 ſpecies, principally diſtinguiſhed by peculiarities in the back fin. The moſt remarkable are:

1. The *fluviatilis*, or common perch, hath a deep body, very rough ſcales, and the back much arched. The colours are beautiful; the back and part of the ſides being of a deep green, marked with five broad black bars pointing downwards; the belly is white, tinged with red; the ventral fins of a fine ſcarlet; the anal fins and tail of the ſame colour, but rather paler. In a lake called *Llyn Raithlyn*, in Merionethſhire in Wales, is a very ſingular variety of this fiſh; the back part is quite hunched, and the lower part of the back-bone next the tail ſtrangely diſtorted: in colour and other reſpects it reſembles the common perch, which are as numerous in this lake as the deformed fiſh. They are not peculiar to this water; for Linnæus takes notice of them in a lake at Fahlun in his country. It is ſaid that they are alſo met with in the Thames near Marlow.

The perch was much eſteemed as food by the Romans, nor is it leſs admired at preſent as a firm and delicate fiſh; and the Dutch are particularly fond of it when made into a diſh called *water-ſoucky*. It is a gregarious fiſh; and loves deep holes and gentle ſtreams; is exceedingly voracious, and an eager biter: if the angler meets with a ſhoal of them, he is ſure of taking every one. It is a common notion that the pike will not attack this fiſh, on account of the ſpiny fins which the perch erects on its approach. This may be true of large fiſh; but it is well known that ſmall perches are the moſt tempting bait which can be laid for the pike. The perch is very tenacious of life, and has been known to ſurvive a journey of 60 miles in dry ſtraw. It ſeldom grows to a large ſize, though Mr. Pennant mentions one that weighed nine pounds; but this, he tells us, is very uncommon.

2. The *labrax*, or baſſe, is a very voracious, ſtrong, and active fiſh. Ovid calls them *rabidi lupi*, a name continued to them by after-writers; and they are ſaid to grow to the weight

of fifteen pounds. The irides are filvery; the mouth large; the teeth are fituated in the jaws, and are very fmall: in the roof of the mouth is a triangular rough fpace, and juft at the gullet are two others of a roundifh form. The fcales are of a middling fize, are very thick fet, and adhere clofely. The body is formed fomewhat like that of a falmon. The colour of the back is dufky, tinged with blue. The belly is white. In young fifh the fpace above the fide-line is marked with fmall black fpots. It is eſteemed a very delicate fifh.

3. The *perca marina*, or fea-perch, is about a foot long: the head large and deformed; eyes great; teeth fmall and numerous. On the head and covers of the gills are ſtrong fpines. The colour red, with a black fpot on the covers of the gills, and fome tranfverfe dufky lines on the fides. It is a fifh held in fome eſteem at the table.

4. The *cernua*, or ruffe, is found in feveral of the Engliſh ſtreams: it is gregarious, aſſembling in large ſhoals, and keeping in the deepeſt part of the water. It is of a much more ſlender form than the perch, and ſeldom exceeds ſix inches in length. The teeth are very ſmall, and diſpoſed in rows. It has only one dorſal fin, extending along the greateſt part of the back; the firſt rays, like thoſe of the perch, are ſtrong, ſharp, and ſpiny; the others ſoft. The body is covered with rough compact ſcales. The back and ſides are of a dirty green, the laſt inclining to yellow, but both ſpotted with black. The dorſal fin is ſpotted with black; the tail marked with tranſverſe bars.

5. The *nilotica*, or perch of the Nile, is taken about Cairo. The fleſh has a ſweet and exquiſite flavour, and is not hard, but very white. It is one of the beſt fiſhes in the Nile; and as it is of the largeſt ſize in Egypt, it adorns a table if brought upon it entire and well fried. See Pilot-*Fiſh*.

PERCEPTION, is a word which cannot but be well underſtood, though it is difficult for the lexicographer to give any explanation of it. It has been called the firſt and moſt ſimple act of the mind by which it is conſcious of its own ideas. This definition, however, is improper, as it confounds perception with conſciouſneſs; although the objects of the former faculty are things without us, thoſe of the latter the energies of our own minds. Perception is that power or faculty by which, through the medium of the ſenſes, we have the cognizance of objects diſtinct and apart from ourſelves, and learn that we are but a ſmall part in the ſyſtem of nature. By what proceſs the ſenſes give us this information, we have endeavoured to ſhow elſewhere, (ſee Metaphysics); and we ſhould not again introduce the ſubject, but to notice a ſingular opinion of a very able writer, whoſe work has been given to the public ſince our article alluded to had iſſued from the preſs.

Dr. Sayers, who is an ornament to that ſchool in which we are ſtrongly inclined to enliſt ourſelves, has endeavoured to prove that no man can perceive two objects, or be conſcious of two ideas, at the ſame inſtant. If this be true, not only our theory of time is groſsly abſurd, but even memory itſelf ſeems to be an imaginary faculty. If a man be not conſcious of his preſent exiſtence, at the very inſtant when he thinks of a paſt event, or reviews a ſeries of paſt tranſactions, it is difficult, to us indeed impoſſible, to conceive what idea he can have of time, or what he can mean when he ſays that he remembers a thing. But let us examine the reaſoning by which the ingenious author endeavours to eſtabliſh his opinion.

"If we reflect (ſays he in his "Diſquiſitions Metaphyſical and Literary,") upon the ſurpriſing velocity with which ideas paſs through the mind, and the remarkable rapidity with which the mind turns itſelf, or is directed, from one object of contemplation to another, this might alone give us ſome ſuſpicion that we may probably be miſtaken in ſuppoſing ideas to be ſynchronouſly perceived. Other arguments may be adduced to ſtrengthen this ſuſpicion. It will be granted, I believe, that the mind, whether immaterial or the reſult of organization, has certainly a wholeneſs or unity belonging to it, and that it is either not compoſed of parts, or that no one of the parts from which it originates is itſelf mind: in this caſe, it is difficult to conceive how two ideas ſhould be impreſſed upon the mind at the ſame inſtant; for this would be ſuppoſing that part of the mind could receive one idea, and part another, at the ſame time; but if the parts do not perceive ſingly, this is evidently impoſſible. If, on the other hand, this ſelf-diviſion of the mind does not take place, then if two ideas are nevertheleſs to be perceived at the ſame inſtant, it would ſeem that thoſe ideas muſt be ſo blended with each other, that neither of them could appear diſtinct. If we examine the manner in which a complex idea is perceived, we ſhall find very clearly, that the whole of ſuch an idea is never preſent to the mind at once. In thinking of a centaur, for inſtance, can we at the ſame moment be thinking of the parts of a man and the parts of a horſe? Can we not almoſt detect the gliding of the mind from the one to the other? In contemplating the complex idea of gold, are the ideas of its colour, ductility, hardneſs, and weight, all preſent to the mind at the ſame inſtant? I think, if we accurately attend to it, we ſhall find a perceptible time has elapſed before this complex idea has been perfectly formed in our mind: but if all the parts of a complex idea cannot be recalled at the ſame inſtant, is it not reaſonable to infer that theſe parts are alſo ſingly impreſſed, and not all originally perceived at the ſame inſtant?"

This reaſoning is plauſible, but perhaps not convincing. Surely we have all been conſcious of bodily pain or pleaſure with our eyes open, and been offended by diſagreeable ſmells at the very inſtant that we looked at objects beautifully coloured. That our ideas paſs through the mind with great velocity, and that the mind can rapidly turn itſelf from one ſubject of contemplation to another, are truths which cannot be controverted; but inſtead of leading us to ſuppoſe that two or more objects cannot be ſynchronouſly perceived, or two or more ideas ſynchronouſly apprehended, they appear to furniſh a complete proof of the reverſe of all this. For we beg leave to aſk how we come to know that ideas paſs with velocity through the mind, if we be not all the while conſcious of ſomething that is permanent? If we can contemplate but one idea at once, it is plainly impoſſible that two or more can be compared together; and therefore we cannot poſſibly ſay that any particular train has paſſed through the mind with a degree of velocity greater or leſs than that which we have uſually experienced; nay, we cannot ſay that we have ever experienced a train of ideas at all, or even been conſcious of a ſingle idea, beſides the immediate object of preſent apprehenſion. That the mind is an individual, we moſt readily grant; but that it ſhould therefore be incapable of having *two* ideas ſynchronouſly excited in it, is a propoſition for which the author has brought no evidence. That it is difficult to conceive *how* this is done, we acknowledge; but not that it is more difficult than to conceive how a *ſingle* idea is excited in the mind; for, of the mode in which mind and matter mutually operate upon each other we can form no conception. We know that objects make an impreſſion on the organs of ſenſe; that this impreſſion is by the nerves communicated to the brain, and that the agitation of the brain excites ſenſation in the mind: but in *what way* it excites ſenſation we know not; and therefore have no reaſon to ſuppoſe that two or more different agitations may not excite two or more ſynchronous ſenſations, as well as one agitation excites one ſenſation. That the agitation given to the brain operates on the mind, is known by experience; but experience gives us no information reſpecting the *mode* of that operation. If the mind be, as our author and we ſuppoſe, one individual, it cannot, as mind, be either diviſible or

extended; and therefore it is certain that the operation in queſtion cannot be, in the proper ſenſe of the word, impreſſion. Hence we have no right to infer, if two objects be perceived at once, either that the idea of the one muſt be impreſſed on a part of the mind different from that which receives the impreſſion of the other, or that the two impreſſions muſt be ſo blended with each other, that neither of them could appear diſtinct; for this would be to reaſon from one mode of operation to another; with which, upon acknowledged principles, it can have nothing in common.

By far the greater part of our ideas are relicks of *viſible* ſenſations; and of every thing which we can actually ſee at once, we may at once contemplate the idea. That we could at once perceive a centaur, if ſuch a being were preſented to us, cannot ſurely be doubted by any one who has ever looked at a man on horſeback; and therefore that we can at the ſame moment contemplate the whole idea of a centaur, is a fact of which conſciouſneſs will not permit us to doubt. If, indeed, we chooſe to analyze this complex idea into its component parts, it is ſelf-evident that the mind muſt glide from the one to the other, becauſe the very analyſis conſiſts in the ſeparation of the parts, of which, if after that proceſs we think of them, we muſt think in ſucceſſion: but that we may have at the ſame inſtant, either an actual or ideal view of all the parts of the centaur united, is a propoſition ſo evident as to admit of no other proof than an appeal to experience. In contemplating what the author calls the complex idea of gold, it cannot be denied that the ideas of its colour, ductility, hardneſs, and weight, are never all preſent to the mind at the ſame inſtant: but the reaſon is obvious. Theſe are not all *ideas*, in the proper ſenſe of the word, but ſome of them are ideas, and ſome notions, acquired by very different proceſſes and very different faculties. Colour is an idea of ſenſation, immediately ſuggeſted through the organ of ſight; ductility is a relative notion, acquired by repeated experiments; and gold might be made the object of every ſenſe, without ſuggeſting any ſuch notion. The writer of this article never ſaw an experiment made on the ductility of gold, and has therefore a very obſcure and indiſtinct notion of that property of the metal; but he is conſcious, that he can perceive, at the ſame inſtant, the yellow colour and circular figure of a guinea, and have a very diſtinct, though relative, notion of its hardneſs.

We conclude, therefore, that the mind is capable of two or more ſynchronous perceptions, or ſynchronous ideas; that, during every train which paſſes through it, it is conſcious of its own permanent exiſtence; and that, if it were limited to the apprehenſion of but one idea at once, it could have no remembrance of the paſt, or anticipation of the future, but would appear to itſelf, could it make any compariſon, to paſs away like a flaſh of lightning.

PERCH, in land-meaſuring, a rod or pole of 16½ feet in length, of which 40 in length and 4 in breadth make an acre of ground. But, by the cuſtoms of ſeveral counties, there is a difference in this meaſure. In Staffordſhire it is 24 feet; and in the foreſt of Sherwood 25 feet, the foot being there 18 inches long; and in Herefordſhire a perch of ditching is 21 feet, the perch of walling 16½ feet, and a pole of denſhiered ground is 12 feet, &c.

PERCHE, a late province of France, in Orleanois, 35 miles long and 30 broad; bounded on the N. by Normandy, on the W. and S. by Maine, and on the E. by Beauce. It takes its name from a foreſt, and is pretty fertile. It now forms, with part of Normandy, the department of Orne.

PERCOLATION, the ſame with FILTRATION.

PERCUSSION, in mechanics, the impreſſion a body makes in falling or ſtriking upon another; or the ſhock of two bodies in motion.

PERDICIUM, in botany: A genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is naked; the pappus is ſimple; the florets bilabiate.

PERDIX. See TETRAO.

PEREASLAW, a ſtrong and populous town of Poland, in the palatinate of Kiovia, ſituated on the river Tribecz; in E. lon. 32. 41. N. lat. 49. 46.

PERENNIALS, or PERENNIAL FLOWERS, in botany, a term applied to thoſe plants whoſe roots will abide many years, whether they retain their leaves in winter or not. Thoſe which retain their leaves are called *evergreens*; but ſuch as caſt their leaves are named *deciduous*, or *peraitols*.

PERFECT, ſomething to which nothing is wanting, or that has all the requiſites of its nature and kind.

PERFECT *Cadence*, in muſic. See CADENCE.

PERFECT *Tenſe*, in grammar. See PRETERITE.

PERFECTION, the ſtate or quality of a thing PERFECT.

Perfection is divided, according to Chauvinus, into phyſical, moral, and metaphyſical. 1. *Phyſical* or natural perfection, is that whereby a thing has all its powers and faculties, and thoſe too in full vigour; and all its parts both principal and ſecondary, and thoſe in their due proportion, conſtitution, &c. in which ſenſe man is ſaid to be perfect when he has a ſound mind in a ſound body. This perfection is by the ſchools frequently termed ἐνεργητικὴ, becauſe a thing is enabled thereby to perform all its operations. 2. *Moral* perfection is an eminent degree of virtue or moral goodneſs, to which men arrive by repeated acts of piety, beneficence, &c. This is uſually ſubdivided into abſolute or inherent, which is actually in him to whom we attribute it; and imputative, which exiſts in ſome other, and not in him it is attributed to. 3. *Metaphyſical*, tranſcendental, or eſſential perfection, is the poſſeſſion of all the eſſential attributes, or of all the parts neceſſary to the integrity of a ſubſtance; or it is that whereby a thing has or is provided of every thing belonging to its nature. This is either abſolute, where all imperfection is excluded, ſuch is the perfection of God; or *ſecundum quid*, and in its kind.

PERFORANS MANUS.
PERFORANS *Pedis*.
PERFORATUS MANUS.
PERFORATUS *Pedis*.
} See ANATOMY, *Table of the Muſcles*.

PERFUME, denotes either the volatile effluvia from any body affecting the organ of ſmelling, or the ſubſtance emitting thoſe effluvia; in which laſt ſenſe the word is moſt commonly uſed. The generality of perfumes are made up of muſk, ambergris, civet, roſe and cedar woods, orange flowers, jeſſamines, jonquils, tuberoſes, and other odoriferous flowers. Thoſe drugs commonly called aromatics, ſuch as ſtorax, frankincenſe, benzoin, cloves, mace, &c. enter the compoſition of a perfume; ſome are alſo compoſed of aromatic herbs or leaves, as lavender, marjoram, ſage, thyme, hyſſop, &c.

The uſe of perfumes was frequent among the Hebrews, and among the orientals in general, before it was known to the Greeks and Romans. In the time of Moſes perfumes muſt have been known in Egypt, ſince he ſpeaks of the art of the perfumer, and gives the compoſition of two kinds of perfumes (Exod. xxx. 25.), of which one was to be offered to the Lord upon the golden altar which was in the holy place; and the other was appointed for the anointing of the high prieſt and his ſons (*ibid.* 34, &c.), as alſo of the tabernacle, and all the veſſels that were uſed in divine ſervice.

The Hebrews had alſo perfumes which they made uſe of in embalming their dead. The compoſition is not known, but it is certain that they generally made uſe of myrrh, aloes, and

other ſtrong and aſtringent drugs, proper to prevent putrefaction (John xix. 49.). See the article EMBALMING.

Beſides the perfumes for theſe purpoſes, the ſcripture mentions other occaſions whereon the Hebrews uſed perfumes. The ſpouſe in the Canticles (i. 3.) commends the ſcent of the perfumes of her lover; and her lover in return ſays, that the ſcent of the perfumes of his ſpouſe ſurpaſſes the moſt excellent odours, (*id.* iv. 10—14.) He names particularly the ſpikenard, the calamus, the cinnamon, the myrrh, and the aloes, as making a part of theſe perfumes. The voluptuous woman deſcribed by Solomon (Prov. vii. 17.) ſays, that ſhe had perfumed her bed with myrrh, aloes, and cinnamon. The epicures in the book of Wiſdom (ii. 7.) encourage one another to the luxuriant uſe of odours and coſtly perfumes.

Iſaiah (lvii. 9.) reproaches Judea, whom he deſcribes as a ſpouſe faithleſs to God, with being painted and perfumed to pleaſe ſtrangers: "Thou wenteſt to the king with ointment, and didſt increaſe thy perfumes." Ezekiel (xxiii. 41.) ſeems to accuſe the Jews with having profaned the odours and perfumes, the uſe of which was reſerved to ſacred things, by applying them to their own uſe.

They came afterwards to be very common among the Greeks and Romans, eſpecially thoſe compoſed of muſk, ambergris, and civet. The *nardus* and *malobathrum* were held in much eſtimation, and were imported from Syria. The *unguentum nardinum* was variouſly prepared, and contained many ingredients. *Malobathrum* was an Indian plant. Perfumes were alſo uſed at ſacrifices, to regale the gods; at feaſts, to increaſe the pleaſures of ſenſation; at funerals, to overpower cadaverous ſmells, and pleaſe the manes of the dead; and in the theatres, to prevent the offenſive effluvia, proceeding from a crowd, from being perceived.

Since people are become ſenſible of the harm they do to the head, perfumes are generally diſuſed among us; however, they are ſtill common in Spain and Italy.

PERGAMA (Virgil), the citadel of Troy; which, becauſe of its extraordinary height, gave name to all high buildings (Servius). Others ſay the walls of Troy were called *Pergama*.

PERGAMUM, (Pliny); called alſo *Pergamea*, (Virgil); *Pergamia*, (Plutarch); a town of Crete, built by Agamemnon in memory of his victory, (Velleius). Here was the burying-place of Lycurgus, (Ariſtoxenus, quoted by Plutarch). It was ſituated near Cydonia (Servius); to what point not ſaid: but Scylax helps him out, who places the Dactynnean temple of Diana, which ſtood near Cydonia (Strabo), to the north of the territory of Pergamia. Another PERGAMUM (Pliny, Strabo); a town of Myſia, ſituated on the Caicus, which runs by it. It was the royal reſidence of Eumenes, and of the kings of the Attali (Livy). There an ancient temple of Æſculapius ſtood; an aſylum (Tacitus). The ornament of Pergamum was the royal library, vying with that of Alexandria in Egypt; the kings of Pergamum and Egypt rivalling each other in this reſpect (Pliny). Strabo aſcribes this rivalry to Eumenes. Plutarch reckons up 200,000 volumes in the library at Pergamum. Here the *membranæ pergamenæ*, whence the name *parchment*, were invented for the uſe of books, (Varro, quoted by Pliny). The country of Galen, and of Oribaſius chief phyſician to Julian the apoſtate (Eunapius), called by ſome the *ape of Galen*. Here P. Scipio died (Cicero). Attalus ſon of Eumenes dying without iſſue, bequeathed his kingdom to the Roman people, who reduced it to a province, (Strabo). *Pergameus*, the epithet (Martial). Here was one of the nine *conventus juridici*, or aſſemblies of the *Aſia Romana*, called *Pergamenus*, and the ninth in order (Pliny); which he alſo calls *juriſdictio Pergamena*.

PERGAMUS, an ancient kingdom of Aſia, formed out of the ruins of the empire of Alexander the Great. It commenced about the year 283. The firſt ſovereign was one Philetærus an eunuch, by birth a Paphlagonian, of a mean deſcent, and in his youth a menial ſervant to Antigonus one of Alexander's captains. He afterwards ſerved Lyſimachus king of Macedon and Thrace, who appointed him keeper of his treaſures lodged in Pergamus. While he held this employment, having fallen under the diſpleaſure of Arſinoe wife to Lyſimachus, ſhe found means to make a quarrel between him and his maſter; upon which Philetærus ſeized on the caſtle of Pergamus, together with the treaſures entruſted to his care, amounting to 90,000 talents. At firſt he offered his ſervice, together with his treaſure, to Seleucus king of Syria: but both Seleucus and Lyſimachus dying ſoon after, he kept poſſeſſion of the town and treaſure alſo till his death; which happened 20 years after his revolt from Lyſimachus.

Philetærus left the city of Pergamus to his brother, or, according to ſome, to his brother's ſon Eumenes I. and he laying hold of the opportunity offered by the diſſenſions among the Seleucidæ, poſſeſſed himſelf of many ſtrong-holds in the province of Aſia; and having hired a body of Galatians, defeated Antiochus, as he was returning from a victory gained over his brother Seleucus Callinicus. By this victory he obtained poſſeſſion of the greater part of Aſia: however, he did not long enjoy his acquiſitions; for he died next year of immoderate drinking, a vice to which he was greatly addicted.

Eumenes was ſucceeded by Attalus I. nephew of Philetærus, and the firſt who took upon him the title of king of Pergamus. He defeated the Gauls, who were deſirous of ſettling in his territory; and, according to Livy, was the firſt of the Aſiatic princes who refuſed to pay a contribution to theſe barbarians. When Seleucus Ceraunus was engaged in other wars, he invaded his territories, and conquered all the provinces on this ſide of Mount Taurus; but was ſoon driven out of his new acquiſitions by Seleucus and his grand-father Aehæus, who entering into an alliance againſt him, deprived him of all his newly acquired territories, and even beſieged him in his capital. Upon this Attalus invited to his aſſiſtance the Gauls who had ſettled in Thrace; and with their help not only obliged the enemy to raiſe the ſiege of Pergamus, but quickly recovered all the provinces he had loſt. After this he invaded Ionia and the neighbouring provinces, where ſeveral cities voluntarily ſubmitted to him. The Teians, Colophonians, with the inhabitants of Egea and Lemnos, ſent deputies declaring themſelves ready to acknowledge him for their ſovereign; the Carſenes, on the other ſide of the river Lycus, opened their gates to him, having firſt expelled the governor ſet over them by Achæus. From thence he advanced to Apia, and encamping on the banks of the river Megithus, received homage from the neighbouring nations. But here the Gauls, being frightened by an eclipſe of the moon, refuſed to proceed farther; which obliged Attalus to return to the Helleſpont, where he allowed his allies to ſettle, giving them a large and fruitful territory, and promiſing that he would always aſſiſt and protect them to the utmoſt of his power.

Attalus having thus ſettled his affairs with equal honour and advantage to himſelf, entered into an alliance with Rome, and afterwards joined them in their war againſt Philip king of Macedon. Here he had the command of the Rhodian fleet; with which he not only drove the Macedonians quite out of the ſeas, but having landed his men, he, in conjunction with the Athenians, invaded Macedon, and obliged Philip to raiſe the ſiege of Athens, which he had greatly diſtreſſed; for which ſervices the Athenians not only heaped on him all the favours they could, but called one of their tribes by his name; an honour they had never beſtowed on any foreigner before.

Attalus, not contented with all he had yet done againſt Philip, attempted to form a general confederacy of the Greeks againſt him. But while he was haranguing the Bœotians to this purpoſe, and exhorting them with great vehemence to enter into an alliance with the Romans againſt their common enemy, he fell down ſpeechleſs. However, he came to himſelf again, and deſired to be carried by ſea from Thebes to Pergamus, where he died ſoon after his arrival, in the 72d year of his age and 43d of his reign.

This prince was a man of great generoſity, and ſuch an enthuſiaſt in learning and learned men, that he cauſed a grammarian named *Daphidas* to be thrown into the ſea from the top of a high rock, becauſe he ſpoke diſreſpectfully of Homer.

Attalus was ſucceeded by his eldeſt ſon Eumenes II. He was exceedingly attached to the Romans, inſomuch that he refuſed the daughter of Antiochus the Great in marriage, leſt he ſhould thus have been led into a difference with that people. He alſo gave notice to the Roman ſenate of the tranſactions of Ariarathes king of Cappadocia, who was making great preparations both by ſea and land. Nor did Eumenes ſtop here; for when he ſaw the war about to break out between Antiochus and the Romans, he ſent his brother Attalus to Rome to give information of the proceedings of Antiochus. The ſenate heaped honours both on Eumenes and his brother; and in the war which followed, gave the command of their fleet to the king of Pergamus in conjunction with C. Livius Salinator. The victory gained on this occaſion was in a great meaſure owing to Eumenes, who boarded ſome of the enemy's ſhips in perſon, and during the whole action behaved with uncommon bravery. Some time afterwards Eumenes, entering the territories of Antiochus with a body of 5000 men, ravaged all the country about Thyatira, and returned with an immenſe booty. But in the mean time Antiochus invading Pergamus in his turn, ravaged the whole country, and even laid ſiege to the capital. Attalus, the king's brother, held out with an handful of men till the Achæans, who were in alliance with Eumenes, ſent 1000 foot and 100 horſe to his aſſiſtance. As this ſmall body of auxiliaries were all choſen men, and commanded by an experienced officer, they behaved with ſuch bravery, that the Syrians were obliged to raiſe the ſiege. At the battle of Magneſia, too, Eumenes behaved with the greateſt bravery; not only ſuſtaining the firſt attack of the enemy's elephants, but driving them back again on their own troops, which put the ranks in diſorder, and gave the Romans an opportunity of giving them a total defeat by attacking them opportunely with their horſe. In conſequence of this defeat, Antiochus was obliged to conclude a peace with the Romans on ſuch terms as they pleaſed to preſcribe; one of which was, that he ſhould pay Eumenes 400 talents, and a quantity of corn, in recompence for the damage he had done him.

Eumenes now thought of obtaining ſome reward from the Romans equivalent to the ſervices he had done them. Having gone to Rome, he told the ſenate, that he was come to beg of them that the Greek cities which had belonged to Antiochus before the commencement of the late war, might now be added to his dominions; but his demand was warmly oppoſed by the ambaſſadors from Rhodes, as well as by deputies from all the Greek cities in Aſia. The ſenate, however, after hearing both parties, decided the matter in favour of Eumenes, adding to his dominions all the countries on this ſide of Mount Taurus which belonged to Antiochus; the other provinces lying between that mountain and the river Mæander, except Lycia and Caria, were beſtowed on the Rhodians. All the cities, which had paid tribute to Attalus, were ordered to pay the ſame to Eumenes; but ſuch as had been tributary to Antiochus were declared free.

Soon after this Eumenes was engaged in a war with Pruſias king of Bithynia, who made war upon him by the advice of Hannibal the celebrated Carthaginian general. But Eumenes, being aſſiſted by the Romans, defeated Pruſias in an engagement by ſea, and another by land; which ſo diſheartened him, that he was ready to accept of peace on any terms. However, before the treaty was concluded, Hannibal found means to draw Philip of Macedon into the confederacy, who ſent Philocles, an old and experienced officer, with a conſiderable body of troops to join Pruſias. Hereupon Eumenes ſent his brother Attalus to Rome with a golden crown, worth 15,000 talents, to complain of Pruſias for making war on the allies of the Roman people without any provocation. The ſenate accepted the preſent, and promiſed to adjuſt every thing to the ſatisfaction of their friend Eumenes, whom they looked upon to be the moſt ſteady ally they had in Aſia. But in the mean time Pruſias, having ventured another ſea-fight, by a contrivance of Hannibal gained a complete victory. The Carthaginian commander adviſed him to fill a great many earthen veſſels with various kinds of ſerpents and other poiſonous reptiles, and in the heat of the fight to throw them into the enemies' ſhips ſo as to break the pots and let the ſerpents looſe. All the ſoldiers and ſeamen were commanded to attack the ſhip in which Eumenes was, and only to defend themſelves as well as they could againſt the reſt; and that they might be in no danger of miſtaking the ſhip, an herald was ſent before the engagement with a letter to the king. As ſoon as the two fleets drew near, all the ſhips of Pruſias, ſingling out that of Eumenes, diſcharged ſuch a quantity of ſerpents into it, that neither ſoldiers nor ſailors could do their duty, but were forced to fly to the ſhore, leſt they ſhould fall into the enemy's hands. The other ſhips, after a faint reſiſtance, followed the king's example, and were all driven aſhore, with great ſlaughter, the ſoldiers being no leſs annoyed by the ſtings of the ſerpents, than by the weapons of the enemy. The greateſt part of the ſhips of Eumenes were burnt, ſeveral taken, and the others ſo much ſhattered that they became quite unſerviceable. The ſame year Pruſias gained two remarkable victories over Eumenes by land, both of which were entirely owing to ſtratagems of Hannibal. But, while matters were thus going on to the diſadvantage of Eumenes, the Romans interfered, and by their deputies not only put an end to the differences between the two kings, but prevailed on Pruſias to betray Hannibal; upon which he poiſoned himſelf.

Eumenes being thus freed from ſuch a dangerous enemy, engaged in a new war with the kings of Cappadocia and Pontus, in which alſo he proved victorious. His friendſhip for the Romans he carried to ſuch a degree of enthuſiaſm, that he went in perſon to Rome to inform them of the machinations of Perſes king of Macedon. He had before quarrelled with the Rhodians, who ſent ambaſſadors to Rome to complain of him. But as the ambaſſadors happened to arrive while the king himſelf was preſent in the city, the Rhodian ambaſſadors could not obtain any hearing, and Eumenes was diſmiſſed with new marks of favour. This journey, however, had almoſt proved fatal to him; for, on his return, as he was going to perform a ſacrifice at Delphi, two aſſaſſins, ſent by Perſes, rolled down two great ſtones upon him as he entered the ſtraits of the mountains. With one he was dangerouſly wounded on the head, and with the other on the ſhoulder. He fell with the blows from a ſteep place, and thus received many other bruiſes; ſo that he was carried on board his ſhip when it could not well be known whether he was dead or alive. His people, however, ſoon finding that he was ſtill alive, conveyed him to Corinth, and from Corinth to Ægina, having cauſed their veſſels to be carried over the Iſthmus.

Eumenes remained at Ægina till his wounds were cured, which was done with ſuch ſecrecy, that a report of his death was ſpread all over Aſia, and even believed at Rome; nay, his brother Attalus was ſo convinced of the truth of this report,

that he not only assumed the government, but even married Stratonice the wife of Eumenes. But in a short time Eumenes convinced them both of his being alive, by returning to his kingdom. On the receipt of this news, Attalus resigned the sovereignty in great haste, and went to meet his brother; carrying an halberd, as one of his guards. Eumenes received both him and the queen with great tenderness; nor did he ever say any thing which might tend to make them uneasy; only it is said he whispered in his brother's ear, when he first saw him, "Be in no haste to marry my wife again till you are sure that I am dead."

The king being now more than ever exasperated against Perses, joined the Romans in their war against him; but during the course of it he suddenly cooled in his affection towards those allies whom he had hitherto served with so much zeal, and that to such a degree that he admitted ambassadors from Perses, and offered to stand neuter if he would pay him 1000 talents, and for 1500 to influence the Romans to grant him a safe and honourable peace. But these negociations were broke off without effect, by reason of the distrust which the two kings had of one another. Eumenes could not trust Perses unless he paid him the money beforehand; while on the other hand, Perses did not care to part with the money before Eumenes had performed what he promised; neither could he be induced to pay the sum in question, though the king of Pergamus offered to give hostages for the performance of his promise. What the reason of such a sudden change in the disposition of Eumenes was, is nowhere told; however, the fact is certain. The negociations above-mentioned were concealed from the Romans as long as possible; but they soon came to be known: after which the republic began to entertain no small jealousy of their old friend, and therefore heaped favours on his brother Attalus, without taking any notice of the king himself. Eumenes had sent him to Rome to congratulate the senate on the happy issue of the war with Perses, not thinking that his practices had been discovered. However, the senate, without taking any notice of their disaffection to Eumenes, at first entertained Attalus with the greatest magnificence; then several of the senators who visited him proceeded to acquaint him with their suspicions of the king, and desired Attalus to treat with them in his own name, assuring him, that the kingdom of Pergamus would be granted him, if he demanded it, by the senate. These speeches had at first some effect; but Attalus, being of an honest disposition, and assisted by the advice of a physician called *Stratius*, a man of great probity, resolved not to comply with their desire. When he was admitted to the senate, therefore, he first congratulated them on the happy issue of the Macedonian war, then modestly recounted his own services; and lastly, acquainted them with the motive of his journey; intreated them to send ambassadors to the Gauls, who by their authority might secure his brother from any danger of their hostilities; and he requested them also, that the two cities of Ænus and Maronea might be bestowed on himself. The senate, imagining that Attalus designed to choose some other day to sue for his brother's kingdom, not only granted all his requests, but sent him richer and more magnificent presents than they had ever done before. Upon this Attalus immediately set out on his return to Pergamus; which so provoked the senators, that they declared the cities free which they had promised to Attalus, thus rendering ineffectual their promise, which they were ashamed openly to revoke; and as for the Gauls, who were on all occasions ready to invade the kingdom of Pergamus, they sent ambassadors to them, with instructions to behave in such a manner as would rather tend to encourage them in their design than dissuade them from it.

Eumenes, being alarmed at those proceedings, resolved to go in person to Rome, in order to justify himself. But the senate having already condemned him in their own minds, resolved not to hear his vindication. For this reason, as soon as they heard of his design, they made an act that no king should be permitted to enter the gates of Rome. Eumenes, however, who knew nothing of this act, set forward on his journey, and landed at Brundusium; but no sooner did the Roman senate get intelligence of his arrival there, than they sent a quæstor acquainting him with the decree of the senate; and telling him at the same time, that if he had any business to transact with the senate, he was appointed to hear it, and transmit it to them; but if not, that the king must leave Italy without delay. To this Eumenes replied, that he had no business of any consequence to transact, and that he did not stand in need of any of their assistance; and, without saying a word more, went on board his ship, and returned to Pergamus.

On his return home, the Gauls, being encouraged by the cold reception which he had met with at Rome, invaded his territories, but were repulsed with great loss by the king, who afterwards invaded the dominions of Prusias, and possessed himself of several cities. This produced new complaints at Rome; and Eumenes was accused, not only by the ambassadors of Prusias, but also by those of the Gauls and many cities in Asia, of keeping a secret correspondence with Perses king of Macedon. This last charge was confirmed by some letters which the Romans themselves had intercepted; so that Eumenes found it impossible to keep up his credit any longer at Rome, though he sent his brothers Athenæus and Attalus thither to intercede for him. The senators, in short, had conceived the most implacable hatred against him, and seemed absolutely bent on his destruction, when he died, in the 39th year of his reign, leaving his kingdom and his wife to his brother Attalus. He left one son, but he was an infant, and incapable of governing the kingdom; for which reason Eumenes chose rather to give the present possession of the crown to his brother, reserving the succession to his son, than to endanger the whole by committing the management of affairs to his son's tutors.

Attalus, in the beginning of his reign, found himself greatly distressed by Prusias king of Bithynia, who not only overthrew him in a pitched battle, but advanced to the very walls of Pergamus, ravaging the country as he marched along; and at last reduced the royal city itself. The king, however, saved himself by a timely flight, and dispatched ambassadors to Rome, complaining of the bad usage of Prusias. The latter endeavoured to defend himself, and to throw the blame on Attalus. But, after a proper inquiry was made into the matter, Prusias was found to be entirely in the wrong; in consequence of which he was at last obliged to conclude a peace with his adversary on the following terms: 1. That he should immediately deliver up to Attalus 20 ships with decks. 2. That he should pay 500 talents to Attalus within the space of 20 years. 3. That he should pay 100 talents to some of the other Asiatic nations by way of reparation for the damages they had sustained from him. And, 4. Both parties should be content with what they had before the beginning of the war.

Some time after this, Prusias having made an unnatural attempt on the life of his son Nicomedes, the latter rebelled, and, with the assistance of Attalus, drove his father from the throne, and, as is said, even murdered him in the temple of Jupiter. The Romans took no notice of these transactions, but showed the same kindness to Attalus as formerly. The last enterprise in which we find Attalus engaged, was against Andriscus the pretended son of Perses king of Macedon, where he assisted the Romans; after which he gave himself up entirely to ease and luxury, committing state affairs entirely to his ministers; and thus continued to his death, which happened in the 82d year of his age, about 138 B. C.

Attalus II. was succeeded by Attalus III. the son of Eu-

menes; for the late king, conſidering that he only held the crown as a truſt for his nephew, paſſed by his own children in order to give it to him, though he appears to have been by no means worthy of it. He is ſaid to have been deprived of his ſenſes through the violence of his grief for his mother's death; and indeed throughout his whole reign, he behaved more like a madman than any thing elſe. Many of his ſubjects of the the higheſt quality were cut off with their wives and children, upon the moſt groundleſs ſuſpicions; and for theſe executions he made uſe of mercenaries hired out from among the moſt barbarous nations. Thus he proceeded till he had cut off all the beſt men in the kingdom; after which he fell into a deep melancholy, imagining that the ghoſts of thoſe whom he had murdered were perpetually haunting him. On this he ſhut himſelf up in his palace, put on a mean apparel, let his hair and beard grow, and ſequeſtered himſelf from all mankind. At laſt he withdrew from the palace, and retired into a garden, which he cultivated with his own hands, and filled with all ſorts of poiſonous herbs. Theſe he uſed to mix with wholeſome pulſe, and ſend packets of them to ſuch as he ſuſpected. At laſt, being weary of this amuſement, and living in ſolitude, becauſe nobody durſt approach him, he took it in his head to follow the trade of a founder, and make a brazen monument. But, while he laboured at melting and caſting the braſs, the heat of the ſun and furnace threw him into a fever, which in ſeven days put an end to his tyranny, after he had ſat on the throne five years.

On the death of the king, a will was found, by which he left the Roman people heirs of all his goods; upon which they ſeized on the kingdom, and reduced it to a province of their empire by the name of *Aſia Proper*. But Ariſtonicus, a ſon of Eumenes by an Epheſian courteſan, reckoning himſelf the lawful heir to the crown, could by no means be ſatisfied with this uſurpation of the Romans, and therefore aſſembled a conſiderable army to maintain his pretenſions. The people in general, having been accuſtomed to a monarchy, dreaded a republican form of government; in conſequence of which, they aſſiſted Ariſtonicus, and ſoon put him in a condition to reduce the whole kingdom. The news, however, were ſoon carried to Rome; and Licinius Craſſus, the pontifex maximus, was ſent into the Eaſt, with orders to enforce obedience to the king's will. Hiſtorians take no notice of any forces which were ſent along with this commander; whence it is ſuppoſed, that he depended on aſſiſtance from the Aſiatics, who were in alliance with Rome, or from the Egyptians. But when he came thither, he found both the Syrians and Egyptians ſo reduced, that he could not expect any aſſiſtance from them. However, he was ſoon ſupplied with troops in plenty by the kings of Pontus, Bithynia, Cappadocia, and Paphlagonia; but managed matters ſo ill that he was entirely defeated and taken priſoner. Thoſe who took him, deſigned to carry him to Ariſtonicus; but he, not able to endure the diſgrace, would have laid violent hands on himſelf if he had not been diſarmed. However, being allowed to keep a rod for managing the horſe on which he ſat, he ſtruck a Thracian ſoldier who ſtood near him ſo violently with it, that he beat out one of his eyes; upon which the other drew his ſword, and run him through on the ſpot. His head was brought to Ariſtonicus, who expoſed it to public view; but the body was honourably buried.

Ariſtonicus had no great time to enjoy the fruits of his victory. Indeed he behaved very improperly after it; for, inſtead of preparing to oppoſe the next army, which he might have been aſſured the Romans would ſend againſt him, he ſpent his time in feaſting and revelling. But he was ſoon roufed out of his lethargy by Perpenna the new conſul, who having aſſembled with incredible expedition the troops of the allies, came unexpectedly upon him, obliged him to venture an engagement at a diſadvantage, and entirely defeated him. Ariſtonicus fled to a city called *Stratonice*; but was ſo cloſely purſued by the conqueror, that the garriſon, having no method of ſupplying themſelves with proviſions, delivered up their leader, as well as a philoſopher named *Bloſius*, who had been the companion and counſellor of Ariſtonicus. The philoſopher behaved with great reſolution after being taken, and openly defended his ſiding with Ariſtonicus, becauſe he thought his cauſe juſt. He exhorted the latter to prevent the diſgrace and miſery of captivity by a voluntary death: but Ariſtonicus, looking upon death as a greater miſery than any captivity, ſuffered himſelf to be treated as his conquerors pleaſed.

In the mean time, a new conſul, named *Manius Aquilius*, being arrived from Rome, ſent a moſt haughty meſſage to Perpenna, requiring him immediately to deliver up Ariſtonicus, as a captive belonging to his triumph when the war ſhould be ended. With this demand Perpenna refuſed to comply, and his refuſal had almoſt produced a civil war. However, this was prevented by the death of Perpenna, which happened ſoon after the diſpute commenced. The Pergamenians, notwithſtanding the defeat and captivity of their leader, ſtill held out with ſuch obſtinacy, that Aquilius was obliged to beſiege, and take by force, almoſt every city in the kingdom. In doing this, he took a very effectual, though exceeding cruel method. Moſt of the cities in the kingdom had no other water than what was brought from a conſiderable diſtance in aqueducts. Theſe Aquilius did not demoliſh, but poiſoned the water, which produced the greateſt abhorrence of him throughout all the Eaſt. At laſt, however, the whole country being reduced, Aquilius triumphed, the unhappy Ariſtonicus was led in chains before his chariot, and probably ended his miſerable life in a dungeon. The country remained ſubject to the Romans while their empire laſted, but is now in the hands of the Turks. The city is half ruined, and is ſtill known by the name of *Pergamus*. It is inhabited by about 3000 Turks, and a few families of poor Chriſtians. E. lon. 27. 27. N. lat. 30. 3.

PERGUNNAH, in the language of Hindoſtan, means the largeſt ſubdiviſion of a province, whereof the revenues are brought to one particular *head Cutchery*, from whence the accounts and caſh are tranſmitted to the general *Cutchery* of the province.

PERIAGOGE, in rhetoric, is uſed where many things are accumulated into one period which might have been divided into ſeveral.

PERIAGUA, a ſort of large canoe made uſe of in the Leeward iſlands, South America, and the gulf of Mexico. It is compoſed of the trunks of two trees hollowed and united together; and thus differs from the canoe, which is formed of one tree.

PERIANDER, tyrant of Corinth and Corcyra, was reckoned among the ſeven wiſe men of Greece; though he might rather have been reckoned among the moſt wicked men, ſince he changed the government of his country, deprived his countrymen of their liberty, uſurped the ſovereignty, and committed the moſt ſhocking crimes. In the beginning of his reign he behaved with mildneſs; but after his having ſent to the tyrant of Syracuſe to conſult him on the ſafeſt method of government, he abandoned himſelf to cruelty. The latter, having heard Periander's envoys, took them into a field, and inſtead of anſwering them, pulled up before them the ears of corn which exceeded the reſt in height. Periander, on being told of this action, underſtood what was meant by it. He firſt ſecured himſelf by a good guard, and then put the moſt powerful Corinthians to death. He abandoned himſelf to the moſt enormous crimes; committed inceſt with his mother; kicked to death his wife Meliſſa, daughter of Procles king of Epidaurus, notwithſtanding her being with child; and was ſo enraged at Lycophron, his ſecond ſon, for lamenting his mother's death, that he baniſhed him into the iſland of Corcyra. Yet he paſſed for one of the greateſt politi-

cians of his time: and Heraclides tells us, that he forbade voluptuouſneſs; that he impoſed no taxes, contenting himſelf with the cuſtom ariſing from the ſale and the import and export of commodities; that, though wicked himſelf, he hated the wicked, and cauſed all pimps to be drowned; laſtly, that he eſtabliſhed a ſenate, and ſettled the expence of its members. He died 585 B. C.

PERIANTHIUM, (from περι "round," and ανθος "the flower,") the flower-cup properly ſo called, the moſt common ſpecies of calyx, placed immediately under the flower, which is contained in it as in a cup. See BOTANY.

PERICARDIUM, in anatomy, a membranous bag filled with water, which contains the heart in man and many other animals. It is formed by a duplicature of the mediaſtinum, or membrane which divides the thorax into two unequal parts. See ANATOMY.

PERICARPIUM, (from περι "round," and καρπος "fruit,") the ſeed-veſſel; an entrail of the plant big with ſeeds, which it diſcharges when ripe. The ſeed-veſſel is in fact the developed ſeed-bud, and may very properly be compared to the fecundated ovary in animals; for it does not exiſt till after the fertilizing of the ſeeds by the male duſt, and the conſequent fall of the flower. All plants, however, are not furniſhed with a ſeed-veſſel; in ſuch as are deprived of it, the receptacle or calyx performs its functions by incloſing the ſeeds as in a matrix, and accompanying them to perfect maturity.

PERICHORUS, in antiquity, a name given by the Greeks to their profane games or combats, that is, to ſuch as were not conſecrated to any of the Gods.

PERICLES was one of the greateſt men that ever flouriſhed in Greece. He was educated with all imaginable care; and beſide other maſters, he had for his tutors Zeno, Eleates, and Anaxagoras. He learned from the laſt of theſe to fear the gods without ſuperſtition, and to account for an eclipſe from a natural cauſe. Many were unjuſt enough to ſuſpect him of atheiſm, becauſe he had perfectly ſtudied the doctrine of that philoſopher. He was a man of undoubted courage; and of ſuch extraordinary eloquence, ſupported and improved by knowledge, that he gained almoſt as great an authority under a republican government as if he had been a monarch; but yet he could not eſcape the ſatirical ſtrokes of the comic poets. His diſſolutcneſs with the women was one of the vices with which he was chiefly charged. He died the third year of the Peloponneſian war, after long ſickneſs, which had weakened his underſtanding. Aſpaſia, Pericles's favourite, was a learned woman of Miletus: ſhe taught Socrates rhetoric and politics. As Pericles cared not much for his wife, he willingly gave her up to another, and married Aſpaſia, whom he paſſionately loved.

PERICRANIUM, in anatomy, a thick ſolid coat or membrane covering the outſide of the cranium or ſkull. See ANATOMY.

PERIGEE, in aſtronomy, that point of the ſun or moon's orbit wherein they are at the leaſt diſtance from the earth, in which ſenſe it ſtands oppoſed to Apogee.

PERIGEUX, an ancient town of France, capital of the department of Dordogne and late province of Perigord, with a biſhop's ſee, the ruins of a temple of Venus, and an amphitheatre. It is ſeated on the river Ille, 50 miles S. W. of Limoges. E. lon. 0. 48. N. lat. 45. 11.

PERIGORD, a late province of France, 83 miles long and 60 broad; bounded on the N. by Angoumois and Marche, on the E. by Quierci and Limoſin, on the S. by Agenois and Bazodois, and on the W. by Bourdelois, Angoumois, and Saintonge. It abounds in iron-mines, and the air is pure and healthy. It now forms the department of Dordogne.

PERIGORD-*Stone*, an ore of manganeſe, of a dark grey colour, like the baſaltes or trapp. It may be ſcraped with a knife, but is extremely difficult to be broken. It is found of no regular figure, is very compact, heavy, and as black as charcoal. Its appearance is glittering and ſtriated, like the ore of antimony; its particles being diſpoſed in the form of needles, croſſing one another without any agglutination, inſomuch that ſome are looſe as iron-filings when ſtuck to a loadſtone; reſembling the ſcoria from a blackſmith's furnace. By calcination it becomes harder and of a reddiſh-brown colour, but is not attracted by the magnet. It has a conſiderable ſpecific gravity, does not melt *per ſe*, but with borax runs into a glaſs of the colour of an amethyſt. It is ſcarcely affected by nitrous acid without the addition of ſugar. It ſeems alſo to contain ſome argil and iron. It is met with in Gaſcony and Dauphiny in France, and in ſome parts of England. It is employed by the French potters and enamellers in the glaſſy varniſh of their earthen wares.

PERIGRAPHE, a word uſually underſtood to expreſs a careleſs or inaccurate delineation of any thing: but in Veſalius it is uſed to expreſs the white lines or impreſſions that appear on the muſculus rectus of the abdomen.

PERIHELIUM, in aſtronomy, that part of a planet or comet's orbit wherein it is in its leaſt diſtance from the ſun, in which ſenſe it ſtands in oppoſition to Aphelium.

PERIMETER, in geometry, the bounds or limits of any figure or body. The perimeters of ſurfaces or figures are lines; thoſe of bodies are ſurfaces. In circular figures, inſtead of perimeter, we ſay circumference, or periphery.

PERINÆUM, or PERINEUM, in anatomy, the ſpace between the anus and the parts of generation, divided into two equal lateral diviſions by a very diſtinct line, which is longer in males than in females.

PERINSKIOLD (JOHN), a learned Swediſh writer, born at Stregneſia in Sudermania, in 1654, ſtudied under his father, who was profeſſor of eloquence and poetry, and afterwards became well ſkilled in the antiquities of the North. He was made profeſſor at Upſal, ſecretary antiquary of the king of Sweden, and counſellor of the chancery of antiquities. He died in 1720. His principal works are: 1. A Hiſtory of the Kings of Norway. 2. A Hiſtory of the Kings of the North. 3. An Edition of John Meſſenius on the Kings of Sweden, Norway, and Denmark, in 14 vols folio, &c. All Perinſkiold's works are excellent, and highly eſteemed.

PERIOD, in aſtronomy, the time taken up by a ſtar or planet in making a revolution round the ſun; or the duration of its courſe till it return to the ſame part of its orbit. See PLANET.

The different periods and mean diſtances of the ſeveral planets are as follow:

	Days	h.	′	″	mean Diſt.
Saturn -	10579	6	36	26	953800
Jupiter -	4332	12	20	35	520110
Mars -	686	23	27	30	152309
Earth -	365	6	9	30	100000
Venus -	224	16	49	24	72333
Mercury -	87	23	15	53	36710

There is a wonderful harmony between the diſtances of the planets from the ſun, and their periods round him; the great law whereof is, that the ſquares of the periodical times of the primary planet are to each other as the cubes of their diſtances from the ſun: and likewiſe, the ſquares of the periodical times of the ſecondaries of any planet are to each other as the cubes of their diſtances from that primary. This harmony among the planets is one of the greateſt confirmations of the Copernican hypotheſis. See ASTRONOMY.

For the periods of the moon, ſee ASTRONOMY, and obſerve *Index* to Aſtronomy.

The periods of ſeveral comets are now pretty well aſcertained. See ASTRONOMY.

PERIOD, in chronology, denotes a revolution of a certain number of years, or a ſeries of years, whereby, in different nations, and on different occaſions, time is meaſured; ſuch are the following.

Calippic PERIOD, a ſyſtem of ſeventy-ſix years. See CALIPPIC, and ASTRONOMY.

Dionyſian PERIOD, or *Victorian Period*, a ſyſtem of 532 lunæ-ſolar and Julian years; which being elapſed, the characters of the moon fall again upon the ſame day and feria, and revolve in the ſame order, according to the opinion of the ancients. This period is otherwiſe called the *great paſchal cycle*, becauſe the Chriſtian church firſt uſed it to find the true time of the paſcha or eaſter. The ſum of theſe years ariſes by multiplying together the cycles of the ſun and moon.

Hipparchus's PERIOD, is a ſeries of 304 ſolar years, returning in a conſtant round, and reſtoring the new and full moons to the ſame day of the ſolar year, according to the ſentiment of Hipparchus. This period ariſes by multiplying the Calippic period by four. Hipparchus aſſumed the quantity of the ſolar year to be 365 days 5 hours 55′ 12″; and hence concluded, that in 104 years Calippus's period would err a whole day. He therefore multiplied the period by four, and from the product caſt away an entire day. But even this does not reſtore the new and full moons to the ſame day throughout the whole period; but they are ſometimes anticipated 1 day 8 hours 23′ 29″ 20‴. See ASTRONOMY.

Julian PERIOD. See JULIAN.

PERIOD, in grammar, denotes a ſmall compaſs of diſcourſe, containing a perfect ſentence, and diſtinguiſhed at the end by a point, or full ſtop, thus (.); and in members or diviſions marked by commas, colons, &c.

Father Buffier obſerves two difficulties in the uſe of the period, or point; i. e. in diſtinguiſhing it from the colon, or double point; and in determining juſtly the end of a period, or perfect ſentence. It is remarked, that the ſupernumerary members of a period, ſeparated from the reſt by colons and ſemicolons, uſually commence with a conjunction: yet it is true theſe ſame conjunctions ſometimes rather begin new periods than ſupernumerary members of old ones. It is the ſenſe of things, and the author's own diſcretion, that muſt make the proper diſtinction which of the two in effect it is. No rules will be of any ſervice, unleſs this be admitted as one, that when what follows the conjunction is of as much extent as what precedes it, it is uſually a new period: otherwiſe not.

The ſecond difficulty ariſes hence, that the ſenſe appears perfect in ſeveral ſhort detached phraſes, wherein it does not ſeem there ſhould be periods; a thing frequent in free diſcourſe: as, *We are all in ſuſpenſe: make your propoſals immediately: you will be to blame for detaining us longer.* Where it is evident, that ſimple phraſes have perfect ſenſes like periods, and ought to be marked accordingly; but that the ſhortneſs of the diſcourſe making them eaſily comprehended, the pointing is neglected.

De Colonia defines period a ſhort but perfect ſentence, conſiſting of certain parts or members, depending one on another, and connected together by ſome common vinculum. The celebrated definition of Ariſtotle is, A period is a diſcourſe which has a beginning, a middle, and an end, all viſible at one view. Rhetoricians conſider period, which treats of the ſtructure of ſentences, as one of the four parts of compoſition. The periods allowed in oratory are three: a period of two members, called by the Greeks *dicolos*, and by the Latins *bimembris*: a period of three members, *tricolos*, *trimembris*; and a period of four, *quadrimembris*, *tetracolos*. See PUNCTUATION.

PERIOD, in numbers, is a diſtinction made by a point or comma, after every ſixth place, or figure; and is uſed in numeration, for the readier diſtinguiſhing and naming the ſeveral figures or places; which ſee under NUMERATION.

PERIOD, in medicine, is applied to certain diſeaſes which have intervals, and returns, to denote an entire courſe or circle of ſuch diſeaſe; or its progreſs from any ſtate through all the reſt till it return to the ſame again. Galen deſcribes period as a time compoſed of an intenſion and remiſſion; whence it is uſually divided into two parts, the paroxyſm or exacerbation, and remiſſion. In intermitting fevers, the periods are uſually ſtated and regular; in other diſeaſes, as the epilepſy, gout, &c. they are vague or irregular.

PERIOD, in oratory. See ORATORY.

PERIODIC, or PERIODICAL, ſomething that terminates and comprehends a period. Such is a periodic month, being the ſpace of time wherein the moon diſpatches her period.

PERIOECI, *περιοικι*, in geography, ſuch inhabitants of the earth as have the ſame latitudes, but oppoſite longitudes, or live under the ſame parallel and the ſame meridian, but in different ſemicircles of that meridian, or in oppoſite points of the parallel. Theſe have the ſame common ſeaſons throughout the year, and the ſame phenomena of the heavenly bodies; but when it is noon-day with the one it is midnight with the other, there being twelve hours in an eaſt and weſt direction. Theſe are found on the globe by the hour-index, or by turning the globe half round; i. e. 180 degrees either way.

PERIOSTEUM, or PERIOSTIUM, in anatomy, a vaſcular membrane, endued with a very quick ſenſe, immediately ſurrounding, in every part, both the internal and external ſurfaces of all the bones in the body, excepting only ſo much of the teeth as ſtand above the gums, and the peculiar places on the bones in which the muſcles are inſerted. It is hence divided into the external and internal perioſteum; and where it externally ſurrounds the bones of the ſkull, it is generally called the *pericranium*. See ANATOMY.

PERIPATETICS, philoſophers, followers of Ariſtotle, and maintainers of the peripatetic philoſophy; called alſo *Ariſtotelians*. Cicero ſays, that Plato left two excellent diſciples, Xenocrates and Ariſtotle, who founded two ſects, which only differed in name: the former took the appellation of *Academics*, who were thoſe that continued to hold their conferences in the Academy, as Plato had done before; the others, who followed Ariſtotle, were called *Peripatetics*, from *περιπατεω*, "I walk;" becauſe they diſputed walking in the Lyceum.

Ammonius derives the name Peripatetic from Plato himſelf, who only taught walking; and adds, that the diſciples of Ariſtotle, and thoſe of Xenocrates, were equally called Peripatetics; the one Peripatetics of the Academy, the other Peripatetics of the Lyceum; but that in time the former quitted the title Peripatetic for that of Academic, on account of the place where they aſſembled; and the latter retained ſimply that of Peripatetic. The greateſt and beſt part of Ariſtotle's philoſophy was borrowed from Plato. Serranus aſſerts, and ſays he could demonſtrate, that there is nothing exquiſite in any part of Ariſtotle's philoſophy, dialectics, ethics, politics, phyſics, or metaphyſics, but is found in Plato. And of this opinion are many of the ancient authors, ſuch as Clemens Alexandrinus, &c. Gale attempts to ſhow, that Ariſtotle borrowed a good deal of his philoſophy, both phyſical, about the firſt matter, and metaphyſical, about the firſt being, his affections, truth, unity, goodneſs, &c. from the Scriptures; and adds from Clearchus, one of Ariſtotle's ſcholars, that he made uſe of a certain Jew, who aſſiſted him therein.

Ariſtotle's philoſophy preſerved itſelf *in puris naturalibus* for a long time: in the earlier ages of Chriſtianity, the Platonic

philoſophy was generally preferred; but this did not prevent the doctrine of Ariſtotle from forcing its way into the Chriſtian church. Towards the end of the fifth century it roſe into great credit; the Platonics interpreting in their ſchools ſome of the writings of Ariſtotle, particularly his dialectics, and recommending them to young perſons. This appears to have been the firſt ſtep to that univerſal dominion which Ariſtotle afterwards obtained among the learned, which was at the ſame time much promoted by the controverſies which Origen had occaſioned. This father was zealouſly attached to the Platonic ſyſtem; and therefore, after his condemnation, many, to avoid the imputation of his errors, and to prevent their being counted among the number of his followers, openly adopted the philoſophy of Ariſtotle. Nor was any philoſophy more proper for furniſhing thoſe weapons of ſubtle diſtinctions and captious ſophiſms, which were uſed in the Neſtorian, Arian, and Eutychian controverſies. About the end of the ſixth century, the Ariſtotelian philoſophy, as well as ſcience in general, was almoſt univerſally decried; and it was chiefly owing to Boethius, who explained and recommended it, that it obtained a higher degree of credit among the Latins than it had hitherto enjoyed. Towards the end of the ſeventh century, the Greeks abandoned Plato to the monks, and gave themſelves up entirely to the direction of Ariſtotle; and in the next century, the Peripatetic philoſophy was taught everywhere in their public ſchools, and propagated in all places with conſiderable ſucceſs. John Damaſcenus very much contributed to its credit and influence, by compoſing a conciſe, plain, and comprehenſive view of the doctrines of the Stagyrite, for the inſtruction of the more ignorant, and in a manner adapted to common capacities. Under the patronage of Photius, and the protection of Bardas, the ſtudy of philoſophy for ſome time declined, but was revived again about the end of the ninth century. About the middle of the 11th century, a revolution in philoſophy commenced in France; when ſeveral famous logicians, who followed Ariſtotle as their guide, took nevertheleſs the liberty of illuſtrating and modelling anew his philoſophy, and extending it far beyond its ancient limits. In the 12th century, three methods of teaching philoſophy were in uſe by different doctors: the firſt was the ancient and plain method, which confined its reſearches to the philoſophical notions of Porphyry, and the dialectic ſyſtem, commonly attributed to St. Auguſtine, and in which was laid down this general rule, that philoſophical inquiries were to be limited to a ſmall number of ſubjects, leſt, by their becoming too extenſive, religion might ſuffer by a profane mixture of human ſubtilty with its divine wiſdom. The ſecond method was called the Ariſtotelian, becauſe it conſiſted in explications of the works of that philoſopher, ſeveral of whoſe books, being tranſlated into Latin, were almoſt everywhere in the hands of the learned. The third was termed the free method, employed by ſuch as were bold enough to ſearch after truth, in the manner the moſt adapted to render their inquiries ſucceſsful, without rejecting the ſuccours of Ariſtotle and Plato. A reformed ſyſtem of the Peripatetic philoſophy was firſt introduced into the ſchools in the univerſity of Paris, from whence it ſoon ſpread throughout Europe, and has ſubſiſted in ſome univerſities even to this day, under the name of *School Philoſophy*. The foundation thereof is Ariſtotle's doctrine, often miſunderſtood, but oftener miſapplied: whence the retainers thereto may be denominated *Reformed Peripatetics*. Out of theſe have ſprung, at various times, ſeveral branches: the chief are, the THOMISTS, SCOTISTS, and NOMINALISTS. See thoſe articles.

The Peripatetic ſyſtem, after having prevailed with great and extenſive dominion for many centuries, began rapidly to decline towards the cloſe of the 17th, when the diſciples of Ramus attacked it on the one hand, and it had ſtill more formidable adverſaries to encounter in Deſcartes, Gaſſendi, and Newton. See PHILOSOPHY.

PERIPATON, in antiquity, the name of that walk in the Lyceum where Ariſtotle taught, and whence the name of Peripatetics given to his followers.

PERIPETIA, in the drama, that part of a tragedy wherein the action is turned, the plot unravelled, and the whole concludes. See CATASTROPHE.

PERIPHERY, in geometry, the circumference of a circle, ellipſis, or any other regular curvilinear figure. See GEOMETRY.

PERIPHRASIS, circumlocution, formed of *περι* "about," and *φραζω* "I ſpeak," in rhetoric, a circuit or tour of words, much affected by orators, to avoid common and trite manners of expreſſion. The periphraſis is of great uſe on ſome occaſions; and it is often neceſſary to make things be conceived which are not proper to name. It is ſometimes polite to ſuppreſs the names, and only intimate or deſign them. Theſe turns of expreſſion are alſo particularly ſerviceable in oratory; for, the ſublime admitting of no direct citations, there muſt be a compaſs taken to inſinuate the authors whoſe authority is borrowed. A periphraſis, by turning round a proper name to make it underſtood, amplifies and raiſes the diſcourſe; but care muſt be taken it be not too much ſwelled, nor extended *mal à propos*, in which caſe it becomes flat and languid. See CIRCUMLOCUTION and ORATORY.

PERIPLOCA, VIRGINIAN SILK, in botany; a genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 30th order, *Con'ortæ*. The nectarium ſurrounds the genitals, and ſends out five filaments. There are five ſpecies, four of which are natives of warm climates, and can only be raiſed there. The fifth, however, is ſufficiently hardy for this climate. The periploca is a fine climbing plant, that will wind itſelf with its ligneous branches about whatever tree, hedge, pale, or pole, is near it; and will ariſe, by the aſſiſtance of ſuch ſupport, to the height of above 30 feet; and where no tree or ſupport is at hand to wind about, it will knit or entangle itſelf together in a moſt complicated manner. The ſtalks of the older branches, which are moſt woody, are covered with a dark brown bark, whilſt the younger ſhoots are more mottled with the different colours of brown and grey, and the ends of the youngeſt ſhoots are often of a light green. The ſtalks are round, and the bark is ſmooth. The leaves are the greateſt ornament to this plant, for they are tolerably large, and of a good ſhining green colour on their upper ſurface, and cauſe a variety by exhibiting their under ſurface of an hoary caſt. Their figure is oblong, or rather more inclined to the ſhape of a ſpear, as their ends are pointed, and they ſtand oppoſite by pairs on ſhort footſtalks. Their flowers afford pleaſure to the curious examiner of nature. Each of them ſingly has a ſtar-like appearance; for, though it is compoſed of one petal only, yet the rim is divided into ſegments, which expand in ſuch a manner as to form that figure. Their inſide is hairy, as is alſo the nectarium which ſurrounds the petal. Four or five of the flowers grow together, forming a kind of umbel. They are of a chocolate colour, are ſmall, and will be in blow in July and Auguſt, and ſometimes in September. In the country where this genus grows naturally, they are ſucceeded by a long taper pod, with compreſſed ſeeds, having down to their tops.

The propagation of this climber is very eaſy; for, if the cuttings are planted in a light moiſt ſoil, in the autumn or in the ſpring, they will readily ſtrike root. Three joints at leaſt ſhould be allowed to each cutting; they ſhould be the bottom of the preceding ſummer's ſhoot; and two of the joints ſhould be

planted deep in the ſoil. Another, and a never-failing method, is by layers; for, if they are laid down in the ground, or a little ſoil only be looſely thrown over the young preceding ſummer's ſhoots, they will ſtrike root at the joints, and be good plants for removing the winter following.

PERIPNEUMONY, Περιπνευμονια, formed from περι "about," and πνευμων "lungs;" in medicine, an inflammation of ſome part of the thorax, properly of the lungs, attended with an acute fever, and a difficulty of breathing. See MEDICINE.

PERIRRHANTERIUM, a veſſel of ſtone or braſs which was filled with holy water, and with which all thoſe were ſprinkled who were admitted by the ancients to their ſacrifices. Beyond this veſſel no profane perſon was allowed to paſs. We are told by ſome, that it was placed in the *Adytum*, or inmoſt receſs of the temple; others ſay it was placed at the door, which indeed ſeems to be the moſt likely opinion. It was uſed both by Greeks and Romans, and has been evidently borrowed, like many other Pagan ceremonies, by the Church of Rome. The Hebrews alſo had a veſſel for purification.

PERISCII, in geography, the inhabitants of either frigid zone, between the polar circles and the poles, where the ſun, when in the ſummer ſigns, moves only round about them, without ſetting; and conſequently their ſhadows in the ſame day turn to all the points of the horizon.

PERISTALTIC, a vermicular ſpontaneous motion of the inteſtines, performed by the contraction of the circular and longitudinal fibres of which the fleſhy coats of the inteſtines are compoſed; by means whereof the chyle is driven into the orifices of the lacteal veins, and the fæces are protruded towards the anus.

PERISTYLE, in ancient architecture, a building encompaſſed with a row of columns on the inſide.

PERITONÆUM, in anatomy, is a thin, ſmooth, and lubricous membrane, inveſting the whole internal ſurface of the abdomen, and containing moſt of the viſcera of that part as it were in a bag. See ANATOMY.

PERITROCHIUM, in mechanics, denotes a wheel, or circle, concentric with the baſe of a cylinder, and moveable together with it about its axis. See MECHANICS.

PERJURY, in law, is defined by Sir Edward Coke to be a crime committed when a lawful oath is adminiſtered, in ſome judicial proceeding, to a perſon who ſwears wilfully, abſolutely, and falſely, in a matter material to the iſſue or point in queſtion. In ancient times it was in ſome places puniſhed with death; in others it made the falſe ſwearer liable to the puniſhment due to the crime he had charged the innocent perſon with; in others a pecuniary mulct was impoſed. But though it eſcaped human, yet it was thought, amongſt the ancients in general, that the divine vengeance would moſt certainly overtake it; and there are many ſevere inflictions from the hand of God upon record, as monuments of the abhorrence in which this atrocious crime is held by the Deity. The ſouls of the deceaſed were ſuppoſed to be employed in puniſhing perjured perſons. Even the inanimate creation was thought to take revenge for this crime. The Greeks ſuppoſed that no perſon could ſwear falſely by Styx without ſome remarkable puniſhment; and that no perſon guilty of perjury could enter the cave of Palæmon at Corinth without being made a memorable example of divine juſtice. In Sicily, at the temple of the Palici, there were fountains called *Delli*, from which iſſued boiling water, with flames and balls of fire: and we are told that if any perſon ſwore falſely near them, he was inſtantly ſtruck dumb, blind, lame, or dead, or was ſwallowed up by the waters. But although perjury was thus held in general abhorrence, notwithſtanding the credit which was given to ſuch accounts of divine inflictions, it was ſo much practiſed by the Greeks, that *Græca fides* became a proverb. Lovers' perjuries, however, were ſuppoſed to paſs unnoticed, or to be very ſlightly puniſhed with blackneſs of the nails, a decayed tooth, or ſome ſmall diminution of beauty.

The ancient philoſophers, however, were ſo afraid of perjury, that even an oath before a judge was never admitted but for want of other proof. Plato's precept was, "Not to adminiſter an oath wantonly, but on deep grounds, and with the ſtricteſt caution." Ulpian gives his opinion thus: "Some are forward to take oaths, from a contempt of religion; others, from an extraordinary awe of the Divine Majeſty, carry their fear to an unreaſonable ſuperſtition; ſo make an equitable deciſion of a judge neceſſary." "No man will perjure himſelf (ſays Ariſtotle) who apprehends vengeance from Heaven and diſgrace among men." Clinias was ſo very ſcrupulous, that, rather than take an oath, (though lawfully,) he ſuffered the loſs of three talents. Perjury, in the time of Philo Judeus, was abominated and capitally puniſhed among the Jews; though ſince they have much degenerated, having been poiſoned with the books of the Talmud, which ſays, "He who breaks his promiſſory oath, or any vows he enters into by the year, if he has a mind they ſhould be ineffectual and invalid, let him riſe the laſt day of the year, and ſay, Whatever promiſes, oaths, and vows, I may think fit to make in the year following, let them be null, void, and of no effect." Tract iii. part 3. of the *Talmud*, in the treatiſe *Nedharim*, ch. 4. And the modern Jews uſe the ſame artifice, thinking they may then lawfully deceive the Chriſtians. See *Hieron. ex Dictis Talmud*, c. 3. and *Magiſter Joannes de Concor. Legum*, tit. iv. c. 7.

In our law, no notice is taken of any perjury but ſuch as is committed in ſome court of juſtice having power to adminiſter an oath, or before ſome magiſtrate or proper officer inveſted with a ſimilar authority, in ſome proceedings relative to a civil ſuit or a criminal proſecution; for it eſteems all other oaths unneceſſary at leaſt, and therefore will not puniſh the breach of them. For which reaſon, it is much to be queſtioned how far any magiſtrate is juſtifiable in taking a voluntary affidavit in any extrajudicial matter, as is now too frequent upon every petty occaſion; ſince it is more than poſſible that, by ſuch idle oaths, a man may frequently, *in foro conſcientiæ*, incur the guilt, and at the ſame time evade the temporal penalties of perjury. The perjury muſt alſo be corrupt, (that is, committed *malo animo*,) wilful, poſitive, and abſolute; not upon ſurpriſe, or the like; it alſo muſt be in ſome point material to the queſtion in diſpute; for, if it only be in ſome trifling collateral circumſtance, to which no regard is paid, it is no more penal than in the voluntary extrajudicial oaths before mentioned. Subornation of perjury is the offence of procuring another to take ſuch a falſe oath as conſtitutes perjury in the principal. The puniſhment of perjury and ſubornation, at common law, has been various. It was anciently death; afterwards baniſhment, or cutting out the tongue; then forfeiture of goods; and now it is fine and impriſonment, and never more to be capable of bearing teſtimony. But the ſtatute 5 Eliz. c. 9. (if the offender be proſecuted thereon) inflicts the penalty of perpetual infamy, and a fine of 40l. on the ſuborner; and in default of payment, impriſonment for ſix months, and to ſtand with both ears nailed to the pillory. Perjury itſelf is thereby puniſhed with ſix months impriſonment, perpetual infamy, and a fine of 20l. or to have both ears nailed to the pillory. But the proſecution is uſually carried on for the offence at common law; eſpecially as, to the penalties before inflicted, the ſtatute 2 Geo. II. c. 25. superadds a power for the court to order the offender to be ſent to the houſe of correction for a term not exceeding ſeven years, or to be tranſported for the ſame period; and makes it felony, without benefit of clergy, to return or eſcape within the time.

It has ſometimes been wiſhed, that perjury, at leaſt upon capital accuſations, whereby another's life has been or might have been deſtroyed, was alſo rendered capital, upon a principle of retaliation; as it was univerſally by the laws of France. And certainly the odiouſneſs of the crime pleads ſtrongly in behalf of the French law. But it is to be conſidered, that there they admitted witneſſes to be heard only on the ſide of the proſecution, and uſed the rack to extort a confeſſion from the accuſed. In ſuch a conſtitution, therefore, it was neceſſary to throw the dread of capital puniſhment into the other ſcale, in order to keep in awe the witneſſes for the crown, on whom alone the priſoner's fate depended; ſo naturally does one cruel law beget another. But corporal and pecuniary puniſhments, exile, and perpetual infamy, are more ſuited to the genius of the Engliſh law; where the fact is openly diſcuſſed between witneſſes on both ſides, and the evidence for the crown may be contradicted and diſproved by thoſe of the priſoner. Where indeed the death of an innocent perſon has actually been the conſequence of ſuch wilful perjury, it falls within the guilt of deliberate murder, and deſerves an equal puniſhment; which our ancient law in fact inflicted. But the mere attempt to deſtroy life by other means not being capital, there is no reaſon that an attempt by perjury ſhould; much leſs that this crime ſhould, in all judicial caſes, be puniſhed with death. For to multiply capital puniſhments leſſens their effect when applied to crimes of the deepeſt dye; and, deteſtable as perjury is, it is not by any means to be compared with ſome other offences, for which only death can be inflicted; and therefore it ſeems already (except perhaps in the inſtance of deliberate murder by perjury) very properly puniſhed by our preſent law; which has adopted the opinion of Cicero, derived from the law of the twelve tables, *Perjurii pœna divina, exitium; humana, dedecus.* See Oath.

PERIWIG. See Peruke.

PERIZONIUS (James), a very learned and laborious writer, was born at Dam in 1651. He became profeſſor of hiſtory and eloquence at the univerſity of Franeker, when, by his merit and learning, he made that univerſity flouriſh. However, in 1693 he went to Leyden, where he was made profeſſor of hiſtory, eloquence, and the Greek tongue; in which employment he continued till his death, which happened in 1715. He wrote many diſſertations, and other learned and curious works, particularly *Origines Babylonicæ et Egyptiacæ*, 2 vols. 8vo, &c. But the part of his labours which is the moſt generally known, and perhaps the moſt uſeful, is the notes which he wrote upon *Sanctа Minerva*. That work, as publiſhed by Perizonius, certainly ſuggeſted the idea of Harris's Hermes; and we heſitate not to ſay, that our countryman has made hardly any improvement on the ſyſtem of his maſter.

PERIZZITES, the ancient inhabitants of Paleſtine, mingled with the Canaanites. There is alſo great probability that they themſelves were Canaanites; but having no fixed habitations, ſometimes diſperſed in one country and ſometimes in another, they were for that reaſon called *Perizzites*, which ſignifies *ſcattered* or *diſperſed*. *Pherazoth* ſtands for *hamlets* or *villages*. The Perizzites did not inhabit any certain portion of the land of Canaan; there were ſome of them on both ſides the river Jordan, in the mountains, and in the plains. In ſeveral places of ſcripture the Canaanites and Perizzites are mentioned as the two chief people of the country. It is ſaid, for example, that in the time of Abraham and Lot the Canaanite and Perizzite were in the land (Gen. xiii. 7.). The Iſraelites of the tribe of Ephraim complained to Joſhua that they were too much pent up in their poſſeſſion (Joſh. xvii. 15.): he bid them go, if they pleaſed, into the mountains of the Perizzites, and Rephaims or giants, and there clearing the land to cultivate and inhabit it. Solomon ſubdued the remains of the Canaanites and Perizzites which the children of Iſrael had not rooted out, and made them tributary to him (1 Kings ix. 20, 21. and 2 Chron. viii. 7.). There is ſtill mention made of the Perizzites in the time of Ezra (ix. 1.), after the return from the captivity of Babylon; and ſeveral Iſraelites had married wives from that nation.

PERKIN. See Cyderkin, and Husbandry.

PERMEABLE, a term applied to bodies of ſo looſe a texture as to let ſomething paſs through them.

PERMSKI, or Permia, a town of the Ruſſian empire, and capital of a province of the ſame name, ſeated on the river Kama between the Dwina and the Oby; E. lon. 55. 50. N. lat. 70. 26. The province is bounded on the north by the Samoiedes, on the weſt by Zirania and Ulatka, and on the eaſt by Siberia.

PERMUTATION, in commerce, the ſame with bartering. In the canon-law, permutation denotes the actual exchange of one benefice for another.

PERNAMBUCO, a province of Brazil, in South America, bounded on the north by Tamera, on the eaſt by the ocean, on the ſouth by Seregippa, and on the weſt by Tapuyers. It is about 200 miles in length and 150 in breadth. The Dutch became maſters of it in 1630, but the Portugueſe ſoon retook it from them. It produces a great quantity of ſugar, and the beſt Brazil wood.

PERNIO, a kibe or chilblain, is a little ulcer, occaſioned by cold in the hands, feet, heels, noſe, and lips. It will come on when warm parts are too ſuddenly expoſed to cold, or when parts from being too cold are ſuddenly expoſed to a conſiderable warmth; and has always a tendency to gangrene, in which it frequently terminates. It moſt commonly attacks children of a ſanguine habit and delicate conſtitution; and may be prevented or removed by ſuch remedies as invigorate the ſyſtem, and are capable of removing any tendency to gangrene in the conſtitution.

PERONÆUS, in anatomy, is an epithet applied to ſome of the muſcles of the perone or fibula. See Anatomy, *Table of the Muſcles*.

PERONES, a ſort of high ſhoes which were worn not only by country people, but by men of ordinary rank at Rome. In the early times of the commonwealth they were worn even by ſenators; but at laſt they were diſuſed by perſons of figure, and confined to the ploughmen and labourers. They were very rudely formed, conſiſting only of hides undreſſed, and reaching to the middle of the leg. Virgil mentions the perones as worn by a company of ruſtic ſoldiers on one foot only.

PERONNE, a ſtrong town of France, in the department of Somme and late province of Picardy. It is called the Virgin, becauſe it has never been taken, though often beſieged. The caſtle is remarkable for the impriſonment of Charles the Simple, who here miſerably died; and in this caſtle the duke of Burgundy detained Lewis XI. three days, till he conſented to ſign a diſadvantageous treaty. It is ſeated on the Somme, 27 miles S. W. of Cambray, and 80 E. by N. of Paris. E. lon. 3. 2. N. lat. 49. 55.

PERORATION, in rhetoric, the epilogue or laſt part of an oration, wherein what the orator had inſiſted on through his whole diſcourſe is urged afreſh with greater vehemence and paſſion. The peroration conſiſts of two parts. 1. Recapitulation; wherein the ſubſtance of what was diffuſed throughout the whole ſpeech is collected briefly and curſorily, and ſummed up with new force and weight. 2. The moving the paſſions; which is ſo peculiar to the peroration, that the maſters of the art call this part *ſedes affectuum*. The paſſions to be raiſed are various, according to the various kinds of oration. In a panegyric, love, admiration, emulation, joy, &c. In an invective, hatred, contempt, &c. In a deliberation, hope, confidence,

or fear. The qualities required in the peroration are, that it be very vehement and paſſionate, and that it be ſhort; becauſe, as Cicero obſerves, tears ſoon dry up. Theſe qualities were well obſerved by Cicero, who never had an equal in the management of this part of an orator's province; for peroration was his maſterpiece.

"Concerning peroration (ſays Dr. Blair) it is needleſs to ſay much, becauſe it muſt vary ſo conſiderably, according to the ſtrain of the preceding diſcourſe. Sometimes the whole pathetic part comes in moſt properly at the peroration. Sometimes, when the diſcourſe has been entirely argumentative, it is fit to conclude with ſumming up the arguments, placing them in one view, and leaving the impreſſion of them full and ſtrong on the mind of the audience. For the great rule of a concluſion, and what nature obviouſly ſuggeſts, is, to place that laſt on which we chooſe that the ſtrength of our cauſe ſhould reſt.

"In all diſcourſes, it is a matter of importance to hit the preciſe time of concluding, ſo as to bring our diſcourſe juſt to a point; neither ending abruptly and unexpectedly, nor diſappointing the expectation of the hearers when they look for the cloſe, and continuing to hover round and round the concluſion till they become heartily tired of us. We ſhould endeavour to go off with a good grace; not to end with a languiſhing and drawling ſentence, but to cloſe with dignity and ſpirit, that we may leave the minds of the hearers warm, and diſmiſs them with a favourable impreſſion of the ſubject and of the ſpeaker."

PEROTIS, in botany: A genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order, *Gramina*. There is no calyx: the corolla conſiſts of a bivalvular gluma; the valves are oblong, acute, ſomewhat unequal, and terminating in a ſharp beard: it has three capillary ſtamina; the antheræ incumbent; the ſtyli capillary, and ſhorter than the corolla; the ſtigma feathery and divaricated. The corolla ſerves as a perianthium, including a ſingle ſeed of an oblong linear ſhape. Of this there is only one ſpecies, viz. plumoſus, a native of America, and lately introduced into Kew garden.

PERPENDICULAR, in geometry, a line falling directly on another line, ſo as to make equal angles on each ſide. See GEOMETRY.

PERPETUAL, ſomething that endures always, or laſts for ever.

PERPETUAL *Motion*. See MOVEMENT.

PERPIGNAN, a town of France, capital of the department of the Eaſtern Pyrenees and late province of Rouſſillon, with a good citadel, a univerſity, and a biſhop's ſee. It is ſeated on the Tet, over which is a bridge, 100 miles S. E. of Bourdeaux. E. lon. 3. 0. N. lat. 42. 41.

PERQUISITE, in a general ſenſe, ſomething gained by a place over and above the ſettled wages.

PERQUISITE, in law, is any thing gotten by a man's own induſtry, or purchaſed with his money; in contradiſtinction to what deſcends to him from his father or other anceſtor.

PERRAULT (CLAUDE), the ſon of an advocate in parliament, was born at Paris in 1613; and was bred a phyſician, though he never practiſed but among his relations, friends, and the poor. He diſcovered early a particular taſte for the ſciences and fine arts; of which he acquired a conſummate knowledge without the aſſiſtance of a maſter: he excelled in architecture, painting, ſculpture, mathematics, phyſics, and all thoſe arts that relate to deſigning and mechanics. The entrance into the Louvre, which was deſigned by him, is, according to the judgment of Voltaire, one of the moſt auguſt monuments of architecture in the world. M. Colbert put him upon tranſlating Vitruvius into French; which he performed, and publiſhed it in 1673, folio, with figures from his own drawings; which are ſaid to have been more exactly finiſhed than the plates themſelves. When the academy of ſciences was eſtabliſhed, he was one of its firſt members, and was chiefly depended on for mechanics and natural philoſophy. His works are, *Memoires pour ſervir à l'Hiſtoire naturelle des Animaux*, folio, 1676, with figures; *Eſſais de Phiſique*, 4 vols. 12mo, 1688; *Recueil des pluſieurs machines de nouvelle invention*, 4to, 1700, &c. He died in 1688.

PERRAULT (Charles), the brother of Claude, was born at Paris in 1626, with as great a genius for arts, and a greater for letters, than his brother. Colbert choſe him firſt clerk of the buildings, of which he was ſuperintendant, and afterwards made him comptroller-general of the finances under him. He was one of the firſt members of the academy of the belles lettres and inſcriptions, and was received into the French academy in 1671. His poem, *La Peinture*, printed in 1688, was univerſally admired: that entitled *Le ſiecle de Louis le Grand*, in which he exalted the modern authors above the ancient, was a prelude to a war with all the learned. After he had diſengaged himſelf from this conteſt, he applied himſelf to draw up elogies of ſeveral great men of the 17th century, with their portraits, of which he has collected 102. There are other eſteemed works of Perrault. Beſides theſe there were two other brothers, *Peter* and *Nicholas*, who made themſelves known in the literary world.

PERRON (JAMES DAVY DU), a cardinal diſtinguiſhed by his abilities and learning, was born in the canton of Bern in 1556. He was educated by Julian Davy, his father, a very learned Calviniſt, who taught him Latin and the mathematics; after which, he by himſelf became acquainted with the Greek and Hebrew, philoſophy, and the poets. Philip Deſportes, abbot of Tyron, made him known to Henry III. king of France, who conceived a great eſteem for him. Some time after, Du Perron abjured Calviniſm, and afterwards embraced the eccleſiaſtical function; and having given great proofs of his wit and learning, he was choſen to pronounce the funeral oration of Mary queen of Scots. After the murder of Henry III. he retired to the houſe of cardinal de Bourbon, and took great pains in bringing back the Proteſtants to the Church of Rome. Among others, he gained over Henry Spondanus, afterwards biſhop of Pamiers. He alſo chiefly contributed to engage Henry IV. to change his religion; and that prince ſent him to negotiate his reconciliation to the holy ſee, in which he ſucceeded. Du Perron was conſecrated biſhop of Evreux while he reſided at Rome. On his return to France, he wrote, preached, and diſputed againſt the reformed; particularly againſt Du Pleſſis Mornay, with whom he had a public conference in the preſence of the king at Fontainebleau. He was made cardinal in 1604 by pope Clement VIII. at the ſolicitation of Henry IV. who afterwards nominated him to the archbiſhopric of Sens. The king at length ſent him to Rome with cardinal Joyeuſe, in order to terminate the diſputes which had ariſen between Paul V. and the Venetians. It is ſaid that this pope had ſuch an high opinion of the addreſs of the cardinal Du Perron, that he uſed to ſay, "Let us pray to God to inſpire the cardinal Du Perron, for he will perſuade us to do whatever he pleaſes." After the death of Henry IV. he retired into the country, where he put the laſt hand to his works; and, ſetting up a printing-houſe, corrected every ſheet himſelf. He died at Paris in 1618. His works were collected after his death, and publiſhed at Paris in 3 vols. folio.

PERROT (NICHOLAS), Sieur d'Ablancourt, one of the firſt geniuſes of his age, was born at Chalons in 1606. After ſtudying philoſophy about three years, he was ſent to Paris to follow the law. At eighteen years of age he was admitted advocate of parliament, and frequented the bar; but he ſoon conceived a diſtaſte for it, and therefore diſcontinued his practice. This diſpleaſed an uncle, but whoſe favour he recovered by quit-

ting the Proteſtant religion. He could not, however, be prevailed upon to take orders in the Romiſh church; and ſome years after, he had a deſire to return to the religion he had abjured. But, that he might not do any thing raſhly, he reſolved to ſtudy philoſophy and divinity. For that purpoſe he choſe for his maſter Mr. Stuart a Scotſman and Lutheran, a man of great learning. Almoſt three years he ſpent in the moſt aſſiduous ſtudy; and then ſet out from Paris to Champagne, where he abjured the Roman Catholic, and once more embraced the Proteſtant religion. In 1637 he was admitted a member of the French academy; a little after which he undertook a tranſlation of Tacitus. Whilſt he was engaged in that laborious taſk, he retired to his ſmall eſtate of Ablancourt, and lived there till his death in 1664. He was a man of fine underſtanding, of great piety and integrity, and of univerſal learning. Moreri has given a catalogue of his works, the greateſt part of which conſiſt of tranſlations, which ſeemed rather originals.

PERRUKE, Peruke, or *Periwig*, was anciently a name for a long head of natural hair; ſuch, particularly, as there was care taken in the adjuſting and trimming of. Menage derives the word rather fancifully from the Latin *pilus*, "hair." It is derived, according to this critic, thus: *pilus, pelus, pelutus, peluticus, pelutica, perutica, peruca, perruque*. The Latins called it *coma*; whence part of Gaul took the denomination of *Gallia Comata*, from the long hair which the inhabitants wore as a ſign of freedom. An ancient author ſays, that Abſalom's perruke weighed 200 ſhekels.

The word is now uſed for a ſet of falſe hair, curled, buckled, and ſewed together on a frame or cawl: anciently called *capillamentum*, or "falſe perruke." It is doubted whether or not the uſe of perrukes of this kind was known among the ancients. It is true, they uſed falſe hair: Martial and Juvenal make merry with the women of their time, for making themſelves look young with their borrowed hair; with the men, who changed their colours according to the ſeaſons; and with the dotards, who hoped to deceive the Deſtinies by their white hair. But theſe ſeem to have ſcarce had any thing in common with our perrukes; and were at beſt only compoſed of hair painted, and glued together. Nothing can be more ridiculous than the deſcription Lampridius gives of the emperor Commodus's perruke: it was powdered with ſcrapings of gold, and oiled (if we may uſe the expreſſion) with glutinous perfumes for the powder to hang by. In effect, the uſe of perrukes, at leaſt in their preſent mode, is not much more than 160 years old; the year 1629 is reckoned the epocha of long perrukes, at which time they began to appear in Paris; from whence they ſpread by degrees through the reſt of Europe. At firſt it was reputed a ſcandal for young people to wear them, becauſe the loſs of their hair at that age was attributed to a diſeaſe the very name whereof is a reproach; but at length the mode prevailed over the ſcruple, and perſons of all ages and conditions have worn them, foregoing without any neceſſity the conveniences of their natural hair. It was, however, ſome time before the eccleſiaſtics came into the faſhion: the firſt who aſſumed the perruke were ſome of the French clergy in the year 1660; nor is the practice yet well authoriſed. Cardinal Grimaldi in 1684, and the biſhop of Lavaur in 1688, prohibited the uſe of the perruke to all prieſts without a diſpenſation or neceſſity. M. Thier has an expreſs treatiſe, to prove the perruke indecent in an eccleſiaſtic, and directly contrary to the decrees and canons of councils. A prieſt's head, embelliſhed with artificial hair curiouſly adjuſted, he eſteems a monſter in the church, nor can he conceive any thing ſo ſcandalous as an abbot with a florid countenance, heightened with a well-curled perruke.

PERRY (Captain John), was a famous engineer, who reſided long in Ruſſia, having been recommended to the czar Peter while in England, as a perſon capable of ſerving him on a variety of occaſions relating to his new deſign of eſtabliſhing a fleet, making his rivers navigable, &c. His ſalary in this ſervice was 300l. per annum, beſides travelling expences and ſubſiſtence money on whatever ſervice he ſhould be employed, together with a further reward to his ſatisfaction at the concluſion of any work he ſhould finiſh. After ſome converſation with the czar himſelf, particularly reſpecting a communication between the rivers Volga and Don, he was employed on that work for three ſummers ſucceſſively; but not being well ſupplied with men, partly on account of the ill ſucceſs of the czar's arms againſt the Swedes at the battle of Narva, and partly by the diſcouragement of the governor of Aſtracan, he was ordered at the end of 1707 to ſtop, and next year was employed in refitting the ſhips at Veroniſe, and in 1709 in making the river of that name navigable; but after repeated diſappointments, and a variety of fruitleſs applications for his ſalary, he at laſt quitted the kingdom, under the protection of Mr. Whitworth, the Engliſh ambaſſador, in 1712. (See his narrative in the Preface to *The State of Ruſſia*.) In 1721 he was employed in ſtopping with ſucceſs the breach at Dagenham, in which ſeveral other undertakers had failed; and the ſame year about the harbour at Dublin, to the objections againſt which he then publiſhed an anſwer. He was author of The State of Ruſſia, 1716, 8vo, and An Account of the ſtopping of Dagenham Breach, 1721, 8vo; and died Feb. 11. 1733.

Perry, the name of a very pleaſant and wholeſome liquor extracted from pears, in the ſame manner as cyder is from apples. See the articles Cyder and Husbandry. The beſt pears for perry, or at leaſt the ſorts which have been hitherto deemed the fitteſt for making this liquor, are ſo exceſſively tart and harſh that no mortal can think of eating them as fruit; for even hungry ſwine will not eat them, nay hardly ſo much as ſmell them. Of theſe the Boſbury pear, the Bareland pear, and the horſe pear, are the moſt eſteemed for perry in Worceſterſhire, and the ſquaſh pear, as it is called, in Glouceſterſhire; in both which counties, as well as in ſome of the adjacent parts, they are planted in the hedge-rows and moſt common fields. There is this advantage attending pear-trees, that they will thrive on land where apples will not ſo much as live, and that ſome of them grow to ſuch a ſize, that a ſingle pear-tree, particularly of the Boſbury and the ſquaſh kind, has frequently been known to yield, in one ſeaſon, from one to four hogſheads of perry. The Boſbury pear is thought to yield the moſt laſting and moſt vinous liquor. The John pear, the Harpary pear, the Drake pear, the Mary pear, the Lullum pear, and ſeveral others of the harſheſt kinds, are eſteemed the beſt for perry; but the redder or more tawny they are, the more they are preferred. Pears, as well as apples, ſhould be full ripe before they are ground.

Dr. Beale, in his general advertiſements concerning cyder, ſubjoined to Mr. Evelyn's Pomona, diſapproves of Palladius's ſaying, that perry will keep during the winter, but that it turns ſour as ſoon as the weather begins to be warm; and gives as his reaſons for being of a contrary opinion, that he had himſelf taſted, at the end of ſummer, a very briſk, lively, and vinous liquor, made of horſe pears; that he had often tried the juice of the Boſbury pear, and found it both pleaſanter and richer the ſecond year, and ſtill more ſo the third, though kept only in common hogſheads, and in but indifferent cellars, without being bottled; and that a very honeſt, worthy, and ingenious gentleman in his neighbourhood aſſured him, as of his own experience, that it will keep a great while, and grow much the ſtronger for keeping, if put into a good cellar and managed with due care. He imputes Palladius's error to his poſſibly ſpeaking of common eatable pears, and to the perry's having been made in a very hot country; but he would have aſcribed it to a more real cauſe, perhaps, had he pointed out the want of a thorough regular fermentation, to which it appears plainly

that the ancients were entire ſtrangers; for all their vinous liquors were medicated by boiling before they were laid up in order to be kept.

PERSECUTION, is any pain or affliction which a perſon deſignedly inflicts upon another; and in a more reſtrained ſenſe the ſufferings of Chriſtians on account of their religion. Hiſtorians uſually reckon ten general perſecutions, the firſt of which was under the emperor Nero, 31 years after our Lord's aſcenſion; when that emperor, having ſet fire to the city of Rome, threw the odium of that execrable action on the Chriſtians, who under that pretence were wrapped up in the ſkins of wild beaſts, and worried and devoured by dogs; others were crucified, and others burnt alive. The ſecond was under Domitian, in the year 95. In this perſecution St. John the apoſtle was ſent to the iſle of Patmos, in order to be employed in digging in the mines. The third began in the third year of Trajan, in the year 100, and was carried on with great violence for ſeveral years. The fourth was under Antoninus the philoſopher, when the Chriſtians were baniſhed from their houſes, forbidden to ſhow their heads, reproached, beaten, hurried from place to place, plundered, impriſoned, and ſtoned. The fifth began in the year 197, under the emperor Severus. The ſixth began with the reign of the emperor Maximinus in 235. The ſeventh, which was the moſt dreadful perſecution that had ever been known in the church, began in the year 250, in the reign of the emperor Decius, when the Chriſtians were in all places driven from their habitations, ſtripped of their eſtates, tormented with racks, &c. The eighth began in the year 257, in the fourth year of the reign of the emperor Valerian. The ninth was under the emperor Aurelian, A. D. 274; but this was very inconſiderable: and the tenth began in the 19th year of Dioclefian, A. D. 303. In this dreadful perſecution, which laſted ten years, houſes filled with Chriſtians were ſet on fire, and whole droves were tied together with ropes and thrown into the ſea. See TOLERATION.

PERSEES, the deſcendants of a colony of ancient Perſians, who took refuge at Bombay, Surat, and in the vicinity of thoſe cities, when their own country was conquered 1100 years ago by the Mahometan Arabs. They are a gentle, quiet, and induſtrious people, loved by the Hindoos, and living in great harmony among themſelves. The conſequence is, that they multiply exceedingly, whilſt their countrymen in the province of Keman are viſibly diminiſhing under the yoke of the Mahometan Perſians. Of the manners and cuſtoms of this amiable race, we have the following account in Heron's elegant tranſlation of Niebuhr's Travels.

"The Perſees (ſays he) make common contributions for the aid of their poor, and ſuffer none of their number to aſk alms from people of a different religion. They are equally ready to employ their money and credit to ſcreen a brother of their fraternity from the abuſes of juſtice. When a Perſee behaves ill, he is expelled from their communion. They apply to trade, and exerciſe all ſorts of profeſſions.

"The Perſees have as little knowledge of circumciſion as the Hindoos. Among them, a man marries only one wife, nor ever takes a ſecond, unleſs when the firſt happens to be barren. They give their children in marriage at ſix years of age; but the young couple continue to live ſeparate, in the houſes of their parents, till they attain the age of puberty. Their dreſs is the ſame as that of the Hindoos, except that they wear under each ear a tuft of hair, like the modern Perſians. They are much addicted to aſtrology, although they are very little ſkilled in aſtronomy.

"They retain the ſingular cuſtom of expoſing their dead to be eaten by birds of prey, inſtead of interring or burning them. I ſaw (continues our author) on a hill at Bombay a round tower covered with planks of wood, on which the Perſees lay out their dead bodies. When the fleſh is devoured, they remove the bones into two chambers at the bottom of the tower.

"The Perſees, followers of the religion of Zerduſt or Zoroaſter, adore one God only, eternal and almighty. They pay, however, a certain worſhip to the ſun, the moon, the ſtars, and to fire, as viſible images of the inviſible divinity. Their veneration for the element of fire induces them to keep a ſacred fire conſtantly burning, which they feed with odoriferous wood, both in the temples and in the houſes of private perſons who are in eaſy circumſtances. In one of their temples at Bombay, I ſaw a fire which had burnt unextinguiſhed for two centuries. They never blow out a light, leſt their breath ſhould foil the purity of the fire. See POLYTHEISM.

"The religion of the Perſees enjoins purifications as ſtrictly as that of the Hindoos. The diſciples of Zerduſt are not, however, obliged to abſtain from animal food. They have accuſtomed themſelves to refrain from the fleſh of the ox, becauſe their anceſtors promiſed the Indian prince who received them into his dominions never to kill horned cattle. This promiſe they continue to obſerve under the dominion of Chriſtians and Mahometans. The horſe is by them conſidered as the moſt impure of all animals, and regarded with extreme averſion.

"Their feſtivals, denominated *Ghumbars*, which return frequently, and laſt upon each occaſion five days, are all commemorations of ſome part of the work of creation. They celebrate them not with ſplendour, or with any particular ceremonies, but only dreſs better during thoſe five days, perform ſome acts of devotion in their houſes, and viſit their friends."

The Perſees were till lately but very little known: the ancients ſpeak of them but ſeldom, and what they ſay ſeems to be dictated by prejudice. On this account Dr. Hyde, who thought the ſubject both curious and intereſting, about the end of laſt century attempted a deeper inveſtigation of a ſubject which till then had been but very little attended to. He applied to the works of Arabian and Perſian authors, from whom, and from the relations of travellers, together with a variety of letters from perſons in India, he compiled his celebrated work on the religion of the Perſees. Other accounts have been given by different men, as accident put information in their way. But the moſt diſtinguiſhed is by M. Anquetil du Perron, who undertook a voyage to diſcover and tranſlate the works attributed to Zoroaſter. Of this voyage he drew up an account himſelf, and read it before the Royal Academy of Sciences at Paris in May 1761. A tranſlation of it was made and publiſhed in the Gentleman's Magazine for 1762, to which we refer our readers. The account begins at p. 373, and is concluded at p. 614. Remarks were afterwards made on Du Perron's account by a Mr. Yates. See the ſame Magazine for 1766, p. 529.

PERSEPOLIS, formerly the capital of Perſia, ſituated in N. lat. 30. 30. E. lon. 84. now in ruins, but remarkable for the moſt magnificent remains of a palace or temple that are to be found throughout the world. See plate 33. This city ſtood in one of the fineſt plains in Perſia, being 18 or 19 leagues in length, and in ſome places two, in ſome four, and in others ſix leagues in breadth. It is watered by the great river Araxes, now Bendemir, and by a multitude of rivulets beſides. Within the compaſs of this plain, there are between 1000 and 1500 villages, without reckoning thoſe in the mountains, all adorned with pleaſant gardens, and planted with ſhady trees. The entrance of this plain on the weſt ſide has received as much grandeur from nature, as the city it covers could do from induſtry or art. It conſiſts of a range of mountains ſteep and high, four leagues in length, and about two miles broad, forming two flat banks, with a riſing terrace in the middle, the ſummit of which is perfectly plain and even, all of native rock. In this there are ſuch openings, and the terraces are ſo fine and ſo even, that one would be tempted to think the whole the work of art,

if the great extent, and prodigious elevation thereof, did not convince one that it is a wonder too great for aught but nature to produce. Undoubtedly theſe banks were the very place where the advanced guards from Perſepolis took poſt, and from which Alexander found it ſo difficult to diſlodge them. One cannot from hence deſcry the ruins of the city, becauſe the banks are too high to be overlooked; but one can perceive on every ſide the ruins of walls and of edifices, which heretofore adorned the range of mountains of which we are ſpeaking. On the weſt and on the north this city is defended in the like manner: ſo that, conſidering the height and evenneſs of theſe banks, one may ſafely ſay, that there is not in the world a place ſo fortified by nature.

The mountain Rehumut, in the form of an amphitheatre, encircles the palace, which is one of the nobleſt and moſt beautiful pieces of architecture remaining of all antiquity. Authors and travellers have been exceedingly minute in their deſcriptions of thoſe ruins; and yet ſome of them have expreſſed themſelves ſo differently from others, that, had they not agreed with reſpect to the latitude and longitude of the place, one would be tempted to ſuſpect that they had viſited different ruins. Theſe ruins have been deſcribed by Garcias de Silva Figueroa, Pietro de la Valle, Chardin, Le Brun, and Mr. Francklin. We ſhall adopt the lateſt deſcription, as being exceedingly diſtinct, and given by a traveller intelligent and unaſſuming. The aſcent to the columns is by a grand ſtaircaſe of blue ſtone containing 104 ſteps.

"The firſt objects that ſtrike the beholder on his entrance are two portals of ſtone, about 50 feet in height each; the ſides are embelliſhed with two ſphinxes of an immenſe ſize, dreſſed out with a profuſion of bead-work, and, contrary to the uſual method, they are repreſented ſtanding. On the ſides above are inſcriptions in an ancient character, the meaning of which no one hitherto has been able to decypher.

"At a ſmall diſtance from theſe portals you aſcend another flight of ſteps, which lead to the grand hall of columns. The ſides of this ſtaircaſe are ornamented with a variety of figures in baſſo relievo; moſt of them have veſſels in their hands: here and there a camel appears, and at other times a kind of triumphal car, made after the Roman faſhion; beſides theſe are ſeveral led horſes, oxen, and rams, that at times intervene and diverſify the proceſſion. At the head of the ſtaircaſe is another baſſo relievo, repreſenting a lion ſeizing a bull; and cloſe to this are other inſcriptions in ancient characters. On getting to the top of this ſtaircaſe, you enter what was formerly a moſt magnificent hall; the natives have given this the name of *chehul minàr*, or forty pillars; and though this name is often uſed to expreſs the whole of the building, it is more particularly appropriated to this part of it. Although a vaſt number of ages have elapſed ſince the foundation, 15 of the columns yet remain entire; they are from 70 to 80 feet in height, and are maſterly pieces of maſonry: their pedeſtals are curiouſly worked, and appear little injured by the hand of time. The ſhafts are enfluted up to the top, and the capitals are adorned with a profuſion of fretwork.

"From this hall you proceed along eaſtward, until you arrive at the remains of a large ſquare building, to which you enter through a door of granite. Moſt of the doors and windows of this apartment are ſtill ſtanding; they are of black marble, and poliſhed like a mirror: on the ſides of the doors, at the entrance, are bas reliefs of two figures at full length; they repreſent a man in the attitude of ſtabbing a goat: with one hand he ſeizes hold of the animal by the horn, and thruſts a dagger into his belly with the other; one of the goat's feet reſts upon the breaſt of the man, and the other upon his right arm. This device is common throughout the palace. Over another door of the ſame apartment is a repreſentation of two men at full length; behind them ſtands a domeſtic holding a ſpread umbrella: they are ſupported by large round ſtaffs, appear to be in years, have long beards, and a profuſion of hair upon their heads.

"At the ſouth-weſt entrance of this apartment are two large pillars of ſtone, upon which are carved four figures; they are dreſſed in long garments, and hold in their hands ſpears 10 feet in length. At this entrance alſo the remains of a ſtaircaſe of blue ſtone are ſtill viſible. Vaſt numbers of broken pieces of pillars, ſhafts, and capitals, are ſcattered over a conſiderable extent of ground, ſome of them of ſuch enormous ſize, that it is wonderful to think how they could have been brought whole, and ſet up together. Indeed, every remains of theſe noble ruins indicate their former grandeur and magnificence, truly worthy of being the reſidence of a great and powerful monarch."

Theſe noble ruins are now the ſhelter of beaſts and birds of prey. Beſides the inſcription above mentioned, there are others in Arabic, Perſian, and Greek. Dr. Hyde obſerves, that the inſcriptions are very rude and unartful; and that ſome, if not all of them, are in praiſe of Alexander the Great; and therefore are later than that conqueror. See the article RUINS.

PERSEVERANCE, in theology, a continuance in a ſtate of grace to a ſtate of glory. About this ſubject there has been much controverſy in the Chriſtian church. All divines, except Unitarians, admit, that no man can ever be in a ſtate of grace without the co-operation of the ſpirit of God; but the Calviniſts and Arminians differ widely as to the nature of this co-operation. The former, at leaſt ſuch as call themſelves the *true diſciples of Calvin*, believe that thoſe who are once under the influence of divine grace can never fall totally from it, or die in mortal ſin. The Arminians, on the other hand, contend, that the whole of this life is a ſtate of probation; that without the grace of God we can do nothing that is good; that the Holy Spirit aſſiſts, but does not overpower, our natural faculties; and that a man, at any period of his life, may reſiſt, grieve, and quench the ſpirit. See THEOLOGY.

PERSEUS, was the moſt ancient of all the Greek heroes. He founded the city of Mycenæ, of which he became afterwards king, and where he and his poſterity reigned for 100 years. He flouriſhed, according to moſt chronologiſts, 1348 B. C. but, according to Sir Iſaac Newton, only 1028.

PERSEUS, in aſtronomy. See ASTRONOMY.

PERSIA, a country of Aſia, than which, perhaps, none has been more various in its power and extent: even its preſent boundaries are, in ſome degree, unknown, eſpecially towards Ruſſia, Tartary, and India. In the general outline, it is bounded on the north by Ruſſia, the Caſpian Sea, and the country of the independent Tartars; on the eaſt by the Mogul empire, from which a ridge of mountains and the river Indus divide it; on the ſouth it has the Arabian Sea and the Perſian Gulf; and on the weſt it has Georgia, Curdiſtan, Armenia, and Arabia. Its greateſt extent from ſouth to north is about 1140 Engliſh miles, and its greateſt extent from eaſt to weſt is about 1280 miles, though in many parts it is much narrower, eſpecially towards the north, where, on the weſt, it contains but a narrow tract of land between Turkey and the Caſpian Sea; and on the eaſt it is alſo pent up between the ſame ſea and the country of the Tartars. The temperature of the air is various, according to the different provinces. In the province of Adirbeitzan, the capital of which is Tauris, to the ſouth of Armenia, the air is very cold, and yet very healthy; but in Taberiſtan, or Mezanderan, to the ſouth of the Caſpian Sea, is very unwholeſome. The country here is marſhy, and abounds with an infinite number of inſects, which dying when the marſhes are dried up in ſummer, infect the air with poiſonous exhalations: there are beſides ſo many fetid waters in this province, that, by overflowing part of the country, they occaſion the inhabitants to have an

earthy complexion. Shah Abbas tranſported 20,000 Armenian families into Taberiſtan, in order to people and cultivate it; but few of them withſtood the inſalubrity of the country, which is, notwithſtanding, very fruitful. The air is not better in the province of Ghilan, which lies to the north-weſt of Mezanderan, and, indeed, is ſo bad in both, that it is cuſtomary to aſk, when any perſon is appointed governor of either, whether he is guilty of robbery or murder, that he ſhould be ſent thither? The province of Perſian Irac, of which Iſpahan is the capital, and which lies about the middle of the kingdom, enjoys ſix months hot and ſix months cold weather, though lying between the 31ſt and 36th degrees of north latitude. It ſnows there four or five times in the ſeaſon, and ſometimes in ſuch quantities that it is impoſſible to find the roads. At about a league's diſtance from Iſpahan, there is a ſtone three or four feet high; and, when the ſnow happens to cover the ground to that height, it is a ſign of a plentiful year. The firſt peaſant that carries the news of it to court receives a reward of 100 tomans, about 230l. ſterling. It rains here very ſeldom, except in April, when the ſhowers are ſometimes pretty heavy. In the ſouthern provinces, eſpecially along the ſea-coaſt, the air is ſo exceſſively hot and ſultry, that it is very dangerous and even mortal to Europeans, particularly to ſuch as are not temperate in eating and drinking: generally ſpeaking, the ſoil in Perſia cannot be much commended; for, though ſome parts are fruitful, others are perfectly barren, being mountainous and ſandy. By reaſon of the ſcarcity of rivers, there is only rain and diſſolved ſnow for watering the land; and theſe, falling from the mountains in ſmall brooks and rivulets, render the valleys fertile. Here their corn ripens exceedingly ſoon, and in ſome parts they have a threefold crop in a year. At Iſpahan they have almoſt all kinds of the choiceſt European fruits, but fairer and better; and, by the dryneſs of the air, they keep a whole year. The melons are excellent, and not dangerous, as in Europe; their apricots delicious; and their peaches large and good. They have nine or ten ſorts of very good grapes, which yield good wine, chiefly white, for the red wines do not keep ſo well, except that of Schiras. They have few trees but what grow in their gardens, and of theſe the palm-tree is the moſt carefully cultivated. Perſia produces all ſorts of culinary herbs, plants, roots, and pulſe; it has ſtore of cattle, eſpecially oxen, and abounds particularly with poultry and game. The Perſian breed is generally very thin, white, and good. Their horſes are the fineſt in all the eaſt; they are higher than the Engliſh ſaddle horſes, ſtraight before, have a ſmall head, legs wonderfully ſlender and finely proportioned, are gentle, good travellers, very light and ſprightly, and do good ſervice till they are eighteen or twenty years old. Their mules are next in requeſt; they pace well, never fall, and are ſeldom tired; the higheſt price of a mule is about forty-five pounds. Their Arabian breed of aſſes is the beſt in the world: they have ſmooth ſhining hair, they carry their heads lofty, their feet are light, and they move them gracefully; ſome of them are valued at twenty pounds, being kept for riding, and their maſters love them for their lightneſs and eaſy going. Their beaſts of burden are, the common aſs, like ours, ſlow and heavy, and camels, of which there are two ſorts, northern and ſouthern; the latter, much the ſmaller, carry but ſeven hundred weight; the other can carry one thouſand three hundred; both are profitable to their maſters, as coſting little or nothing to keep. The camel's hair is the moſt profitable fleece of all the tame beaſts; fine ſtuffs are made out of it, and, in Europe, hats, with a mixture of a little beaver. As Perſia is very mountainous, it is full of metals and minerals, which they began to work upon in the laſt century much more than in preceding times. Their diligence, in this reſpect, was owing to the great Shah Abbas. The metals uſually to be met with are iron, ſteel, braſs, and lead; minerals and mineral waters abound throughout Perſia; ſulphur and ſaltpetre are extracted out of the mountain of Damavend, which ſeparates Taberiſtan from Irac. Wild beaſts are not very common in Perſia, becauſe there are few foreſts; but in all woody countries, as in Hyrcania, now called Taberiſtan, there are abundance of lions, bears, tigers, leopards, porcupines, wild boars, jackals, and wolves; but the laſt not ſo numerous as any of the other ſpecies. Perſia is divided into the following provinces: Schirvan, which is the moſt northern province of Perſia, and lies along the weſtern coaſt of the Caſpian Sea; Adirbeitzan; Ghilan; Mezanderan, with Taberiſtan; Perſian Irak, or ancient Parthia; Chuſiſtan; Farſiſtan; Kerman, or Keriſtan; Mecran, or Makran; Segeſtan; Sableſtan; and Choraſan; including Aſterabat and Dageſtan. Candahar was anciently a province of Perſia, but is now independent. When the kingdoms of Media and Perſia were united, under Cyrus the Great, in the year of the world 3419, that prince, having conquered Babylonia, erected the ſecond or Perſian monarchy upon the total ruin of the Aſſyrian empire, and thereby extended the Perſian dominions through Aſſyria, Armenia, and all Aſia Minor, to the very borders of Europe; but this monarchy continued no longer than 206 years, in a ſucceſſion of twelve kings, the third of whom, Darius Hyſtaſpes, invaded Greece with an army of 100,000 foot and 10,000 horſe; a force ſufficient for over-running all that country, if the virtue and bravery of the Greeks had not exceeded what could poſſibly have been expected from men. The Greeks could not get together an army of above 10,000 men; and yet this handful of people ventured, under the conduct of Miltiades, to give the Perſians battle, in the plains of Marathon, near Athens; and, with the loſs of 192 men only, according to Herodotus, entirely defeated that immenſe army. Xerxes, the ſon and ſucceſſor of Darius, renewed the attempt againſt Greece, and, after ten years preparation, invaded it with ſo large an army, that the whole land was, in a manner, covered, and entire rivers drank dry by them: but this expedition did not prove more ſucceſsful; for, after the battle, by land, at the Straits of Thermopylæ, and the ſea-engagement at Salamis, Xerxes was glad to retire, and leave his general Mardonius, with 300,000 men, to finiſh the war; which was, indeed, ſoon after put an end to, by the entire rout of the Perſian army, at the famous battle of Platæa. About 150 years after, Alexander, king of Macedon, invaded Aſia; fought the numerous Perſian armies, firſt at the river Granicus, in Phrygia; ſecondly, at Iſſus, in Cilicia; and, thirdly, at Arbela, in Aſſyria; in all which battles he obtained entire victories, and finally entered Babylon in triumph. At the grand partition of Alexander's dominions among his captains, Perſia was made part of the Syrian kingdom of Seleucus Nicanor, but did not continue long ſo; for, in the reign of Antiochus Theos, the grandſon of Seleucus, the Parthians revolted, under the conduct of Arſaces, a nobleman of that country, who perſuaded the neighbouring nations to join with him, and aſſumed the title of king. He was ſucceeded by a race of princes, who were potent monarchs, and oppoſed the Romans with greater vigour than any other nation. This kingdom remained thus, under the Parthian government, from the year of the world 3718 to the year of Chriſt 228; when Artaxerxes, a noble Perſian, having ſlain Artabanus III. and repelled the Romans, aſcended the throne. This king is reckoned to have reſtored the ancient Perſian race, and from him began a new dynaſty, or race of kings, who, in twenty-eight generations, governed this country 406 years. In the year 634, the Saracens, under Omar, the ſucceſſor of Mohammed, defeated Hormiſdas II. This put an end to that kingdom: ſo that Perſia became a part of the Saracen empire, and was governed by certain deputies, with the title of ſultans, under the grand caliph. In proceſs of time the ſultans of Perſia, Babylon, &c. quarrelling among themſelves, occaſioned ſeveral revolu-

tions and fluctuations of power, which, in the end, brought in the Turks. Tangrolipix overcame the ſultan or king of Perſia in the year 1030, and aſſumed the government of that country. He was ſucceeded by a race of Turkiſh princes for about 200 years; and then a new dynaſty of Tartarian princes gained the government. Haalen, the firſt of theſe, became king of Perſia in the year 1260, and was ſucceeded by eight of his poſterity, till the year 1337; when, upon the death of Abuſaid, the laſt of that houſe, the kingdom became divided amongſt ſeveral Tartar princes, till about the year 1400, when Tamerlane reduced the whole to his obedience, and left it to his ſon Mirza Charock: but that family did not hold it long; for, after continual feuds among themſelves, in a ſucceſſion of ſix generations, the laſt of them was defeated and ſlain, in 1472, by Uſum Caſſan, an Armenian prince, who was, at that time, governor of Turcomania, and founded a new dynaſty, called the Armenian. There were five other princes of this line, the laſt of whom was at firſt ſucceſsful in war againſt the Sophian family, who then began to make a great figure in Perſia; but he was at laſt defeated by Iſmael Sophi, the founder of the dynaſty of the Sophian race, who governed Perſia till within theſe few years. In the beginning of the preſent century, Nadir Khan, the ſon of a Perſian nobleman, on the borders of Tartary, was invited by the reigning Thamas to aſſiſt in quelling a rebellion ſet on foot by Myrr Weis, the governor of Candahar; which he performed. But Nadir Khan, to whom Thamas had given the name of Thamas Kouli Khan, that is, the ſlave of Thamas, thinking his ſervices not ſufficiently rewarded, and pretending that the king had a deſign againſt his life, or at leaſt to ſet him aſide, conſpired againſt his ſovereign, made him priſoner, and put him to death as is ſuppoſed; after which he uſurped the throne, ſtyling himſelf Shah Nadir, or king Nadir. He afterwards laid ſiege to Candahar, of which a ſon of Myrr Weis had poſſeſſed himſelf. While he lay at this ſiege, the court of the great mogul being diſtracted by factions, one of the parties invited Shah Nadir to come to their aſſiſtance, and betrayed the mogul into his hands. Hereupon, he marched to Delhi; where having amaſſed the greateſt treaſure ever prince was maſter of, he returned to Perſia, giving the mogul his liberty, on condition of reſigning the provinces on the weſt ſide of the Indies to the crown of Perſia. He afterwards made a conqueſt of Uſbeck Tartary, and plundered Bukhara, the capital city. Then he marched againſt the Dagiſtan Tartars, but loſt great part of his army in the mountains, without fighting. He defeated the Turks in ſeveral engagements, but, laying ſiege to Bagdad, was twice compelled to raiſe the ſiege. He proceeded to change the religion of the Perſians to that of Omar, hanged up the chief prieſts, put his own ſon to death, and was guilty of ſuch cruelty, that he was at length aſſaſſinated by his own relations, in 1747, who have been fighting for the crown ever ſince. The contending parties have been reduced to two, and, in the ſpring of the year 1763, Kerim Khan made himſelf maſter of all Perſia, by the defeat of Fat Ali Khan. The highways were ſince ſafe, trade recovered its vigour, caravans are very frequent, and between 15,000 and 20,000 families of that kingdom, who had retired to Bagdad, ſucceſſively returned to their own country. At firſt Kerim Khan declined the title of king, aſſuming only in his firmans, and on his coin, that of ſabelzaman, which ſignifies maſter of the preſent time; but he ſince, in the month of October of the ſame year, convoked all the Perſian grandees, to meet him at Iſpahan, in order to aſſiſt at his coronation at Tauris. Perſia is an abſolute monarchy; the king's will is law, in all caſes; he judges of the lives and fortunes of his ſubjects, without regard to any other juſtice or law than his own pleaſure; and that often leads him to extravagant ſeverities. He has no eſtabliſhed council, but is adviſed by ſuch miniſters as are moſt in favour; and the reſolutions taken by the ladies in the haram frequently defeat the beſt laid deſigns. The crown is hereditary, excluding only the females; but the ſons of a daughter are allowed to inherit. The laws of Perſia exclude the blind from the throne; and this is the reaſon that the reigning prince uſually orders the eyes of all the males of the royal family, of whom he entertains any jealouſy, to be put out. The religion of the Perſians is the ſame in ſubſtance with that of the Turks; though no nations in the world hate one another ſo much on account of religion as they do. The true ground of their diviſion is, that the Turks pretend that Abubeker was the lawful ſucceſſor of Mahomet, Omar the ſucceſſor of Abubeker, Oſman of Omar, and then Ali; whereas the Perſians aſſert, that Ali ſucceeded Mahomet, or ought to have ſucceeded him, as being his ſon-in-law, and that the reſt were but ſo many uſurpers of his right. This is the reaſon that the Turks hold the Perſians to be heretics.

PERSIAN WHEEL. See HYDROSTATICS.

PERSICA, the PEACH, is by Linnæus referred to the ſame claſs and genus with amygdalus: however, as they are ſo commonly reckoned to be different genera, we have thought proper to diſtinguiſh them. There are a great variety of peach-trees planted in the gardens, ſome of which are preſerved only for the beauty of their flowers, but moſt of them for the ſake of the fruit. Of thoſe remarkable for the beauty of their flowers the principal are, 1. The *vulgaris*, or common peach-tree, with double flowers, which is a very great ornament in gardens, producing very large double flowers of a beautiful red or purple colour, and growing to a conſiderable ſize. 2. The *humilis*, or dwarf almond. 3. The *africana*, or double-flowering dwarf almond. Theſe two reach not above the height of three or four feet, though their flowers are of equal beauty with the former.

Of the peach-trees cultivated for the ſake of their fruit there are a great number, to deſcribe which particularly would exceed the proper bounds of this article. They are raiſed from the ſtones of the fruit, which ſhould be planted in autumn on a bed of light dry earth, about three inches deep and four inches aſunder. In the winter the beds ſhould be covered with mulch to protect them from the froſt. In this bed they ſhould remain for a year; when they are to be taken up and planted in a nurſery, where they are to remain one or two years; after which they muſt be removed to the places where they are to continue.

PERSICANA, in botany. See POLYGONUM.

PERSICUS SINUS, in anc. geog. (Mela, Pliny); a part of the ſea which the Romans called *Mare Rubrum*, and the Greeks *Mare Erythræum*; waſhing Arabia Felix on the eaſt, between which and Carmania, entering into the land, it waſhes Perſis on the ſouth. Its large mouth conſiſts of ſtraight ſides, like a neck; and then the land retiring equally a vaſt way, and the ſea ſurrounding it in a large compaſs of ſhore, there is exhibited the figure of a human head (Mela). Theophraſtus calls this bay *Sinus Arabicus*, a name it equally claims with *Perſicus*, only for diſtinction ſake *Perſicus* is appropriated to it by others.

PERSIMON. See DIOSPYROS. From the perſimon is made a very palatable liquor in the following manner: As ſoon as the fruit is ripe, a ſufficient quantity is gathered, which is very eaſy, as each tree is well ſtocked with them. Theſe perſimon apples are put into a dough of wheat or other flour, formed into cakes, and put into an oven, in which they continue till they are quite baked and ſufficiently dry, when they are taken out again: then, in order to brew the liquor, a pot full of water is put on the fire, and ſome of the cakes are put in: theſe become ſoft by degrees as the water grows warm, and crumble in pieces at laſt: the pot is then taken from the fire, and the water in it well ſtirred about, that the cakes may mix with it: this is then poured into another veſſel, and they continue to ſteep and break as many cakes as are neceſſary for a brewing: the malt is then infuſed, and they proceed as uſual

with the brewing. Beer thus prepared is reckoned much preferable to other beer. They likewiſe make brandy of this fruit in the following manner: Having collected a ſufficient quantity of perſimons in autumn, they are altogether put into a veſſel, where they lie for a week till they are quite ſoft: then they pour water on them, and in that ſtate they are left to ferment of themſelves, without promoting the fermentation by any addition. The brandy is then made in the common way, and is ſaid to be very good, eſpecially if grapes (in particular of the ſweet ſort), which are wild in the woods, be mixed with the perſimon fruit. Some perſimons are ripe at the end of September, but moſt of them later, and ſome not before November and December, when the cold firſt overcomes their acrimony. The wood of this tree is very good for joiners inſtruments, ſuch as planes, handles to chiſels, &c but if after being cut down it lies expoſed to ſunſhine and rain, it is the firſt wood which rots, and in a year's time there is nothing left but what is uſeleſs. When the perſimon trees get once into a field, they are not eaſily got out of it again, as they ſpread ſo much.

PERSIS, a Roman lady, whom St. Paul ſalutes in his epiſtle to the Romans (xvi. 12.), and whom he calls his beloved ſiſter. He ſays, ſhe has läboured much for the Lord, and ſtill labours. Nothing elſe of her life is come to our knowledge, nor do we know that ſhe is honoured by any church; which is ſomething ſingular.

PERSIUS (Flaccus Aulus), a Latin poet in the reign of Nero, celebrated for his ſatires. He was born, according to ſome, at Volterra in Tuſcany; and according to others, at Tigulia, in the gulf Della Specia, in the year 34. He was educated till 12 years old at Volterra; and afterwards continued his ſtudies at Rome under Palæmon the grammarian, Virginius the rhetorician, and Cornutus the ſtoic philoſopher, who contracted a friendſhip for him. Perſius conſulted that illuſtrious friend in the compoſition of his verſes. Lucian alſo ſtudied with him under Cornutus; and appeared ſo charmed with his verſes, that he was inceſſantly breaking out into acclamations at the beautiful paſſages in his ſatires: an example rarely ſeen in poets of equal rank. He was a ſteady friend, a good ſon, an affectionate brother and parent. He was chaſte, meek, and modeſt: which ſhows how wrong it is to judge of a man's morals by his writings; for the ſatires of Perſius are not only licentious, but ſharp and full of bitterneſs. He wrote but ſeldom; and it was ſome time before he applied himſelf regularly to it.

Perſius was of a weak conſtitution, and troubled with a bad ſtomach, which was the cauſe of his death in the 30th year of his age. Six of his ſatires remain; in their judgments of which the critics have been much divided, excepting as to their obſcurity, Perſius being indeed the moſt obſcure of all the Latin poets. As a poet, he is certainly inferior to Horace and Juvenal; and all the labours of Iſaac Caſaubon, who has written a moſt learned and elaborate commentary upon him, cannot make him equal to either of them as a ſatiriſt, though in virtue and learning he exceeded them both. He was a profeſſed imitator of Horace; yet had little of Horace's wit, eaſe, and talent at ridicule. His ſtyle is grand, figurative, poetical, and ſuitable to the dignity of the Stoic philoſophy: and hence he ſhines moſt in recommending virtue and integrity: here it is that ſatire becomes him. He was too grave to court the muſes with ſucceſs; but he had a great ſoul, ſuſceptible of noble ſentiments, which gave a grace to but indifferent poetry. His cotemporaries thought highly of him. Quintilian allows, that Perſius, although he wrote but one book of ſatires, acquired a great deal of true glory, *Multum et veræ gloriæ quamvis uno libro Perſius meruit:* and Martial ſays much the ſame thing, *Sæpius in libro memoratur Perſius uno*, &c.

PERSON, an individual ſubſtance of a rational intelligent nature. Thus we ſay, an ambaſſador repreſents the perſon of his prince; and that, in law, the father and ſon are reputed the ſame perſon.

The word *perſon*, *perſona*, is thought to be borrowed *a perſonando*, from perſonating or counterfeiting; and is ſuppoſed to have firſt ſignified a maſk: becauſe, as Boethius informs us, *in larva concava ſonus volvatur:* and hence the actors who appeared maſked on the ſtage were ſometimes called *larvati* and ſometimes *perſonati*. He likewiſe ſays, that as the ſeveral actors repreſented each a ſingle individual perſon, *viz.* Œdipus, or Chremes, or Hecuba, or Medea; for this reaſon, other people, who were at the ſame time diſtinguiſhed by ſomething in their form, character, &c. whereby they might be known, came likewiſe to be called by the Latins *perſonæ*, and by the Greeks προσωπα. Again, as actors rarely repreſented any but great and illuſtrious characters, the word came at length to import the mind, as being that whoſe diſpoſitions conſtitute the character. And thus men, angels, and even God himſelf, were called *perſons*. Things merely corporeal, as a ſtone, a plant, or a horſe, were called *hypoſtaſes* or *ſuppoſita*, but never *perſons*. Hence the learned ſuppoſe, that the ſame name *perſon* came to be uſed to ſignify ſome dignity, whereby a *perſon* is diſtinguiſhed from another: as a father, huſband, judge, magiſtrate, &c. In this ſenſe we are to underſtand that of Cicero: "Cæſar never ſpeaks of Pompey but in terms of honour and reſpect: he does many hard and injurious things, however, againſt his perſon."

Perſon we have already defined to mean an individual ſubſtance of a reaſonable nature. Now, a thing may be individual two ways: 1. Logically, becauſe it cannot be predicated of any other; as Cicero, Plato, &c. 2. Phyſically; in which ſenſe a drop of water, ſeparated from the ocean, may be called an individual. Perſon is an individual nature in each of theſe ſenſes: logically, according to Boethius, becauſe *perſon* is not ſpoken of univerſals, but only of ſingulars and individuals; we do not ſay the *perſon* of an animal or a man, but of Cicero and Plato: and phyſically, ſince Socrates's hand or foot are never conſidered as perſons. This laſt kind of individual is denominated two ways: poſitively, when the perſon is ſaid to be the whole principle of acting; for, to whatever thing action is attributed, that the philoſophers call a *perſon:* and negatively, as when we ſay, with the Thomiſts, &c. that a perſon conſiſts in this, that it does not exiſt in another as a more perfect being. Thus a man, though he conſiſts of two different things, *viz.* body and ſpirit, is not two perſons; becauſe neither part of itſelf is a complete principle of action, but one perſon, ſince the manner of his conſiſting of body and ſpirit is ſuch as conſtitutes one whole principle of action nor does he exiſt in any other as a more perfect being, as, for example, Socrates's foot does in Socrates, or a drop of water in the ocean.

Person, in grammar, a term applied to ſuch nouns or pronouns as, being either prefixed or underſtood, are the nominatives in all inflections of a verb; or it is the agent or patient in all finite or perſonal verbs. See Grammar.

PERSONAL, any thing that concerns, or is reſtrained to, the perſon: thus, it is a maxim in ethics, that all faults are perſonal.

Personal *Action*, in law, is an action levied directly and ſolely againſt the perſon; in oppoſition to a real or mixed action. See Action.

Personal *Goods*, or *Chattels*, in law, ſignifies any moveable thing belonging to a perſon, whether alive or dead. See Chattels.

Personal *Identity*. See Metaphysics.

Personal *Verb*, in grammar, a verb conjugated in all the three perſons; thus called in oppoſition to an imperſonal verb, or that which has the third perſon only.

PERSONALITY, in the ſchools, is that which conſtitutes an individual a diſtinct perſon.

PERSONATÆ, is the name of the 40th order in Linnæus's Fragments of a Natural Method, conſiſting of a number of plants whoſe flowers are furniſhed with an irregular gaping or grinning petal, which in figure ſomewhat reſembles the ſnout of an animal. The bulk of the genera of this natural order arrange themſelves under the claſs and order didynamia angioſpermia of the Sexual Method. The reſt, although they cannot enter into the artificial claſs juſt mentioned, for want of the claſſic character, the inequality of the ſtamina; yet, in a natural method, which admits of greater latitude, may be arranged with thoſe plants which they reſemble in their habit and general appearance, and particularly in the circumſtances expreſſed in that title.

PERSONIFYING, or PERSONALIZING, the giving an inanimate being the figure, ſentiments, and language of a perſon. Dr. Blair, in his Lectures on Rhetoric, gives this account of perſonification. "It is a figure, the uſe of which is very extenſive, and its foundation laid deep in human nature. At firſt view, and when conſidered abſtractly, it would appear to be a figure of the utmoſt boldneſs, and to border on the extravagant and ridiculous. For, what can ſeem more remote from the track of reaſonable thought, than to ſpeak of ſtones and trees, and fields and rivers, as if they were living creatures, and to attribute to them thought and ſenſation, affections and actions? One might imagine this to be no more than childiſh conceit, which no perſon of taſte could reliſh. In fact, however, the caſe is very different. No ſuch ridiculous effect is produced by perſonification when properly employed; on the contrary, it is found to be natural and agreeable, nor is any very uncommon degree of paſſion required in order to make us reliſh it. All poetry, even in its moſt gentle and humble forms abounds with it. From proſe it is far from being excluded; nay, in common converſation, very frequent approaches are made to it. When we ſay, the ground *thirſts* for rain, or the earth *ſmiles* with plenty; when we ſpeak of ambition's being *reſtleſs*, or a diſeaſe being *deceitful*; ſuch expreſſions ſhow the facility with which the mind can accommodate the properties of living creatures to things that are inanimate, or to abſtract conceptions of its own forming.

"Indeed, it is very remarkable, that there is a wonderful proneneſs in human nature to animate all objects. Whether this ariſes from a ſort of aſſimilating principle, from a propenſion to ſpread a reſemblance of ourſelves over all other things, or from whatever other cauſe it ariſes; ſo it is, that almoſt every emotion which in the leaſt agitates the mind beſtows upon its object a momentary idea of life. Let a man, by an unwary ſtep, ſprain his ankle, or hurt his foot upon a ſtone, and in the ruffled diſcompoſed moment he will ſometimes feel himſelf diſpoſed to break the ſtone in pieces, or to utter paſſionate expreſſions againſt it, as if it had done him an injury. If one has been long accuſtomed to a certain ſet of objects, which have made a ſtrong impreſſion on his imagination; as to a houſe, where he has paſſed many agreeable years; or to fields, and trees, and mountains, among which he has often walked with the greateſt delight; when he is obliged to part with them, eſpecially if he has no proſpect of ever ſeeing them again, he can ſcarce avoid having ſomewhat of the ſame feeling as when he is leaving old friends. They ſeem endowed with life. They become objects of his affection; and, in the moment of his parting, it ſcarce ſeems abſurd to him to give vent to his feeling in words, and to take a formal adieu.

"So ſtrong is that impreſſion of life which is made upon us, by the more magnificent and ſtriking objects of nature eſpecially, that I doubt not in the leaſt of this having been one cauſe of the multiplication of divinities in the heathen world. The belief of dryads and naiads, of the genius of the wood and the god of the river, among men of lively imaginations, in the early ages of the world, eaſily aroſe from this turn of mind. When their favourite rural objects had often been animated in their fancy, it was an eaſy tranſition to attribute to them ſome real divinity, ſome unſeen power or genius which inhabited them, or in ſome peculiar manner belonged to them. Imagination was highly gratified, by thus gaining ſomewhat to reſt upon with more ſtability; and when belief coincided ſo much with imagination, very ſlight cauſes would be ſufficient to eſtabliſh it.

"From this deduction may be eaſily ſeen how it comes to paſs that perſonification makes ſo great a figure in all compoſitions where imagination or paſſion has any concern. On innumerable occaſions it is the very language of imagination and paſſion; and therefore deſerves to be attended to, and examined with peculiar care. There are three different degrees of this figure, which it is neceſſary to remark and diſtinguiſh, in order to determine the propriety of its uſe. The firſt is, when ſome of the properties or qualities of living creatures are aſcribed to inanimate objects; the ſecond, when thoſe inanimate objects are introduced as acting like ſuch as have life; and the third, when they are repreſented as either ſpeaking to us, or as liſtening to what we ſay to them."

The ingenious profeſſor goes on to inveſtigate the nature of perſonification at conſiderable length. We ſhall give his caution for the uſe of it in proſe compoſitions, in which he informs us this figure requires to be uſed with great moderation and delicacy. "The ſame liberty is not allowed to the imagination there as in poetry. The ſame aſſiſtances cannot be obtained for raiſing paſſion to its proper height by the force of numbers and the glow of ſtyle. However, addreſſes to inanimate objects are not excluded from proſe, but have their place only in the higher ſpecies of oratory. A public ſpeaker may on ſome occaſions very properly addreſs religion or virtue; or his native country, or ſome city or province, which has ſuffered perhaps great calamities, or been the ſcene of ſome memorable action. But we muſt remember, that as ſuch addreſſes are among the higheſt efforts of eloquence, they ſhould never be attempted unleſs by perſons of more than ordinary genius: for, if the orator fails in his deſign of moving our paſſions by them, he is ſure of being laughed at. Of all frigid things the moſt frigid are the awkward and unſeaſonable attempts ſometimes made towards ſuch kinds of perſonification, eſpecially if they be long continued. We ſee the writer or ſpeaker toiling and labouring to expreſs the language of ſome paſſion which he neither feels himſelf nor can make us feel. We remain not only cold, but frozen; and are at full leiſure to criticiſe on the ridiculous figure which the perſonified object makes, when we ought to have been tranſported with a glow of enthuſiaſm. Some of the French writers, particularly Boſſuet and Flechier, in their ſermons and funeral orations, have attempted and executed this figure not without warmth and dignity. Their works are exceedingly worthy of being conſulted for inſtances of this and of ſeveral other ornaments of ſtyle. Indeed the vivacity and ardour of the French genius is more ſuited to this bold ſpecies of oratory, than the more correct but leſs animated genius of the Britiſh, who in their proſe works very rarely attempt any of the high figures of eloquence."

PERSPECTIVE.

PERSPECTIVE is the art of drawing on a plane ſurface true reſemblances or pictures of objects, as the objects themſelves appear to the eye from any diſtance and ſituation real or imaginary.

It was in the 16th century that *Perſpective* was revived, or rather reinvented. It owes its birth to painting, and particularly to that branch of it which was employed in the decorations of the theatre, where landſcapes were properly introduced, and which would have looked unnatural and horrid if the ſize of the objects had not been pretty nearly proportioned to their diſtance from the eye. We learn from Vitruvius, that Agatharchus, inſtructed by Æſchylus, was the firſt who wrote upon this ſubject; and that afterwards the principles of this art were more diſtinctly taught by Democritus and Anaxagoras, the diſciples of Agatharchus. Of the theory of this art, as deſcribed by them, we know nothing; ſince none of their writings have eſcaped the general wreck that was made of ancient literature in the dark ages of Europe. However, the revival of painting in Italy was accompanied with a revival of this art.

The firſt perſon who attempted to lay down the rules of perſpective was Pietro del Borgo, an Italian. He ſuppoſed objects to be placed beyond a tranſparent tablet, and endeavoured to trace the images which rays of light, emitted from them, would make upon it. But we do not know what ſucceſs he had in this attempt, becauſe the book which he wrote upon this ſubject is not now extant. It is, however, very much commended by the famous Egnazio Dante; and upon the principles of Borgo Albert Durer conſtructed a machine, by which he could trace the perſpective appearance of objects.

Balthazar Peruſſi ſtudied the writings of Borgo, and endeavoured to make them more intelligible. To him we owe the diſcovery of points of diſtance, to which all lines that make an angle of 45 degrees with the ground-line are drawn. A little time after, Guido Ubaldi, another Italian, found that all the lines that are parallel to one another, if they be inclined to the ground-line, converge to ſome point in the horizontal line; and that through this point alſo, a line drawn from the eye, parallel to them, will paſs. Theſe principles put together enabled him to make out a pretty complete theory of perſpective.

Great improvements were made in the rules of perſpective by ſubſequent geometricians; particularly by profeſſor Graveſande, and ſtill more by Dr. Brook Taylor, whoſe principles are in a great meaſure new, and far more general than any before him.

In order to underſtand the principles of perſpective, it will be proper to conſider the plane on which the repreſentation is to be made as tranſparent, and interpoſed between the eye of the ſpectator and the object to be repreſented. Thus, ſuppoſe a perſon at a window looks through an upright pane of glaſs at any object beyond it, and, keeping his head ſteady, draws the figure of the object upon the glaſs with a black-lead pencil, as if the point of the pencil touched the object itſelf; he would then have a true repreſentation of the object in perſpective as it appears to his eye.

In order to this two things are neceſſary: firſt, that the glaſs be laid over with ſtrong gum-water, which, when dry, will be fit for drawing upon, and will retain the traces of the pencil; and, ſecondly, that he looks through a ſmall hole in a thin plate of metal, fixed about a foot from the glaſs, between it and his eye, and that he keeps his eye cloſe to the hole; otherwiſe he might ſhift the poſition of his head, and conſequently make a falſe delineation of the object.

Having traced out the figure of the object, he may go over it again with pen and ink; and, when that is dry, put a ſheet of paper upon it, and trace it thereon with a pencil: then taking away the paper and laying it on a table, he may finiſh the picture by giving it the colours, lights, and ſhades, as he ſees them in the object itſelf; and then he will have a true reſemblance of the object.

To every perſon who has a general knowledge of the principles of optics, this muſt be ſelf-evident: for, as viſion is occaſioned by pencils of rays coming in ſtraight lines to the eye from every point of the viſible object, it is plain that, by joining the points in the tranſparent plane through which all thoſe pencils reſpectively paſs, an exact repreſentation muſt be formed of the object, as it appears to the eye in that particular poſition, and at that determined diſtance: and were pictures of things to be always firſt drawn on tranſparent planes, this ſimple operation, with the principle on which it is founded, would compriſe the whole theory and practice of perſpective. As this, however, is far from being the caſe, rules muſt be deduced from the ſciences of optics and geometry for drawing repreſentations of viſible objects on opaque planes; and the application of theſe rules conſtitutes what is properly called the *art* of perſpective.

Previous to our laying down the fundamental principles of this art, it may not be improper to obſerve, that when a perſon ſtands right againſt the middle of one end of a long avenue or walk, which is ſtraight and equally broad throughout, the ſides thereof ſeem to approach nearer and nearer to each other as they are further and further from his eye; or the angles, under which their different parts are ſeen, become leſs and leſs according as the diſtance from his eye increaſes; and if the avenue be very long, the ſides of it at the fartheſt end will ſeem to meet: and there an object that would cover the whole breadth of the avenue, and be of a height equal to that breadth, would appear only to be a mere point. See OPTICS.

Having made theſe preliminary obſervations, we now proceed to the practice of perſpective, which is built upon the following

(*Fundamental*) THEOREM I.

Let *a b c d* (fig. 1. Plate 34.) repreſent the ground-plan of the figure to be thrown into perſpective, and *e f g h* the tranſparent plane through which it is viewed by the eye at E. Let theſe planes interſect in the ſtraight line *k l*. Let B be any point in the ground-plan, and B E a ſtraight line, the path of a ray of light from that point to the eye. This will paſs through the plane *e f g h* in ſome point *b*; or B will be ſeen through that point, and *b* will be the picture, image, or repreſentation of B.

If BA be drawn in the ground-plan, making any angle BAK with the common interſection, and EV be drawn parallel to it, meeting the picture-plane or perſpective plane in V, and VA be drawn, the point *b* is in the line VA ſo ſituated that BA is to EV as *b*A to *b*V.

For ſince EV and BA are parallel, the figure BA*b*VE*b*B is on one plane, cutting the perſpective-plane in the ſtraight line VA; the triangles BA*b*, EV*b*, are ſimilar, and BA : EV = *b*A : *b*V.

Cor. 1. If B be beyond the picture, its picture *b* is above the interſection *k b*; but if B be between the eye and the picture, as at B′, its picture *b*′ is below *k b*.

2. If two other parallel lines BA′, ES, be drawn, and A′, S, be

joined, the picture of B is in the intersection of the lines AV and AS.

3. The line BA is represented by bA, or bA is the picture of BA; and if AB be infinitely extended, it will be represented by AV. V is therefore called the *vanishing point* of the line AB.

4. All lines parallel to AB are represented by lines converging to V from the points where these lines intersect the perspective-plane; and therefore V is the vanishing point of all such parallel lines.

5. The pictures of all lines parallel to the perspective-plane are parallel to the lines themselves.

6. If through V be drawn HVD parallel to $k\,l$, the angle EVH is equal to BAK.

Remark. The proposition now demonstrated is not limited to any inclination of the picture-plane to the ground-plane; but it is usual to consider them as perpendicular to each other, and the ground-plane as horizontal. Hence the line $k\,l$ is called the *ground-line*, and OH the *horizon-line*; and VK, perpendicular to both, is called the *height of the eye*.

If ES be drawn perpendicular to the picture-plane, it will cut it in a point S of the horizon-line directly opposite to the eye. This is called the *point of sight*, or *principal point*.

7. The pictures of all vertical lines are vertical, and the pictures of horizontal lines are horizontal, because these lines are parallel to the perspective-plane.

8. The point of sight S is the vanishing point of all lines perpendicular to the perspective-plane.

The above proposition is a sufficient foundation for the whole practice of perspective, whether on direct or inclined pictures, and serves to suggest all the various practical constructions, each of which has advantages which suit particular purposes. Writers on the subject have either confined themselves to one construction, from an affectation of simplicity or fondness for system; or have multiplied precepts, by giving every construction for every example, in order to make a great book, and give the subject an appearance of importance and difficulty. An ingenious practitioner will avoid both extremes, and avail himself of the advantage of each construction as it happens to suit his purpose. We shall now proceed to the practical rules, which require no consideration of intersecting planes, and are all performed on the perspective plane by means of certain substitutions for the place of the eye and the original figure. The general substitution is as follows:

Let the plane of the paper be first supposed to be the ground-plan, and the spectator to stand at F (fig. 2.) Let it be proposed that the ground-plan is to be represented on a plane surface, standing perpendicularly on the line GKI of the plan, and that the point K is immediately opposite to the spectator, or that FK is perpendicular to GL: then FK is equal to the distance of the spectator's eye from the picture.

Now suppose a piece of paper laid on the plan with its straight edge lying on the line GL; draw on this paper KS perpendicular to GL, and make it equal to the height of the eye above the ground-plan. This may be much greater than the height of a man, because the spectator may be standing on a place much raised above the ground-plan. Observe also that KS must be measured on the same scale on which the ground-plan and the distance FK were measured. Then draw HSO parallel to GL. This will be a horizontal line, and (when the picture is set upright on GL) will be on a level with the spectator's eye, and the point S will be directly opposite to his eye. It is therefore called the *principal point*, or *point of sight*. The distance of his eye from this point will be equal to FK. Therefore make SP (in the line SK) equal FK, and P is the projecting point or substitute for the place of the eye. It is sometimes convenient to place P above S, sometimes to one side of it on the horizontal line, and in various other situations; and writers, ignorant of or inattentive to the principles of the theory, have given it different denominations, such as *point of distance*, *point of view*, &c. It is merely a substitute for the point E in fig. 1. and its most natural situation is below, as in this figure.

The art of perspective is conveniently divided into Ichnography, which teaches how to make a perspective draught of figures on a plane, commonly called the ground-plan; and Scenography, which teaches how to draw solid figures, or such figures as are raised above this plan.

Fundamental Prob. I. *To put into perspective any given point of the ground-plan.*

First general construction.

From B and P (fig. 2.) draw any two parallel lines BA, PV, cutting the ground-line and horizon-line in A and V, and draw BP, AV, cutting each other in b; b is the picture of B.

For it is evident that BA, PV, of this figure are analogous to BA and EV of fig. 1. and that BA : PV = : bV.

If BA′ be drawn perpendicular to GL, PV will fall on PS, and need not be drawn. A′V will be A′S.—This is the most easy construction, and is nearly the same with Ferguson's.

Second general construction.

Draw two lines BA, BA″, and two lines PV, PD, parallel to them, and draw AV, A″D, cutting each other in b: b is the picture of B by Cor. 2.—This construction is the foundation of all the rules of perspective that are to be found in the books on this subject. They appear in a variety of forms, owing to the ignorance or inattention of the authors to the principles. The rule most generally adhered to is as follows:

Draw BA (fig. 3.) perpendicular to the ground-line, and AS to the point of sight, and set off $A\beta$ equal to BA. Set off SD equal to the distance of the eye in the opposite direction from S that β is from A, where B and E of fig. 1. are on opposite sides of the picture; otherwise set them the same way. D is called the point of distance. Draw βD, cutting AS in B. This is evidently equivalent to drawing BA and PS perpendicular to the ground-line and horizon-line, and $B\beta$ and PD making an angle of 45° with these lines, with the additional puzzle about the way of setting off $A\beta$ and SD, which is avoided in the construction here given.

This usual construction, however, by a perpendicular and the point of distance, is extremely simple and convenient; and two points of distance, one on each side of S, serve for all points of the ground-plan. But the first general construction requires still fewer lines, if BA be drawn perpendicular to GL, because PV will then coincide with PS.

Third general construction.

Draw BA from the given point B perpendicular to the ground-line, and AS to the point of sight. From the point of distance D set off Dd equal to BA, on the same or the contrary side as S, according as B is on the same or the contrary side of the picture as the eye. Join d, A, and draw Db parallel to dA. b is the picture of B. For SD, Dd, are equal to the distances of the eye and given point from the picture, and SD : Dd = bS : bA.

This construction does not naturally arise from the original lines, but is a geometrical consequence from their position and magnitude; and it is of all others the most generally convenient, as the perpendicular distances of any number of points may be arranged along SD without confusion, and their direct situations transferred to the ground-line by perpendiculars such as BA; and nothing is easier than drawing parallels, either by a parallel-ruler or a bevel square, used by all who practise drawing.

Prob. 2. *To put any straight line* BC (fig. 4. Plate 34.) *of the ground-plan in perspective.*

Find the pictures b, c, of its extreme points by any of

the foregoing conſtructions, and join them by the ſtraight line *b c*.

Perhaps the following conſtruction will be found very generally convenient.

Produce CB till it meet the ground line in A, and draw PV parallel to it, and AV, and PB, PC, cutting AV in *b*, *c*. V is its vaniſhing point, by Cor. 3. of the fundamental theorem.

It muſt be left to the experience and ſagacity of the drawer to ſelect ſuch conſtructions as are moſt ſuitable to the multiplicity of the figures to be drawn.

PROB. 3. *To put any rectilineal figure of the ground-plan in perſpective.*

Put the bounding lines in perſpective, and the problem is ſolved.

The variety of conſtructions of this problem is very great, and it would fill a volume to give them all. The moſt generally convenient is to find the vaniſhing points of the bounding lines, and connect theſe with the points of their interſection with the ground-line. For example, to put the ſquare ABCD (fig. 5.) into perſpective.

Draw from the projecting point PV, PW, parallel to AB, BC, and let AB, BC, CD, DA, meet the ground-line in α, $\varkappa$, β, δ, and draw αV, δV, $\varkappa$W, βW, cutting each other in *a b c d*, the picture of the ſquare ABCD. The demonſtration is evident.

This conſtruction, however, runs the figure to great diſtances on each ſide of the middle line when any of the lines of the original figure are nearly parallel to the ground-line.

The following conſtruction (fig. 6.) avoids this inconvenience.

Let D be the point of diſtance. Draw the perpendiculars Aα, Bβ, C$\varkappa$, Dδ, and the lines A*e*, B*f*, C*g*, D*h*, parallel to PD. Draw Sα, Sβ, S$\varkappa$, Sδ, and D*e*, D*f*, D*g*, D*h*, cutting the former in *a*, *b*, *c*, *d*, the angles of the picture.

It is not neceſſary that D be the point of diſtance, only the lines A*e*, B*f*, &c. muſt be parallel to PD.

Remark. In all the foregoing conſtructions the neceſſary lines (and even the finiſhed picture) are frequently confounded with the original figure. To avoid this great inconvenience, the writers on perſpective direct us to tranſpoſe the figure; that is, to tranſfer it to the other ſide of the ground-line, by producing the perpendiculars Aα, Bβ, C$\varkappa$, Dδ, till αA′, βB′, &c. are reſpectively equal to Aα, Bβ, &c.; or, inſtead of the original figure, to uſe only its tranſpoſed ſubſtitute A′B′C′D′. This is an extremely proper method. But in this caſe the point P muſt alſo be tranſpoſed to P′ above S, in order to retain the firſt or moſt natural and ſimple conſtruction, as in fig. 7.; where it is evident, that when BA = AB′, and SP = SP′, and B′P′ is drawn, cutting AS in *b*, we have *b*A : *b*S = B′A : P′S, = BA : PS, and *b* is the picture of B : whence follows the truth of all the ſubſequent conſtructions with the tranſpoſed figure.

PROB. 4. *To put any curvilineal figure to the ground-plan into perſpective.*

Put a ſufficient number of its points in perſpective by the foregoing rules, and draw a curve line through them.

It is well known that the conic ſections and ſome other curves, when viewed obliquely, are conic ſections or curves of the ſame kinds with the originals, with different poſitions and proportions of their principal lines, and rules may be given for deſcribing their pictures founded on this property. But theſe rules are very various, unconnected with the general theory of perſpective, and more tedious in the execution, without being more accurate than the general rule now given. It would be a uſeleſs affectation to inſert them in this elementary treatiſe.

We come in the next place to the delineation of figures not in a horizontal plane, and of ſolid figures. For this purpoſe it is neceſſary to demonſtrate the following

THEOREM II.

The length of any vertical line ſtanding on the ground-plane is to that of its picture as the height of the eye to the diſtance of the horizon-line from the picture of its foot.

Let BC be the vertical line ſtanding on B, and let EF be a vertical line through the eye. Make BD equal to EF, and draw DE, CE, BE. It is evident that DE will cut the horizon-line in ſome point *d*, CE will cut the picture-plane in *c*, and BE will cut it in *b*, and that *b c* will be the picture of BC, and is vertical, and that B C is to *b c* as BD to *b d*, or as EF to *b d*.

Cor. The picture of a vertical line is divided in the ſame ratio as the line itſelf. For BC : BM = *b c* : *b m*.

PROB. 5. *To put a vertical line of a given length in perſpective ſtanding on a given point of the picture.*

Through the given point *b* (fig. 8. Plate 34.) of the picture, draw S *b* A from the point of ſight, and draw the vertical line AD, and make AE equal to the length or height of the given line. Join ES, and draw *b c* parallel to AD, producing *b c*, when neceſſary, till it cut the horizontal line in *d*, and we have *b c* : *b d*, = AD : AE, that is, as the length of the given line to the height of the eye, and *b d* is the diſtance of the horizon-line from the point *b*, which is the picture of the root of the line. Therefore (Theor. 2.) *b c* is the required picture of the vertical line.

This problem occurs frequently in views of architecture; and a compendious method of ſolving it would be peculiarly convenient. For this purpoſe, draw a vertical line XZ at the margin of the picture, or on a ſeparate paper, and through any point V of the horizon-line draw VX. Set off XY, the height of the vertical line, and draw VY. Then from any points *b*, *r*, on which it is required to have the pictures of lines equal to XY, draw *b*S, *r t*, parallel to the horizon-line, and draw the verticals S*u*, *t v*: theſe have the lengths required, which may be transferred to *b* and *r*. This, with the third general conſtruction for the baſe points, will ſave all the confuſion of lines which would ariſe from conſtructing each line apart.

PROB. 6. *To put any ſloping line in perſpective.*

From the extremities of this line, ſuppoſe perpendiculars making the ground-plane in two points, which we ſhall call the baſe points of the ſloping line. Put theſe baſe points in perſpective, and draw, by laſt problem, the perpendiculars from the extremities. Join theſe by a ſtraight line. It will be the picture required.

PROB. 7. *To put a ſquare in perſpective, as ſeen by a perſon not ſtanding right againſt the middle of either of its ſides, but rather nearly even with one of its corners.*

In fig. 9. let ABCD be a true ſquare, viewed by an obſerver, not ſtanding at *o*, directly againſt the middle of its ſide AD, but at O almoſt even with its corner D, and viewing the ſide AD under the angle AOD; the angle A*o*D (under which he would have ſeen AD from *o*) being 60 degrees.

Make AD in fig. 10. equal to AD in fig. 9. and draw SP and OO parallel to AD. Then, in fig. 10. let O be the place of the obſerver's eye, and SO be perpendicular to SP; then S ſhall be the point of ſight in the horizon SP.

Take SO in your compaſſes, and ſet that extent from S to P: then P ſhall be the true point of diſtance, taken according to the foregoing rules.

From A and D draw the ſtraight lines AS and DS; draw alſo the ſtraight line AP, interſecting DS in C.

Laſtly, to the point of interſection C, draw BC parallel to AD; and ABCD in fig. 10. will be a true perſpective repreſentation of the ſquare ABCD in fig. 9. The point M is the centre of each ſquare, and AMC and BMD are the diagonals.

PROB. 8. *To put a reticulated ſquare in perſpective, as ſeen by a perſon ſtanding oppoſite to the middle of one of its ſides.*

A reticulated ſquare is one that is divided into ſeveral little ſquares, like net-work, as fig. 11. each ſide of which is divided into four equal parts, and the whole ſurface into four times four (or 16) equal ſquares.

Having divided this ſquare into the given number of leſſer ſquares, draw the two diagonals A *x* C and B *x* D.

Make AD in fig. 12. equal to AD in fig. 11. and divide it into four equal parts, as A *e*, *e g*, *g i*, and *i* D.

Draw SP for the horizon, parallel to AD, and, through the middle point *g* of AD, draw OS perpendicular to AD and SP. Make S the point of ſight, and O the place of the obſerver's eye.

Take SP equal to SO, and P ſhall be the true point of diſtance. Draw AS and DS to the point of ſight, and AP to the point of diſtance, interſecting DS in C: then draw BC parallel to AD, and the outlines of the reticulated ſquare ABCD will be finiſhed.

From the diviſion points *e*, *g*, *i*, draw the ſtraight lines *e f*, *g h*, *i k*, tending towards the point of ſight S; and draw BD for one of the diagonals of the ſquare, the other diagonal AC being already drawn.

Through the points *r* and *s*, where theſe diagonals cut *e f* and *i k*, draw *l m* parallel to AD. Through the centre point *x*, where the diagonals cut *g h*, draw *n o* parallel to AD. Laſtly, through the points *v* and *w*, where the diagonals cut *e f* and *i k*, draw *p q* parallel to AD; and the reticulated perſpective ſquare will be finiſhed.

This ſquare is truly repreſented, as if ſeen by an obſerver ſtanding at O, and having his eye above the horizontal plane ABCD on which it is drawn; as if OS was the height of his eye above that plane: and the lines which form the ſmall ſquares within it have the ſame letters of reference with thoſe in fig. 11. which is drawn as it would appear to an eye placed perpendicularly above its centre *x*.

PROB. 9. *To put a circle in perſpective.*

If a circle be viewed by an eye placed directly over its centre, it appears perfectly round; but if it be obliquely viewed, it appears of an elliptical ſhape. This is plain by looking at a common wine glaſs ſet upright on a table.

Make a true reticulated ſquare, as fig. 11. plate 34. of the ſame diameter as you would have the circle: and ſetting one foot of your compaſſes in the centre *x*, deſcribe as large a circle as the ſides of the ſquare will contain. Then, having put this reticulated ſquare into perſpective, as in fig. 12. obſerve through what points of the croſs lines and diagonals of fig. 11. the circle paſſes; and through the like points in fig. 12. draw the ellipſis, which will be as true a perſpective repreſentation of the circle, as the ſquare in fig. 12. is of the ſquare in fig. 11.

This is Mr. Ferguſon's rule for putting a circle in perſpective; but the following rules by *Wolf* are perhaps more univerſal.

If the circle to be put in perſpective be ſmall, deſcribe a ſquare about it. Draw firſt the diagonals of the ſquare, and then the diameters *b a* and *d e* (fig. 1. plate 35.) cutting one another at right angles; draw the ſtraight lines *f g* and *b c* parallel to the diameter *d e*. Through *b* and *f* and likewiſe *c* and *g* draw ſtraight lines meeting DE, the ground-line of the picture in the points 3 and 4. To the principal point V draw the ſtraight lines 1 V, 3 V, 4 V, 2 V, and to the points of diſtance L and K, 2 L and 1 K. Laſtly, join the points of interſection *a*, *b*, *d*, *f*, *b*, *g*, *e*, *c*, by the arcs *a b*, *b d*, *d f*, and *a b d f b g e c a* will be the circle in perſpective.

If the circle be large, ſo as to make the foregoing practice inconvenient, biſect the ground-line AB, deſcribing, from the point of biſection as a centre, the ſemicircle AGB. (fig. 2. plate 35.), and from any number of points in the circumference C, F, G, H, I, &c. draw to the ground-line the perpendiculars C 1, F 2, G 3, H 4, I 5, &c.: from the points A, 1, 2, 3, 4, 5, B, draw ſtraight lines to the principal point or point of ſight V, likewiſe ſtraight lines from B and A to the points of diſtance L and K. Through the common interſections draw ſtraight lines, as in the preceding caſe; and you will have the points *a*, *c*, *f*, *g*, *h*, *i*, *b*, repreſentatives of A, C, F, G, H, I, B. Then join the points *a*, *c*, *f*, &c. as formerly directed, and you have the perſpective circle *a c f g h i b i h g f c a*.

Hence it is apparent how we may put not only a circle, but alſo a pavement laid with ſtones of any form in perſpective. It is likewiſe apparent how uſeful the ſquare is in perſpective; for, as, in the ſecond caſe, a true ſquare was deſcribed round the circle to be put in perſpective, and divided into ſeveral ſmaller ſquares, ſo in this third caſe we make uſe of the ſemicircle only for the ſake of brevity inſtead of that ſquare and circle.

PROB. 10. *To put a reticulated ſquare in perſpective, as ſeen by a perſon not ſtanding right againſt the middle of either of its ſides, but rather nearly even with one of its corners.*

In fig. 13. plate 34, let O be the place of an obſerver, viewing the ſquare ABCD almoſt even with its corner D. Draw at pleaſure SP for the horizon, parallel to AD, and make SO perpendicular to SP: then S ſhall be the point of ſight, and P the true point of diſtance, if SP be made equal to SO.

Draw AS and DS to the point of ſight, and AP to the point of diſtance, interſecting DS in the point C; then draw BC parallel to AD, and the outlines of the perſpective ſquare will be finiſhed. This done, draw the lines which form the leſſer ſquares, as taught in *Prob.* 8. and the work will be completed. You may put a perſpective circle in this ſquare by the ſame rule as it was done in fig. 12.

PROB. 14. *To put a cube in perſpective, as if viewed by a perſon ſtanding almoſt even with one of its edges, and ſeeing three of its ſides.*

In fig. 16. plate 34. let AB be the breadth of either of the ſix equal ſquare ſides of the cube AG; O the place of the obſerver, almoſt even with the edge CD of the cube, S the point of ſight, SP the horizon parallel to AD, and P the point of diſtance taken as before.

Make ABCD a true ſquare; draw BS and CS to the point of ſight, and BP to the point of diſtance, interſecting CS in G. Then draw FG parallel to BC, and the uppermoſt perſpective ſquare ſide BFGC of the cube will be finiſhed.

Draw DS to the point of ſight, and AP to the point of diſtance, interſecting DS in the point I: then draw GI parallel to CD; and, if the cube be an opaque one, as of wood or metal, all the outlines of it will be finiſhed; and then it may be ſhaded as in the figure.

But if you want a perſpective view of a tranſparent glaſs cube, all the ſides of which will be ſeen, draw AH toward the point of ſight, FH parallel to BA, and HI parallel to AD: then AHID will be the ſquare baſe of the cube, perſpectively parallel to the top BFGC; ABFH will be the ſquare ſide of the cube, parallel to CGID, and FGIH will be the ſquare ſide parallel to ABCD.

As to the ſhading part of the work, it is ſuch mere children's play, in compariſon of drawing the lines which form the ſhape of any object, that no rules need be given for it. Let a perſon ſit with his left ſide toward a window, and he knows full well, that if any ſolid body be placed on a table before him, the light will fall on the left-hand ſide of the body, and the right-hand ſide will be in the ſhade.

PROB. 15. *To put any ſolid in perſpective.*

Put the baſe of the ſolid, whatever it be, in perſpective by the preceding rules. From each bounding point of the baſe, raiſe lines repreſenting in perſpective the altitude of the object; by joining theſe lines and ſhading the figure according to the directions in the preceding problem, you will have a ſcenographic repreſentation of the object. This rule is general; but as its application to particular caſes may not be apparent, it will be proper to give the following example of it.

PROB. 16. *To put a cube in perſpective as ſeen from one of its angles.*

Since the baſe of a cube ſtanding on a geometrical plane, and ſeen from one of its angles, is a ſquare ſeen from one of its angles, draw firſt ſuch a perſpective ſquare: then raiſe from any point of the ground-line DE (fig. 3. plate 35.) the perpendicular HI equal to the ſide of the ſquare, and draw to any point V in the horizontal line HR the ſtraight lines VI and VH. From the angles *d b* and *c* draw the dotted lines *d* 2 and *c* 1 parallel to the ground-line DE. Perpendicular to thoſe dotted lines, and from the points 1 and 2, draw the ſtraight lines L 1 and M 2. Laſtly, ſince HI is the altitude of the intended cube in *a*, L 1 in *c* and *b*, M 2 in *d*, draw from the point *a* the ſtraight line *f a* perpendicular to *a* E, and from the points *b* and *c*, *b g* and *c e*, perpendicular to *b c* 1, and *a b d c* being according to rule, make *a f* = HI, *b g* = *e c* = L 1, and *b d* = M 2. Then, if the points *g*, *b*, *e*, *f*, be joined, the whole cube will be in perſpective.

PROB. 17. *To put a ſquare pyramid in perſpective, as ſtanding upright on its baſe, and viewed obliquely.*

In fig. 4. N° 1. of plate 35. let AD be the breadth of either of the four ſides of the pyramid ATCD at its baſe ABCD; and MT its perpendicular height. Let O be the place of the obſerver, S his point of ſight, SE his horizon, parallel to AD and perpendicular to OS; and let the proper point of diſtance be taken in SE produced toward the left hand, as far from S as O is from S.

Draw AS and DS to the point of ſight, and DL to the point of diſtance, interſecting AS in the point B. Then, from B, draw BC parallel to AD; and ABCD ſhall be the perſpective ſquare baſe of the pyramid.

Draw the diagonal AC, interſecting the other diagonal BD at M, and this point of interſection ſhall be the centre of the ſquare baſe.

Draw MT perpendicular to AD, and of a length equal to the intended height of the pyramid: then draw the ſtraight outlines AT, CT, and DT; and the outlines of the pyramid (as viewed from O) will be finiſhed; which being done, the whole may be ſo ſhaded as to give it the appearance of a ſolid body.

If the obſerver had ſtood at *o*, he could have only ſeen the ſide ATD of the pyramid; and two is the greateſt number of ſides that he could ſee from any other place of the ground. But if he were at any height above the pyramid, and had his eye directly over its top, it would then appear as in N° 2. and he would ſee all its four ſides E, F, G, H, with its top *t* juſt over the centre of its ſquare baſe ABCD; which would be a true geometrical and not a perſpective ſquare.

PROB. 18. *To put two equal ſquares in perſpective, one of which ſhall be directly over the other, at any given diſtance from it, and both of them parallel to the plane of the horizon.*

In fig. 5. plate 35. let ABCD be a perſpective ſquare on a horizontal plane, drawn according to the foregoing rules, S being the point of ſight, SP the horizon (parallel to AD), and P the point of diſtance.

Suppoſe AD, the breadth of this ſquare, to be three feet; and that it is required to place juſt ſuch another ſquare EFGH directly above it, parallel to it and two feet from it.

Make AE and DH perpendicular to AD, and two thirds of its length: draw EH, which will be equal and parallel to AD; then draw ES and HS to the point of ſight S, and EP to the point of diſtance P, interſecting HS in the point G: this done, draw FG parallel to EH; and you will have two perſpective ſquares ABCD and EFGH, equal and parallel to one another, the latter directly above the former, and two feet diſtant from it; as was required.

By this method ſhelves may be drawn parallel to one another, at any diſtance from each other in proportion to their length.

PROB. 19. *To put a truncated pyramid in perſpective.*

Let the pyramid to be put in perſpective be quinquangular. If from each angle of the ſurface whence the top is cut off, a perpendicular be ſuppoſed to fall upon the baſe, theſe perpendiculars will mark the bounding points of a pentagon, of which the ſides will be parallel to the ſides of the baſe of the pyramid within which it is inſcribed. Join theſe points, and the interior pentagon will be formed with its longeſt ſide parallel to the longeſt ſide of the baſe of the pyramid. From the ground-line EH (fig. 6. plate 35.) raiſe the perpendicular IH, and make it equal to the altitude of the intended pyramid. To any point V draw the ſtraight lines IV and HV, and, by a proceſs ſimilar to that in problem 16, determine the ſcenographical altitudes *a*, *b*, *c*, *d*, *e*. Connect the upper points *f*, *g*, *h*, *i*, *k*, by ſtraight lines; and draw *l k*, *f m*, *g n*, and the perſpective of the truncated pyramid will be completed.

Cor. If in a geometrical plane two concentric circles be deſcribed, a truncated cone may be put in perſpective in the ſame manner as a truncated pyramid.

PROB. 20. *To put in perſpective a hollow priſm lying on one of its ſides.*

Let ABDEC (fig. 7. N° 1.) be a ſection of ſuch a priſm. Draw HI parallel to AB, and diſtant from it the breadth of the ſide on which the priſm reſts; and from each angle internal and external of the priſm let fall perpendiculars to HI. The parallelogram will be thus divided by the ichnographical proceſs below the ground-line, ſo as that the ſide AB of the real priſm will be parallel to the correſponding ſide of the ſcenographic view of it. To determine the altitude of the internal and external angles. From H (N° 2.) raiſe HI perpendicular to the ground-line, and on it mark off the true altitudes H 1, H 2, H 3, H 4, and H 5. Then if from any point V in the horizon be drawn the ſtraight lines VH, V 1, V 2, V 3, V 4, V 5, or VI; by a proceſs ſimilar to that of the preceding problem, will be determined the height of the internal angles, viz. 1 = *a a*, 2 = *b b*, 4 = *d d*; and of the external angles, 3 = *c c*, and 5 = *e e*; and when theſe angles are formed and put in their proper places, the ſcenograph of the priſm is complete.

PROB. 21. *To put a ſquare table in perſpective, ſtanding on four upright ſquare legs of any given length with reſpect to the breadth of the table.*

In fig. 5. plate 35. let ABCD be the ſquare part of the floor on which the table is to ſtand, and EFGH the ſurface of the ſquare table, parallel to the floor.

Suppoſe the table to be three feet in breadth, and its height from the floor to be two feet: then two thirds of AD or EH will be the length of the legs *i* and *k*; the other two (*l* and *m*) being of the ſame length in perſpective.

Having drawn the two equal and parallel ſquares ABCD and EFGH, as ſhown in prob. 10. let the legs be ſquare in form, and fixed into the table at a diſtance from its edges equal to their thickneſs. Take A *a* and D *d* equal to the intended thickneſs of the legs, and *a b* and *d c* alſo equal thereto. Draw the

diagonals AC and BD, and draw ſtraight lines from the points *a*, *b*, *c*, *d*, towards the point of ſight S, and terminating at the ſide BC. Then, through the points where theſe lines cut the diagonals, draw the ſtraight lines *n* and *o*, *p* and *q*, parallel to AD; and you will have formed four perſpective ſquares (like ABCD in fig. 4. N° 1.) for the baſes of the four legs of the table: and then it is eaſy to draw the four upright legs by parallel lines, all perpendicular to AD; and to ſhade them as in the figure.

To repreſent the intended thickneſs of the table board, draw *e b* parallel to EH, and HG toward the point of ſight S: then ſhade the ſpaces between theſe lines, and the perſpective figure of the table will be finiſhed.

PROB. 22. *To put five ſquare pyramids in perſpective, ſtanding upright on a ſquare pavement compoſed of the ſurfaces of* 81 *cubes.*

In fig. 8. pl. 35, let ABCD be a perſpective ſquare, drawn according to the foregoing rules; S the point of ſight, P the point of diſtance in the horizon PS, and AC and BD the two diagonals of the ſquare.

Divide the ſide AD into 9 equal parts, (becauſe 9 times 9 is 81,) as A *a*, *a b*, *b c*, &c. and from theſe points of diviſion, *a*, *b*, *c*, *d*, &c. draw lines toward the point of ſight S, terminating at the furthermoſt ſide BC of the ſquare. Then, through the points where theſe lines cut the diagonals, draw ſtraight lines parallel to AD, and the perſpective ſquare ABCD will be ſubdivided into 81 leſſer ſquares, repreſenting the upper ſurfaces of 81 cubes, laid cloſe to one another's ſides in a ſquare form.

Draw AK and DL, each equal to A *a*, and perpendicular to AD; and draw LN toward the point of ſight S: then draw KL parallel to AD, and its diſtance from AD will be equal to A *a*.—This done, draw *a l*, *b m*, *c n*, *d o*, *e p*, *f q*, *g r*, and *h s*, all parallel to AK; and the ſpace ADLK will be ſubdivided into nine equal ſquares, which are the outer upright ſurfaces of the nine cubes in the ſide AD of the ſquare ABCD.

Draw LN toward the point of ſight S; and from the points where the lines which are parallel to AD in this ſquare meet the ſide CD thereof, draw ſhort lines to LN, all parallel to DL, and they will divide that ſide into the outer upright ſurfaces of the nine cubes which compoſe it: and then the outſides of all the cubes that can be viſible to an obſerver placed at a proper diſtance from the corner D of the ſquare will be finiſhed.

As taught in Prob. 17. place the pyramid AE upright on its ſquare baſe A *t v a*, making it as high as you pleaſe; and the pyramid DH on its ſquare baſe *h u w* D, of equal height with AE.

Draw EH from the top of one of theſe pyramids to the top of the other, and EH will he parallel to AD.

Draw ES and HS to the point of ſight S, and HP to the point of diſtance P, interſecting ES in F.

From the point F, draw FG parallel to EH; then draw EG, and you will have a perſpective ſquare EFGH (parallel to ABCD) with its two diagonals EG and FH, interſecting one another in the centre of the ſquare at I. The four corners of this ſquare, E, F, G, H, give the perſpective heights of the four pyramids AE, BF, CG, and DH; and the interſection I of the diagonals gives the height of the pyramid MI, the centre of whoſe baſe is the centre of the perſpective ſquare ABCD.

Laſtly, place the three pyramids BF, CG, MI, upright on their reſpective baſes at B, C, and M; and the required perſpective repreſentation will be finiſhed, as in the figure.

PROB. 23. *To put upright pyramids in perſpective, on the ſides of an oblong ſquare or parallelogram; ſo that their diſtances from one another ſhall be equal to the breadth of the parallelogram.*

In moſt of the foregoing operations we have conſidered the obſerver to be ſo placed as to have an oblique view of the perſpective objects: in this we ſhall ſuppoſe him to have a direct view of fig. 8. pl. 35. that is, ſtanding right againſt the middle of the end AD which is neareſt to his eye, and viewing AD under an angle of 60 degrees.

Having cut AD in the middle, by the perpendicular line S *s*, take S therein at pleaſure for the point of ſight, and draw ES for the horizon, parallel to AD. Here S *s* muſt be ſuppoſed to be produced downward, below the limits of the plate, to the place of the obſerver; and SE to be produced towards the left hand beyond E, far enough to take a proper point of diſtance therein, according to the foregoing rules.

Take A *d* at pleaſure, and D *g* equal to A *d*, for the breadths of the ſquare baſes of the two pyramids AE and DF next the eye: then draw AS and *d* S, and likewiſe DS and *g* S, to the point of ſight S; and DG on to the point of diſtance, interſecting AS in G; then, from G draw GI parallel to AD, and you will have the firſt perſpective ſquare AGID of the parallelogram ABCD.

From I draw IH to (or toward) the point of diſtance, interſecting AS in H: then, from H draw HK parallel to AD, and you will have the ſecond perſpective ſquare GHKI of the parallelogram. Go on in this manner till you have drawn as many perſpective ſquares up toward S as you pleaſe.

Through the point *e*, where DG interſects *g* S, draw *b f* parallel to AD; and you will have formed the two perſpective ſquare baſes A *b c d* and *e f* D *g* of the two pyramids at A and D.

From the point *f* (the upper outward corner of *e f* D *g*) draw *f b* toward the point of diſtance, till it meets AS in *b*; then, from this point of meeting, draw *b m* parallel to GI, and you will have formed the two perſpective ſquares G *b i k* and *l m* I *n*, for the ſquare baſes of the two pyramids at G and I.

Proceed in the ſame manner to find the baſes of all the other pyramids, at the corners of the reſt of the perſpective ſquares in the parallelogram ABCD, as ſhewn by the figure.—Then,

Having placed the firſt two pyramids at A and D upright on their ſquare baſes, as ſhown in Prob. 9, and made them of any equal heights at pleaſure, draw ES and FS from the tops of theſe pyramids to the point of ſight S: place all the reſt of the pyramids upright on their reſpective baſes, making their tops touch the ſtraight lines ES and FS; and all the work, except the ſhading part, will be finiſhed.

PROB. 24. *To put a ſquare pyramid of equal ſized cubes in perſpective.*

Fig. 2. Plate 36. repreſents a pyramid of this kind, conſiſting as it were of ſquare tables of cubes, one table above another; 81 in the loweſt, 49 in the next, 25 in the third, 9 in the fourth, and 1 in the fifth or uppermoſt. Theſe are the ſquare numbers of 9, 7, 5, 3, and 1.

If the artiſt is already maſter of all the preceding operations, he will find leſs difficulty in this than in attending to the following deſcription of it; for it cannot be deſcribed in a few words, but may be executed in a very ſhort time.

In fig. 1. having drawn PS for the horizon, and taken S for the point of ſight therein (the obſerver being at O), draw AD parallel to PS for the ſide (next the eye) of the firſt or lowermoſt table of cubes. Draw AS and DS to the point of ſight S, and DP to the point of diſtance P, interſecting AS in the point B. Then, from B, draw BC parallel to AD, and you will have the ſurface ABCD of the firſt table.

Divide AD into nine equal parts, as A *a*, *a b*, *b c*, *c d*, &c. then make AK and DL equal to A *a*, and perpendicular to AD. Draw KL parallel to AD, and from the points of equal diviſion at *a*, *b*, *c*, &c. draw lines to KL, all parallel to AK.

Then draw *b* S to the point of ſight S, and from the diviſion points *a*, *b*, *c*, &c. draw lines with a black-lead pencil, all tending towards the point of ſight, till they meet the diagonal BD of the ſquare.

From theſe points of meeting draw black-lead lines to DC, all parallel to AD; then draw the parts of theſe lines with black ink which are marked 1, 2, 3, 4, &c. between *b* E and DC.

Having drawn the firſt of theſe lines βq with black ink, draw the parts *a i*, *b k*, *c l*, &c. (of the former lines which met the diagonal BD), with black ink alſo; and rub out the reſt of the black-lead lines, which would otherwiſe confuſe the following part of the work. Then draw LF toward the point of ſight S; and, from the points where the lines 1, 2, 3, 4, &c. meet the line DC, draw lines down to LF, all parallel to DL; and all the viſible lines between the cubes in the firſt table will be finiſhed.

Make *i* G equal and perpendicular to βi, and *q* M equal and parallel to *i* G: then draw GM, which will be equal and parallel to *i q*. From the points *k l*, *m n*, &c. draw *k n*, *l o*, *m p*, &c. all parallel to *i* G, and the outſides of the ſeven cubes in the ſide G *q* of the ſecond table will be finiſhed.

Draw GS and MS to the point of ſight S, and MP to the point of diſtance P, interſecting GS in H; then, from the point of interſection H, draw HI parallel to AD; and you will have the ſurface GHIM of the ſecond table of cubes.

From the points *n*, *o*, *p*, *q*, &c. draw black-lead lines toward the point of ſight S, till they meet the diagonal MH of the perſpective ſquare ſurface GHIM; and draw *s* M, with black ink, toward the point of ſight.

From thoſe points where the lines drawn from *n*, *o*, *p*, *q*, &c. meet the diagonal MH, draw black-lead lines to MI, all parallel to AD; only draw the whole firſt line γ 1 with black ink, and the parts 2, 3, 4, &c. and *n t*, *o u*, *p v*, &c. of the other lines between *y* N and MI, and GM and γ 1, with the ſame; and rub out all the reſt of the black-lead lines, to avoid further confuſion. Then, from the points where the ſhort lines 1, 2, 3, &c. meet the line MI, draw lines down to *q* E, all parallel to M *q*, and the outer ſurfaces of the ſeven cubes in the ſide ME will be finiſhed; and all theſe laſt lines will meet the former parallels 2, 3, 4, &c. in the line *q* E.

Make *t* O equal and perpendicular to γt, and *y* P equal and parallel to *t* O; then draw OP, which will be equal and parallel to *t y*. This done, draw OS and PS to the point of ſight S, and PP to the point of diſtance P in the horizon. Laſtly, from the point Q, where PP interſects OS, draw QR parallel to OP; and you will have the outlines OQRP of the ſurface of the third perſpective table of cubes.

From the points *u*, *v*, *w*, *x*, draw upright lines to OP, all parallel to *t* O, and you will have the outer ſurfaces of the five cubes in the ſide O *y* of this third table.

From the points where theſe upright lines meet OP, draw lines toward the point of ſight S, till they meet the diagonal PQ; and from theſe points of meeting draw lines to PR, all parallel to OP, making the parts 2, 3, 4, 5, of theſe lines with black ink which lie between ZY and PR. Then, from the points where theſe lines meet PR, draw lines down to *y* N; which will bound the outer ſurfaces of the five cubes in the ſide PN of the third table.

Draw the line δ 1 with black ink; and, at a fourth part of its length between δ and Z, draw an upright line to S, equal in length to that fourth part, and another equal and parallel thereto from Z to V: then draw SV parallel to δ Z, and draw the two upright and equidiſtant lines between δ Z and SV, and you will have the outer ſurfaces of the three cubes in the ſide SZ of the fourth table.

Draw SS and VS to the point of ſight S in the horizon, and VP to the point of diſtance therein, interſecting SS in T; then draw TU parallel to SV, and you have STUV, the ſurface of the fourth table; which being reticulated or divided into 9 perſpective ſmall ſquares, and the uppermoſt cube W placed on the middlemoſt of the ſquares, all the outlines will be finiſhed; and when the whole is properly ſhaded, as in fig. 2. the work is done.

PROB. 25. *To repreſent a double croſs in perſpective.*

Fig. 3 pl. 36. let ABCD and EFGH be two perſpective croſſes, equal and parallel to one another, the uppermoſt directly above the lowermoſt, drawn by the rules already laid down, and as far aſunder as is equal to the given height of the upright part of the croſs; S being the point of ſight, and P the point of diſtance, in the horizon PS taken parallel to AD.

Draw AE, DH, and CG; then AEHD and DHGC ſhall be the two viſible ſides of the upright part of the croſs; of which, the length AE is here made equal to three times the breadth EH.

Divide DH into three equal parts, HI, IK, and KD. Through theſe points of diviſion, at I and K, draw MO and PR parallel to AD; and make the parts MN, IO, PQ, KR, each equal to HI: then draw MP and OR parallel to DH.

From M and O, draw MS and OS to the point of ſight S; and from the point of diſtance P draw PN, cutting MS in T; from T draw TU parallel to MO, and meeting OS in U; and you will have the uppermoſt ſurface MTUO of one of the croſs pieces of the figure.——From R, draw RS to the point of ſight S; and from U draw UV parallel to OR; and OUVR ſhall be the perſpective ſquare end next the eye of that croſs-part.

Draw PM *x* (as long as you pleaſe) from the point of diſtance P, through the corner M; lay a ruler to N and S, and draw XN from the line P *x*; then lay the ruler to I and S, and draw YZS. Draw XY parallel to MO, and make XW and YB equal and perpendicular to XY: then draw WB parallel to XY, and WXYB ſhall be the ſquare viſible end of the other croſs-part of the figure.

Draw BK toward the point of ſight S; and from U, draw UP to the point of diſtance P, interſecting YS in Z: then, from the interſection Z, draw Z *a* parallel to MO, and Z *b* parallel to HD, and the whole delineation will be finiſhed.

This done, ſhade the whole, as in fig 4. and you will have a true perſpective repreſentation of a double croſs.

PROB. 26. *To put three rows of upright ſquare objects in perſpective, equal in ſize, and at equal diſtances from each other, on an oblong ſquare plane, the breadth of which ſhall be of any aſſigned proportion to the length thereof.*

Fig. 5. pl. 36. is a perſpective repreſentation of an oblong ſquare plane, three times as long as it is broad, having a row of nine upright ſquare objects on each ſide, and one of the ſame number in the middle; all equally high, and at equal diſtances from one another, both long-wiſe and croſs-wiſe, on the ſame plane.

In fig. 6. PS is the horizon, S the point of ſight, P the point of diſtance, and AD (parallel to PS) the breadth of the plane.

Draw AS, NS, and DS, to the point of ſight S; the point N being in the middle of the line AD: and draw DP to the point of diſtance P, interſecting AS in the point B: then, from B draw BC parallel to AD, and you have the perſpective ſquare ABCD.

Through the point *i*, where DB interſects NS, draw *a e* pa-

rallel to AD; and you will have ſubdivided the perſpective ſquare ABCD into four leſſer ſquares, as A *a i* N, N *i e* D, *a* B *k i*, and *i k* C *e*.

From the point C (at the top of the perſpective ſquare ABCD) draw CP to the point of diſtance P, interſecting AS in E; then, from the point E draw EF parallel to AD; and you will have the ſecond perſpective ſquare BEFC.

Through the point *l*, where CE interſects NS, draw *b f* parallel to AD; and you will have ſubdivided the ſquare BEFC into the four ſquares B *b l k*, *k l f* C, *b* E *m l*, and *l m* F *f*.

From the point F (at the top of the perſpective ſquare BEFG) draw FP to the point of diſtance P, interſecting AS in I; then from the point I draw IK parallel to AD, and you will have the third perſpective ſquare EIKF.

Through the point *n*, where FI interſects NS, draw *c g* parallel to AD; and you will have ſubdivided the ſquare EIKF into four leſſer ſquares, E *c n m*, *m n g* F, *c* I *o n*, and *n o* K *g*.

From the point K (at the top of the third perſpective ſquare EIKF) draw KP to the point of diſtance P, interſecting AS in L; then from the point L draw LM parallel to AD; and you will have the fourth perſpective ſquare ILMK.

Through the point *p*, where KL interſects NS, draw *d h* parallel to AD; and you will have ſubdivided the ſquare ILMK into the four leſſer ſquares I *d p o*, *o p h* K, *d* L *q p*, and *p q* M *h*.

Thus we have formed an oblong ſquare ALMD, whoſe perſpective length is equal to four times its breadth, and it contains 16 equal perſpective ſquares. If greater length was ſtill wanted, we might proceed further on toward S.

Take A 3, equal to the intended breadth of the ſide of the upright ſquare object AQ (all the other ſides being of the ſame breadth), and AO for the intended height. Draw O 18 parallel to AD, and make D 8 and 4 7 equal to A 3; then draw 3 S, 4 S, 7 S, and 8 S, to the point of ſight S; and among them we ſhall have the perſpective ſquare baſes of all the 27 upright objects on the plane.

Through the point 9, where DB interſects 8 S, draw 1 10 parallel to AD, and you have the three perſpective ſquare baſes A 1 2 3, 4 5 6 7, 8 9 10 D, of the three upright ſquare objects at A, N, and D.

Through the point 21, where *e b* interſects 8 S, draw 14, 11 parallel to AD; and you have the three perſpective ſquares *a* 14 15 16 17 18 19 20, and 21 11 *e* 22, for the baſes of the ſecond croſs-row of objects; namely, the next beyond the firſt three at A, N, and D.

Through the point *w*, where CE interſects 8 S, draw a line parallel to BC; and you will have three perſpective ſquares, at B, *k*, and C, for the baſes of the third row of objects; one of which is ſet up at B.

Through the point *x*, where *f c* interſects 8 S, draw a line parallel to *b f*; and you will have three perſpective ſquares, at *b*, *l*, and *x*, for the baſes of the fourth croſs-row of objects.

Go on in this manner, as you ſee in the figure, to find the reſt of the ſquare baſes, up to LM; and you will have 27 upon the whole oblong ſquare plane, on which you are to place the like number of objects, as in fig. 5. pl. 36.

Having aſſumed AO for the perſpective height of the three objects at A, N, and D (fig. 6.) next the obſerver's eye, and drawn O 18 parallel to AD, in order to make the objects at N and D of the ſame height as that at O; and having drawn the upright lines 4 15, 7 W, 8 X, and D 22, for the heights N and D; draw O8 and RS, 15 S and WS, XS and 22 S, all to the point of ſight S: and theſe lines will determine the perſpectively equal heights of all the reſt of the upright objects, as ſhown by the two placed at *a* and B.

To draw the ſquare tops of theſe objects, equal and parallel to their baſes, we need only give one example, which will ſerve for all.

Draw 3 R and 2 Q parallel to AO, and up to the line RS; then draw PQ parallel to OR, and OPQR ſhall be the top of the object at A, equal and parallel to its ſquare baſe A 1 2 3.—In the ſame eaſy way the tops of all the other objects are formed.

When all the reſt of the objects are delineated, ſhade them properly, and the whole perſpective ſcheme will have the appearance of fig. 5.

PROB. 27. *To put a ſquare box in perſpective, containing a given number of leſſer ſquare boxes of a depth equal to their width.*

Let the given number of little ſquare boxes or cells be 16, then 4 of them make the length of each ſide of the four outer ſides *a b*, *b c*, *c d*, *d a*, as in fig. 7. and the depth *a f* is equal to the width *a c*. Whoever can draw the reticulated ſquare, by the rules laid down towards the beginning of this article, will be at no loſs about putting this perſpective ſcheme in practice.

PROB. 28. *To put ſtairs with equal and parallel ſteps in perſpective.*

In fig. 1. of Plate 37, let *a b* be the given breadth of each ſtep, and *a i* the height thereof. Make *b c*, *c d*, *d e*, &c. each equal to *a b*; and draw all the upright lines *a i*, *b l*, *c n*, *d p*, &c. perpendicular to *a b* (to which the horizon *s*S is parallel); and from the points *i*, *l*, *n*, *p*, *r*, &c. draw the equidiſtant lines *i* B, *l* C, *n* D, &c. parallel to *a b*; theſe diſtances being equal to that of *i* B from *a b*.

Draw *x i* touching all the corner-points *l*, *n*, *p*, *r*, *t*, *v*; and draw 2 16 parallel to *x i*, as far from it as you want the length of the ſteps to be.

Toward the point of ſight S draw the lines *a* 1, *i* 2, *k* 3, *l* 4, &c. and draw 16 15, 14 13, 12 11, 10 9, 8 7, 6 5, 4 3, and 2 1, all parallel to A *b*, and meeting the lines *w* 15, *u* 13, *s* 11, &c. in the points 15, 13, 11, 9, 7, 5, 3, and 1: then from theſe points draw 15 14, 13 12, 11 10, 9 8, 7 6, 5 4, and 3 2, all parallel to *b a*; and the outlines of the ſteps will be finiſhed. From the point 16 draw 16 A parallel to *b a*, and A *x* 16 will be part of the flat at the top of the uppermoſt ſtep. This done, ſhade the work as in fig. 2. and the whole will be finiſhed.

PROB. 29. *To put ſtairs with flats and openings in perſpective, ſtanding on a horizontal pavement of ſquares.*

In fig. 3. of Plate 37, having made S the point of ſight, and drawn a reticulated pavement AB with black-lead lines, which may be rubbed out again; at any diſtance from the ſide AB of the pavement which is neareſt to the eye, and at any point where you chooſe to begin the ſtair at that diſtance, as *a*, draw G *a* parallel to BA, and take *a b* at pleaſure for the height of each ſtep.

Take *a b* in your compaſſes, and ſet that extent as many times upward from F to E as is equal to the firſt required number of ſteps O, N, M, L, K; and from theſe points of diviſion in EF draw 1 *b*, 2 *d*, 3 *f*, 4 *h*, and E *k*, all equidiſtant from one another, and parallel to F *a*: then draw the equidiſtant upright lines *a b*, *t d*, *u f*, *v h*, *w k*, and l *m*, all perpendicular to F *a*: then draw *m b*, touching the outer corners of theſe ſteps at *m*, *k*, *h*, *f*, *d*, and *b*; and draw *n s* parallel to *m b*, as far from it as you want the length of the ſteps K, L, M, N, O to be.

Towards the point of ſight S draw *m n*, *l* 5, *k o*, *i* 6, *h p*, *f q*, *d r*, and *b s*. Then (parallel to the bottom-line BA) through

the points *n*, *o*, *p*, *q*, *r*, *s*, draw *n* 8; 5, 14; 6, 15; 7, 16; 1, 17; and 2 *s*: which done, draw *n* 5 and *o* 6 parallel to *l m*, and the outlines of the ſteps K, L, M, N, O will be finiſhed.

At equal diſtances with that between the lines marked 8 and 14, draw the parallel lines above marked 9, 10, 11, 12 and 13; and draw perpendicular lines upwards from the points *n*, *o*, *p*, *q*, *r*, *s*, as in the figure.

Make H *m* equal to the intended breadth of the flat above the ſquare opening at the left hand, and draw HW toward the point of ſight S, equal to the intended length of the flat; then draw WP parallel to H *m*, and the outlines of the flat will be finiſhed.

Take the width of the opening at pleaſure, as from F to C, and draw CD equal and parallel to FE. Draw GH parallel to CD, and the ſhort lines marked 33, 34, &c. juſt even with the parallel lines 1, 2, &c. From the points where theſe ſhort lines meet CD draw lines toward the point of ſight S till they meet DE; then from the points where the lines 38, 39, 40, &c. of the pavement meet C *y*, draw upright lines parallel to CD, and the lines which form the opening will be finiſhed.

The ſteps P, Q, R, S, T, and the flat U above the arch V, are done in the ſame manner with thoſe in fig. 1. as taught in Prob. 28. and the equidiſtant parallel lines marked 18, 19, &c. are directly even with thoſe on the left hand ſide of the arch V, and the upright lines on the right-hand ſide are equidiſtant with thoſe on the left.

From the points where the lines 18, 19, 20, &c. meet the right-hand ſide of the arch, draw lines toward the point of ſight S; and from the points where the pavement lines 29, 30, 31, 32, meet the line drawn from A towards the point of ſight, draw upright lines toward the top of the arch.

Having done the top of the arch, as in the figure, and the few ſteps to the right hand thereof, ſhade the whole as in fig. 4. and the work will be finiſhed.

PROB. 30. *To put upright conical objects in perſpective, as if ſtanding on the ſides of an oblong ſquare, at diſtances from one another equal to the breadth of the oblong.*

In fig. 5. of Plate 37, the baſes of the upright cones are perſpective circles inſcribed in ſquares of the ſame diameter; and the cones are ſet upright on their baſes by the ſame rules as are given for pyramids, which we need not repeat here.

In moſt of the foregoing operations we have conſidered the obſerver's eye to be above the level of the tops of all the objects, as if he viewed them when ſtanding on high ground. In this figure, and the firſt and ſecond of the next plate, we ſhall ſuppoſe him to be ſtanding on low ground, and the tops of the objects to be above the level of his eye.

In fig. 5. Pl. 37. let AD be the perſpective breadth of the oblong ſquare ABCD; and let A *a* and D *d* (equal to A *a*) be taken for the diameters of the circular baſes of the two cones next the eye, whoſe intended equal heights ſhall be AE and DF.

Having made S the point of ſight in the horizon parallel to AD, and found the proper point of diſtance therein, draw AS and *a* S to contain the baſes of the cones on the left-hand ſide, and DS and *d*S for thoſe on the right.

Having made the two firſt cones at A and D of equal height at pleaſure, draw ES and FS from their tops to the point of ſight, for limiting the perſpective heights of all the reſt of the cones. Then divide the parallelogram ABCD into as many equal perſpective ſquares as you pleaſe; find the baſes of the cones at the corners of theſe ſquares, and make the cones thereon, as in the figure.

If you would repreſent a ceiling equal and parallel to ABCD, ſupported on the tops of theſe cones, draw EF, then EFGH ſhall be the ceiling; and by drawing *e f* parallel to EF, you will have the thickneſs of the floor-boards and beams, which may be what you pleaſe.

This ſhows how any number of equidiſtant pillars may be drawn of equal heights to ſupport the ceiling of a long room, and how the walls of ſuch a room may be repreſented in perſpective at the backs of theſe pillars. It alſo ſhows how a ſtreet of houſes may be drawn in perſpective.

PROB. 31. *To put a ſquare hollow in perſpective, the depth of which ſhall bear any aſſigned proportion to its width.*

Fig. 1. of Plate 38. is the repreſentation of a ſquare hollow, of which the depth AG is equal to three times its width AD; and S is the point of ſight over which the obſerver's eye is ſuppoſed to be placed, looking perpendicularly down into it, but not directly over the middle.

Draw AS and DS to the point of ſight S; make ST the horizon parallel to AD, and produce it to ſuch a length beyond T that you may find a point of diſtance therein not nearer S than if AD was ſeen under an angle of 60 degrees.

Draw DU to the point of diſtance, interſecting AS in B; then from the point B draw BC parallel to AD; and you will have the firſt perſpective ſquare ABCD, equal to a third part of the intended depth.

Draw CV to the point of diſtance, interſecting AS in E; then from the point E draw EF parallel to AD; and you will have the ſecond perſpective ſquare BEFC, which, added to the former one, makes two thirds of the intended depth.

Draw FW to the point of diſtance, interſecting AS in G; then from the point G draw GH parallel to AD; and you will have the third perſpective ſquare EGHF, which, with the former two, makes the whole depth AGHD three times as great as the width AD, in a perſpective view.

Divide AD into any number of equal parts, as ſuppoſe 8; and from the diviſion points *a*, *b*, *c*, *d*, &c. draw lines toward the point of ſight S, and ending at GH; then through the points where the diagonals BD, EC, GF, cut theſe lines, draw lines parallel to AD; and you will have the parallelogram AGHD reticulated, or divided into 192 ſmall and equal perſpective ſquares.

Make AI and DM equal and perpendicular to AD; then draw IM, which will be equal and parallel to AD; and draw IS and MS to the point of ſight S.

Divide AI, IM, and MD, into the ſame number of equal parts as AD is divided; and from theſe points of diviſion draw lines toward the point of ſight S, ending reſpectively at GK, KL, and LH.

From thoſe points where the lines parallel to AD meet AG and DH draw upright lines parallel to AI and DM; and from the points where theſe lines meet IK and LM draw lines parallel to IM; then ſhade the work, as in the figure.

PROB. 32. *To repreſent a ſemicircular arch in perſpective, as if it were ſtanding on two upright walls, equal in height to the height of the obſerver's eye.*

After having gone through the preceding operation, this will be more eaſy by a bare view of fig. 2. in Plate 38. than it could be made by any deſcription; the method being ſo much like that of drawing and ſhading the ſquare hollow.—We need only mention, that *a* T EA and DF *e t d* are the upright walls on which the ſemicircular arch is built; that S is the point of ſight in the horizon T *t*, taken in the centre of the arch; that *d* in fig. 1. is the point of diſtance; and that the two perſpective ſquares ABCD and BEFC make the parallelogram AEFD of a length equal to twice its breadth AD.

PROB. 33. *To repreſent a ſquare in perſpective, as viewed by an obſerver ſtanding directly even with one of its corners.*

In fig. 3. of Plate 38, let A 9 BC be a true ſquare, viewed by an obſerver ſtanding at ſome diſtance from the corner C, and juſt even with the diagonal C 9.

Let *p*SP be the horizon, parallel to the diagonal AB; and S the point of ſight, even with the diagonal C 9. Here it will be proper to have two points of diſtance *p* and P, equidiſtant from the point of ſight S.

Draw the ſtraight line 1 17 parallel to AB, and draw A 8 and B 10 parallel to CS. Take the diſtance between 8 and 9 in your compaſſes, and ſet it off all the way in equal parts from 8 to 1, and from 10 to 17. The line 1 17 ſhould be produced a good way further both to right and left hand from 9, and divided all the way in the ſame manner.

From theſe points of equal diviſion, 8, 9, 10, &c. draw lines to the point of ſight S, and alſo to the two points of diſtance *p* and P, as in the figure.

Now it is plain, that *a c b* 9 is the perſpective repreſentation of A9BC, viewed by an obſerver even with the corner C and diagonal C 9. But if there are other ſuch ſquares lying even with this, and having the ſame poſition with reſpect to the line 1 17, it is evident that the obſerver, who ſtands directly even with the corner C of the firſt ſquare, will not be even with the like corners G and K of the others; but will have an oblique view of them, over the ſides FG and IK, which are neareſt his eye: and their perſpective repreſentations will be *e g f* 6 and *b k i* 3, drawn among the lines in the figure: of which, the ſpaces taken up by each ſide lie between three of the lines drawn toward the point of diſtance *p*, and three drawn to the other point of diſtance P.

PROB. 34. *To repreſent a common chair, in an oblique in perſpective.*

The original lines to the point of ſight S, and points of diſtance *p* and P, being drawn as in the preceding operation, chooſe any part of the plane, as *l m n* 13, on which you would have the chair L to ſtand.—There are juſt as many lines (namely two) between *l* and *m* or 13 and *n*, drawn toward the point of diſtance *p*, at the left hand, as between *l* and 13, or *m* and *n*, drawn to the point of diſtance P on the right: ſo that *l m*, *m n*, *n* 13, and 13 *l*, form a perſpective ſquare.

From the four corners *l*, *m*, *n*, 13, of this ſquare raiſe the four legs of the chair to the perſpective perpendicular height you would have them: then make the ſeat of the chair a ſquare equal and parallel to *l m n* 13, as taught in Prob. 18. which will make the two ſides of the ſeat in the direction of the lines drawn toward the point of diſtance *p*, and the fore and back part of the ſeat in direction of the lines drawn to the other point of diſtance P. This done, draw the back of the chair leaning a little backward, and the croſs bars therein tending toward the point of diſtance P. Then ſhade the work as in the figure; and the perſpective chair will be finiſhed.

PROB. 35. *To preſent an oblong ſquare table in an oblique perſpective view.*

In fig. 3 of Plate 38. M is an oblong ſquare table, as ſeen by an obſerver ſtanding directly even with C 9 (ſee *Prob. 33.*), the ſide next the eye being perſpectively parallel to the ſide *a c* of the ſquare *a c b* 9.—The forementioned lines drawn from the line 1 17 to the two points of diſtance *p* and P, form equal perſpective ſquares on the ground plane.

Chooſe any part of this plane of ſquares for the feet of the table to ſtand upon; as at *p*, *q*, *r*, and *s*, in direction of the lines *o p* and *r s* for the two long ſides, and *t s* and *q r* for the two ends; and you will have the oblong ſquare or parallelogram *q r s t* for the part of the floor or ground plane whereon the table is to ſtand: and the breadth of this plane is here taken in proportion to the length as 6 to 10; ſo that, if the length of the table be ten feet, its breadth will be ſix.

On the four little perſpective ſquares at *q*, *r*, *s*, and *t*, place the four upright legs of the table, of what height you pleaſe, ſo that the height of the two next the eye, at *o* and *p*, ſhall be terminated by a ſtraight line *u w* drawn to the point of diſtance P. This done, make the leaf M of the table an oblong ſquare, perſpectively equal and parallel to the oblong ſquare *q r s t* on which the feet of the table ſtand. Then ſhade the whole, as in the figure, and the work will be finiſhed.

If the line 1 17 was prolonged to the right and left hand, and equally divided throughout (as it is from 1 to 17), and if the lines which are drawn from *p* and P to the right and left hand ſides of the plate were prolonged till they came to the extended line 1 17, they would meet it in the equal points of diviſion. In forming large plans of this ſort, the ends of ſlips of paper may be paſted to the right and left edges of the ſheet on which the plan is to be formed.

Of the ANAMORPHOSIS, *or reformation of diſtorted images.*

By this means, pictures that are ſo miſhapen as to exhibit no regular appearance of any thing to the naked eye, ſhall, when viewed by reflection, preſent a regular and beautiful image. The inventor of this ingenious device is not known. Simon Stevinus, who was the firſt that wrote upon it, does not inform us from whom he learned it. The principles of it are laid down by S. Vauzelard in his *Perſpective Conique et Cylindrique*; and Gaſpar Schott profeſſes to copy Marius Bettinus in his deſcription of this piece of artificial magic.

It will be ſufficient for our purpoſe to copy one of the ſimpleſt figures of this writer, as by this means the myſtery of this art will be ſufficiently unfolded. Upon the cylinder of paper, or paſteboard, ABCD, Plate 37. fig. 6. draw whatever is intended to be exhibited, as the letters IHS. Then with a needle make perforations along the whole outline; and placing a candle, G, behind this cylinder, mark upon the ground plane the ſhadow of them, which will be diſtorted more or leſs, according to the poſition of the candle or the plane, &c. This being done, let the picture be an exact copy of this diſtorted image, let the metallic ſpeculum be ſubſtituted in the place of the cylinder, and let the eye of the ſpectator have the ſame poſition before the cylinder that the candle had behind it. Then looking upon the ſpeculum, he will ſee the diſtorted image reſtored to its proper ſhape. The reformation of the image, he ſays, will not eaſily be made exact in this method, but it will be ſufficiently ſo to anſwer the purpoſe.

Other methods, more exact and geometrical than this, were found out afterwards: ſo that theſe pictures could be drawn by certain rules, without the uſe of a candle. Schott quotes one of theſe methods from Bettinus, another from Herigonius, and another from Kircher, which may be ſeen in his *Magia*, vol. i. p. 162, &c. He alſo gives an acccunt of the methods of reforming pictures by ſpeculums of conical and other figures.

Inſtead of copying any of theſe methods from Schott or Bettinus, we ſhall preſent our readers with that which Dr. Smith hath given us in his Optics, vol. i. p. 250, as, no doubt, the beſt, and from which any perſon may eaſily make a drawing of this kind. The ſame deſcription anſwers to two mirrors, one of which, fig. 7. is convex, and the other, fig. 8. is concave.

In order to paint upon a plane a deformed copy ABCDEKI HGF of an original picture, which ſhall appear regular, when ſeen from a given point O, elevated above the plane, by rays reflected from a poliſhed cylinder, placed upon the circle *l n p*, equal to its given baſe; from the point R, which muſt be ſuppoſed to lie perpendicularly under O, the place of the eye, draw two lines R *a*, R *e*; which ſhall either touch the baſe of the cylinder, or elſe cut off two ſmall equal ſegments from the ſides of it, according as the copy is intended to be more or leſs deformed. Then, taking the eye, raiſed above R, to the given height RO, ſomewhat greater than that of the cylinder, for a luminous point, deſcribe the ſhadow *a e k f* (of a ſquare *a e x z*, fig. 36. or parallelogram ſtanding upright upon its baſe *a e*, and containing the picture required) anywhere behind the arch *l n p*. Let the lines drawn from R to the extremities and divi-

ſions of the baſe *a, b, c, d, e,* cut the remoteſt part of the ſhadow in the points *f, g, h, i, k,* and the arch of the baſe in *l, m, n, o, p*; from which points draw the lines *l* AF, *m* BG, *n* CH, *o* DI, *p* EK, as if they were rays of light that came from a focus R, and were reflected from the baſe *l n p*; ſo that each couple, as *l* A, *l* R, produced, may cut off equal ſegments from the circle. Laſtly, tranſfer the lines *l a f, m b g,* &c. and all their parts, in the ſame order, upon the reſpective lines *l*AF, *m*BG, &c. and having drawn regular curves, by eſtimation, through the points A, B, C, D, E, through F, G, H, I, K, and through every intermediate order of points; the figure ACEK HF, ſo divided, will be the deformed copy of the ſquare, drawn and divided upon the original picture, and will appear ſimilar to it, when ſeen in the poliſhed cylinder, placed upon the baſe *l n p*, by the eye in its given place O.

The practical methods of drawing theſe images ſeem to have been carried to the greateſt perfection by J. Leopold, who, in the Acta Lipſienſia for the year 1712, has deſcribed two machines, one for the images to be viewed with a cylindrical, and the other with a conical, mirror. The perſon poſſeſſed of this inſtrument has nothing to do but to take any print he pleaſes, and while he goes over the outlines of it with one pen, another traces the anamorphoſis.

By methods of this kind, groves of trees may be cut, ſo as to repreſent the appearance of men, horſes, and other objects from ſome one point of view, which are not at all diſcernible in any other. This might eaſily be effected by one perſon placing himſelf in any particular ſituation, and giving directions to other perſons what trees to lop, and in what manner. In the ſame method it has been contrived, that buildings of circular and other forms, and alſo whole groups of buildings, conſiſting of walls at different diſtances, and with different poſitions to one another, ſhould be painted ſo as to exhibit the exact repreſentation of particular objects, which could only be perceived in one ſituation. Bettinus has illuſtrated this method by drawings in his *Apiaria*.

It may appear a bold aſſertion to ſay, that the very ſhort ſketch now given of the art of perſpective is a ſufficient foundation for the whole practice, and includes *all* the expeditious rules peculiar to the problems which moſt generally occur. It is, however, true, and the intelligent reader will ſee, that the two theorems on which the whole reſts include every poſſible caſe, and apply with equal facility to pictures and originals in any poſition, although the examples are ſelected of perpendicular pictures, and of originals referred to horizontal planes, as being the moſt frequent. The ſcientific foundation being ſo ſimple, the ſtructure need not be complex, nor ſwell into ſuch volumes as have been publiſhed on the ſubject: volumes which, by their ſize, deter from the peruſal, and give the ſimple art the appearance of intricate myſtery; and, by their prices, defeat the deſign of their authors, viz. the diſſemination of knowledge among the practitioners. The treatiſes on perſpective acquire their bulk by long and tedious diſcourſes, minute explanations of common things, or by great numbers of examples; which indeed do make ſome of theſe books valuable by the variety of curious cuts, but do not at all inſtruct the reader by any improvements made in the art itſelf. For it is evident, that moſt of thoſe who have treated this ſubject have been more converſant in the practice of deſigning than in the principles of geometry; and therefore when, in their practice, the caſes which have offered have put them on trying particular expedients, they have thought them worth communicating to the public as improvements of the art; and each author, fond of his own little expedient (which a ſcientific perſon would have known for an eaſy corollary from the general theorem), has made it the principle of a practical ſyſtem—and in this manner narrowing inſtead of enlarging the knowledge of the art; and the practitioner, tired of the bulk of the volume, in which a ſingle maxim is tediouſly ſpread out, and the principle on which it is founded kept out of his ſight, contents himſelf with a remembrance of the maxim (not underſtood), and keeps it ſlightly in his eye, to avoid groſs errors. We can appeal to the whole body of painters and draughtſmen for the truth of this aſſertion; and it muſt not be conſidered an imputation on them of remiſſneſs or negligence, but as a neceſſary conſequence of the ignorance of the authors from whom they have taken their information. This is a ſtrong term, but it is not the leſs juſt. Several mathematicians of eminence have written on perſpective, treating it as the ſubject of pure geometry, as it really is; and the performances of Dr. Brook Taylor, Graveſande, Wolf, De la Caille, Emerſon, are truly valuable, by preſenting the art in all its perſpicuous ſimplicity and univerſality. The works of Taylor and Emerſon are more valuable, on account of the very ingenious and expeditious conſtructions which they have given, ſuited to every poſſible caſe. The merit of the firſt author has been univerſally acknowledged by all the Britiſh writers on the ſubject, who never fail to declare that their own works are compoſed on the principle of Dr. Brook Taylor: but any man of ſcience will ſee that theſe authors have either not underſtood them, or aimed at pleaſing the public by fine cuts and uncommon caſes; for, without exception, they have omitted his favourite conſtructions, which had gained his predilection by their univerſality, and attached themſelves to inferior methods, more uſually expedient perhaps, or inventions (as they thought) of their own. What has been given in this article is not *profeſſed* to be according to the principles of Dr. Brook Taylor, becauſe the principles are not peculiar to him, but the neceſſary reſults of the theory itſelf, and inculcated by every *mathematician* who had taken the trouble to conſider the ſubject. They are ſufficient not only for directing the ordinary practice, but alſo for ſuggeſting modes of conſtruction for every caſe out of the common track. And a perſon of ingenuity will have a laudable enjoyment in thus, without much ſtretch of thought, inventing rules for himſelf; and will be better pleaſed with ſuch fruits of his own ingenuity, than in reading the tedious explanations of examples deviſed by another. And for this purpoſe we would, with Dr. Taylor, "adviſe all our readers not to be contented with the ſcheme they find here; but, on every occaſion, to draw new ones of their own, in all the variety of circumſtances they can think of. This will take up more time at firſt, but they will find the vaſt benefit and pleaſure of it by the extenſive notions it will give them of the nature of the principles."

The art of perſpective is neceſſary to all arts where there is any occaſion for deſigning; as architecture, fortification, carving, and generally all the mechanical arts; but it is more particularly neceſſary to the art of painting, which can do nothing without it. A figure in a picture, which is not drawn according to the rules of perſpective, does not repreſent what is intended, but ſomething elſe. Indeed we heſitate not to ſay, that a picture which is faulty in this particular, is as blameable, or more ſo, than any compoſition in writing which is faulty in point of orthography, or grammar. It is generally thought very ridiculous to pretend to write an heroic poem, or a fine diſcourſe, upon any ſubject, without underſtanding the propriety of the language in which we write; and to us it ſeems no leſs ridiculous for one to pretend to make a good picture without underſtanding perſpective: Yet how many pictures are there to be ſeen, that are highly valuable in other reſpects, and yet are entirely faulty in this point! Indeed this fault is ſo very general, that we cannot remember that we ever have ſeen a picture that has been entirely without it; and what is the more to be lamented, the greateſt maſters have been the moſt guilty of it. Thoſe examples make it to be the leſs regarded, but the

fault is not the leſs, but the more to be lamented, and deſerves the more care in avoiding it for the future. The great occaſion of this fault, is certainly the wrong method that is generally uſed in educating of perſons in this art: for young people are generally put immediately to drawing; and when they have acquired a facility in that, they are put to colouring. And theſe things they learn by rote, and by practice only; but are not at all inſtructed in any rules of art. By which means, when they come to make any deſigns of their own, though they are very expert at drawing out and colouring every thing that offers itſelf to their fancy; yet for want of being inſtructed in the ſtrict rules of art, they do not know how to govern their inventions with judgment, and become guilty of ſo many groſs miſtakes; which prevent themſelves, as well as others, from finding that ſatisfaction they otherwiſe would do in their performances. To correct this for the future, we would recommend it to the maſters of the art of painting, to conſider if it would not be neceſſary to eſtabliſh a better method for the education of their ſcholars, and to begin their inſtructions with the technical parts of painting, before they let them looſe to follow the inventions of their own uncultivated imaginations.

The art of painting, taken in its full extent, conſiſts of two parts; the inventive, and the executive. The inventive part is common with poetry, and belongs more properly and immediately to the original deſign (which it invents and diſpoſes in the moſt proper and agreeable manner) than to the picture, which is only a copy of that deſign already formed in the imagination of the artiſt. The perfection of this art of painting depends upon the thorough knowledge the artiſt has of all the parts of his ſubject; and the beauty of it conſiſts in the happy choice and diſpoſition that he makes of it: And it is in this that the genius of the artiſt diſcovers and ſhows itſelf, while he indulges and humours his fancy, which here is not confined. But the other, the executive part of painting, is wholly confined and ſtrictly tied to the rules of art, which cannot be diſpenſed with upon any account; and therefore in this the artiſt ought to govern himſelf entirely by the rules of art, and not to take any liberties whatſoever. For any thing that is not truly drawn according to the rules of perſpective, or not truly coloured or truly ſhaded, does not appear to be what the artiſt intended, but ſomething elſe. Wherefore, if at any time the artiſt happens to imagine that his picture would look the better, if he ſhould ſwerve a little from theſe rules, he may aſſure himſelf, that the fault belongs to his original deſign, and not to the ſtrictneſs of the rules; for what is perfectly agreeable and juſt in the real original objects themſelves, can never appear defective in a picture where thoſe objects are exactly copied.

Therefore, to offer a ſhort hint of thoughts we have ſome time had upon the method which ought to be followed in inſtructing a ſcholar in the executive part of painting; we would firſt have him learn the moſt common effections of practical geometry, and the firſt elements of plain geometry and common arithmetic. When he is ſufficiently perfect in theſe, we would have him learn perſpective. And when he has made ſome progreſs in this, ſo as to have prepared his judgment with the right notions of the alterations that figures muſt undergo, when they come to be drawn on a flat, he may then be put to drawing by view, and be exerciſed in this along with perſpective, till he comes to be ſufficiently perfect in both. Nothing ought to be more familiar to a painter than perſpective; for it is the only thing that can make the judgment correct, and will help the fancy to invent with ten times the eaſe that it could do without it.

We earneſtly recommend thoſe of our readers who are anxious for farther inſtruction in Perſpective, to the *careful* peruſal of Dr. Taylor's Treatiſe, as publiſhed by Colſon in 1749, and Emerſon's publiſhed along with his Optics.

PERSPECTIVE is alſo uſed for a kind of picture or painting, frequently ſeen in gardens, and at the ends of galleries; deſigned expreſsly to deceive the ſight by repreſenting the continuation of an alley, a building, landſcape, or the like.

Aerial PERSPECTIVE, is ſometimes uſed as a general denomination for that which more reſtrictedly is called *aerial perſpective*, or the art of giving a due diminution or degradation to the ſtrength of light, ſhade, and colours of objects, according to their different diſtances, the quantity of light which falls upon them, and the medium through which they are ſeen; the *chiaro oſcuro*, or *clair obſcure*, which conſiſts in expreſſing the different degrees of light, ſhade, and colour of bodies, ariſing from their own ſhape, and the poſition of their parts with reſpect to the eye and neighbouring objects, whereby their light or colours are affected; and keeping, which is the obſervance of a due proportion in the general light and colouring of the whole picture, ſo that no light or colour in one part may be too bright or ſtrong for another. A painter, who would ſucceed in *aerial perſpective*, ought carefully to ſtudy the effects which diſtance, or different degrees or colours of light, have on each particular original colour, to know how its hue or ſtrength is changed in the ſeveral circumſtances that occur, and to repreſent it accordingly. As all objects in a picture take their meaſures in proportion to thoſe placed in the front, ſo, in *aerial perſpective*, the ſtrength of light, and the brightneſs of the colours of objects cloſe to the picture, muſt ſerve as a meaſure, with reſpect to which all the ſame colours at ſeveral diſtances muſt have a proportional degradation in like circumſtances.

Bird's-eye view in PERSPECTIVE, is that which ſuppoſes the eye to be placed above any building, &c. as in the air at a conſiderable diſtance from it. This is applied in drawing the repreſentations of fortifications, when it is neceſſary not only to exhibit one view as ſeen from the ground, but ſo much of the ſeveral buildings as the eye can poſſibly take in at one time from any ſituation. In order to this, we muſt ſuppoſe the eye to be removed a conſiderable height above the ground, and to be placed as it were in the air, ſo as to look down into the building like a bird that is flying. In repreſentations of this kind, the higher the horizontal line is placed, the more of the fortification will be ſeen, and *vice verſa*.

PERSPECTIVE *Machine* is an inſtrument by which any perſon, without the help of the rules of art, may delineate the true perſpective figures of objects. Mr. Ferguſon has deſcribed a machine of this ſort, of which he aſcribes the invention to Dr. Bevis.

Fig. 4. of Plate 38. is a plane of this machine, and fig. 5. is a repreſentation of it when made uſe of in drawing diſtant objects in perſpective.

In fig. 4. *a b e f* is an oblong ſquare board, repreſented by ABEF in fig. 5. *x* and *y* (X and Y) are two hinges on which the part *c l d* (CLD) is moveable. This part conſiſts of two arches or portions of circles *c m l* (CML) and *d n l* (DNL) joined together at the top *l* (L), and at bottom to the croſs bar *d c* (DC), to which one part of each hinge is fixed, and the other part to a flat board, half the length of the board *a b e f* (ABEF), and glued to its uppermoſt ſide. The centre of the arch *c m l* is at *d*, and the centre of the arch *d n l* is at *c*.

On the outer ſide of the arch *d n l* is a ſliding piece *n* (much

like the nut of the quadrant of altitude belonging to a common globe), which may be moved to any part of the arch between *a* and *l*: and there is ſuch another ſlider *o* on the arch *c m l*, which may be ſet to any part between *c* and *l*. A thread *c p n* (CPN) is ſtretched tight from the centre *c* (C) to the ſlider *n* (N), and ſuch another thread is ſtretched from the centre *d* (D) to the ſlider *o* (O); the ends of the threads being faſtened to theſe centres and ſliders.

Now it is plain, that, by moving theſe ſliders on their reſpective arches, the interſection *p* (P) of the threads may be brought to any point of the open ſpace within the arches. In the groove *k* (K) is a ſtraight ſliding bar *i* (I), which may be drawn further out or puſhed further in at pleaſure.

To the outer end of this bar I (fig. 5.) is fixed the upright piece HZ, in which is a groove for receiving the ſliding piece Q. In this ſlider is a ſmall hole *r* for the eye to look through in uſing the machine: and there is a long ſlit in HZ, to let the hole *r* be ſeen through when the eye is placed behind it, at any height of the hole above the level of the bar I.

How to delineate the perſpective figure of any diſtant object, or objects, by means of this machine.

Suppoſe you wanted to delineate a perſpective repreſentation of the houſe *q s r p* (which we muſt imagine to be a great way off, without the limits of the plate), place the machine on a ſteady table, with the end EF of the horizontal board ABEF toward the houſe, ſo that, when the Gothic-like arch DLC is ſet upright, the middle part of the open ſpace (about P) within it may be even with the houſe when you place your eye at Z, and look at the houſe through the ſmall hole *r*. Then fix the corners of a ſquare piece of paper with four wafers on the ſurface of that half of the horizontal board which is neareſt the houſe; and all is ready for drawing.

Set the arch upright, as in the figure; which it will be when it comes to the perpendicular ſide *t* of the upright piece *s t* fixed to the horizontal board behind D. Then place your eye at Z, and look through the hole *r* at any point of the houſe, as *q*, and move the ſliders N and O till you bring the interſection of the threads at P directly between your eye and the point *q*: then put down the arch flat upon the paper on the board, as at ST, and the interſection of the threads will be at W. Mark the point W on the paper with the dot of a black lead pencil, and ſet the arch upright again as before: then look through the hole *r*, and move the ſliders N and O till the interſection of the threads comes between your eye and any other point of the houſe, as *p*: then put down the arch again to the paper, and make a pencil mark thereon at the interſection of the threads, and draw a line from that mark to the former one at W: which line will be a true perſpective repreſentation of the corner *p q* of the houſe.

Proceed in the ſame manner, by bringing the interſection of the threads ſucceſſively between your eye and other points of the outlines of the houſe, as *r*, *s*, &c. and put down the arch to mark the like points on the paper, at the interſection of the threads: then connect theſe points by ſtraight lines, which will be the perſpective outlines of the houſe. In like manner find points for the corners of the door and windows, top of the houſe, chimneys, &c. and draw the finiſhing lines from point to point: then ſhade the whole, making the lights and ſhades as you ſee them on the houſe itſelf, and you will have a true perſpective figure of it.—Great care muſt be taken, during the whole time, that the poſition of the machine be not ſhifted on the table; and to prevent ſuch an inconvenience, the table ſhould be very ſtrong and ſteady, and the machine fixed to it either by ſcrews or clamps.

In the ſame way, a landſcape, or any number of objects within the field of view through the arch, may be delineated, by finding a ſufficient number of perſpective points on the paper, and connecting them by ſtraight or curved lines as they appear to the eye. And as this makes every thing in perſpective equally eaſy, without taking the trouble to learn any of the rules for drawing, the operations muſt be very pleaſing and agreeable. Yet as ſcience is ſtill more ſo, we would by all means recommend it to our readers to learn the rules for drawing particular objects; and to draw landſcapes by the eye, for which, we believe, no perſpective rules can be given. And although any thing may be very truly drawn in perſpective by means of this machine, it cannot be ſaid that there is the leaſt degree of ſcience in going *that* way to work.

The arch ought to be at leaſt a foot wide at bottom, that the eye at Z may have a large field of view through it; and the eye ſhould then be, at leaſt, 10½ inches from the interſection of the threads at P when the arch is ſet upright. For, if it be nearer, the boundaries of view at the ſides near the foot of the arch will ſubtend an angle at Z of more than 60 degrees, which will not only ſtrain the eye, but will alſo cauſe the outermoſt parts of the drawing to have a diſagreeable appearance. To avoid this, it will be proper to draw back the ſliding bar I, till Z be 14½ inches diſtant from P; and then the whole field of view, through the foot-wide arch, will not ſubtend an angle to the eye at Z of more than 45 degrees; which will give a more eaſy and pleaſant view, not only of all the objects themſelves, but alſo of their repreſentations on the paper whereon they are delineated. So that, whatever the width of the arch be, the diſtance of the eye from it ſhould be in this proportion: As 12 is to the width of the arch, ſo is 14½ to the diſtance of the eye (at Z) from it.

If a pane of glaſs, laid over with gum-water, be fixed into the arch, and ſet upright when dry, a perſon who looks through the hole *r* may delineate the objects upon the glaſs which he ſees at a diſtance through and beyond it, and then transfer the delineation to a paper put upon the glaſs, as mentioned in the beginning of the article PERSPECTIVE.

Mr. Peacock likewiſe invented three ſimple inſtruments for drawing architecture and machinery in perſpective, of which the reader will find ſketches and deſcriptions in the 75th volume of the Philoſophical Tranſactions. We do not inſert theſe deſcriptions here, becauſe we do not think the inſtruments ſuperior to that deſcribed by Ferguſon, and becauſe we wiſh that our readers who have occaſion to *draw* may make themſelves ſo much maſters of the art of perſpective as to be above the aid of ſuch mechanical contrivances.

PERSPECTIVE *Glaſs*, or *Graphical Perſpective*. See DIOPTRICS.

PERSPIRATION, in medicine, the evacuation of the juices of the body through the pores of the ſkin. Perſpiration is diſtinguiſhed into ſenſible and inſenſible; and here ſenſible perſpiration is the ſame with ſweating, and inſenſible perſpiration that which eſcapes the notice of the ſenſes; and this laſt is the idea affixed to the word *perſpiration* when uſed alone.

PERSPICUITY, properly ſignifies the property which any thing has of being eaſily ſeen through: hence it is generally applied to ſuch writings or diſcourſes as are eaſily underſtood.

PERSPICUITY, in compoſition. See ORATORY.

PERTH, a county of Scotland, including Menteith, Braidalbin, Athol, Stratherne, part of Gowrie, and Perth Proper; is bounded by Badenoch and Lochaber on the north and north-weſt; by Marr on the north-eaſt; by Argyle and Lennox on the weſt and ſouth-weſt; having Clackmannanſhire, part of Stirlingſhire, and the Forth to the ſouth; the ſhires of Kinroſs and Fife to the ſouth-eaſt, and Angus to the eaſt. It extends above 70 miles in length, and near 60 at its greateſt breadth, exhibiting a variety of Highlands and Lowlands;

mountains, hills, dales, and ſtraths, diverſified with paſture-grounds, corn-fields, and meadows; rivers, lakes, foreſts, woods, plantations, incloſures, towns, villages, and a great number of elegant ſeats, beautifully ſituated, belonging to noblemen and gentlemen. The chief rivers of Perthſhire are the Tay, the Teith, and the Erne, beſides a great number of ſubordinate ſtreams. The river Teith is famous for its ſalmon fiſhery, and its ſteep cataract, near the Blair of Drummond, the noiſe of which is ſo loud as to deafen thoſe who approach it. The river Erne riſes from Loch-Erne, a lake ſeven miles long, in the mountainous country of Stratherne: this river, after a courſe of thirty-four miles from weſt to eaſt, during which it receives many ſtreams and rivulets, falls into the Tay at Abernethy.

Freeſtone, lead, iron, and copper ores, with ſome lapis calaminaris, are found in different parts of Perthſhire. The ſoil, being generally rich and well manured, produces excellent wheat, and all kinds of grain. The hilly country abounds with paſture for the black cattle, horſes, ſheep, goats, and deer. The heaths, woods, and foreſts are ſtored with variety of game; the rivers teem with ſalmon and trout; the gardens and orchards are ſtored with all kinds of herbs, roots, apples, pears, cherries, plums, and almoſt every ſpecies of fruit found in South Britain. The houſes and attire, even of the commonalty, are neat and decent; and every peaſant can produce a good quantity of linen, and great ſtore of blankets, made in his own family. Indeed this is the caſe through all the Lowlands of Scotland. Flax is reared by every huſbandman; and being dreſſed at home, is ſpun by the females of his family into thread for linen: this is woven by country weavers, of whom there is a great number through all the Low Country, and afterwards bleached or whitened by the good wife and her ſervants; ſo that the whole is made fit for uſe at a very ſmall expence. They likewiſe waſh, card, ſpin, and weave their wool into tartan for plaids, kerſies, and coarſe ruſſet cloth, for common wearing, beſides great part of it which is knit into caps, ſtockings, and mitts. Plaids, made of the fineſt worſted, are worn either plain or variegated, as veils, by women of the lower, and even of the middle rank; nay, ſome years ago, ladies of faſhion wore ſilken plaids with an undreſs: this is a looſe piece of drapery, gathered about the head, ſhoulders, and waiſt, on which it is croſſed, ſo as to leave the hands at liberty, and produces a very good effect to the eye of the ſpectator. The Lowlanders of Perthſhire are civilized, hoſpitable, and induſtrious: the commerce of the country conſiſts chiefly in corn, linen, and black cattle: there are, moreover, ſome merchants who trade to foreign countries.—For an account of the different diviſions of this county above mentioned, ſee the articles as they occur in the order of the alphabet.

Perth *Proper*, ſtretching twenty miles in length, and at ſome places fifteen in breadth, is bounded on the north-eaſt by the Carſe of Gowrie; on the eaſt by Angus; on the weſt by Stratherne; on the north by Athol, and on the ſouth by the Frith of Tay. This is likewiſe a fruitful country, populous and well cultivated, abounding with gentlemen who poſſeſs opulent eſtates; with farmers who underſtand agriculture; and with manufacturers who turn their induſtry to great account. North-eaſtward from Perth to Brechin lies the vale of Strathmore one of the moſt fertile diſtricts in Scotland, which gives the title of *Earl* to the noble family of Lyon.

Perth, the capital of Perthſhire, ſeated on the Tay, over which is an elegant bridge of nine arches. It has two churches, one of which belonged formerly to a fine abbey. Perth has been the reſidence of the ſovereigns of Scotland, and the ſeat of the parliament and of the ſupreme courts of juſtice. The tide comes up to this place, and the river is navigable for ſmall veſſels. Here is a great linen and cotton manufacture. Perth is thirty miles north of Edinburgh. W. lon. 3. 27. N. lat. 56. 22.

Perth *Amboy*. See New Jersey.

PERTINAX, was an illuſtrious Roman emperor after the death of Commodus. He was deſcended of a mean family; and like his father, who was either a ſlave or the ſon of a manumitted ſlave, he for ſome time followed the employment of drying wood and making charcoal. His poverty did not, however, prevent him from receiving a liberal education. For ſome time he was employed in teaching a number of pupils the Greek and the Roman languages in Etruria. He left this laborious profeſſion, and became a ſoldier; and by his valour and intrepidity gradually roſe to offices of the higheſt truſt in the army, and was made conſul by M. Aurelius for his ſervices. He was afterwards entruſted with the government of Mœſia, and at length he preſided over the city of Rome as governor. When Commodus was murdered, Pertinax was univerſally choſen to ſucceed to the imperial dignity; and his refuſal, on the plea of old age and increaſing infirmities, did not prevent his being ſaluted Emperor and Auguſtus. He complied with reluctance; but his mildneſs, his economy, and popularity, convinced the ſenate and the people of the prudence and the juſtice of their choice. He forbade his name to be inſcribed on ſuch places or eſtates as were part of the imperial domains, and aſſerted that they belonged not to him but to the public. He melted all the ſilver ſtatues which had been raiſed to his predeceſſor; and he expoſed to ſale all his concubines, horſes, arms, and all the inſtruments of his pleaſure and extravagance. With the money raiſed from theſe relics he enriched the empire, and was enabled to aboliſh all the taxes which Commodus had laid on the rivers, ports, and highways, through the empire. Theſe patriotic actions gained him the affection of the worthieſt and moſt diſcerning of his ſubjects; but the extravagant, luxurious, and vicious, raiſed their clamours againſt him; and when the emperor attempted to introduce among the pretorian guards ſuch diſcipline as was abſolutely neceſſary to preſerve the peace and tranquillity of Rome, the flames of rebellion were kindled, and the minds of the ſoldiers totally alienated. Pertinax was apprized of their mutinying, but he refuſed to fly at the hour of danger. He ſcorned the advice of ſuch of his friends as wiſhed him to withdraw from the impending ſtorm; and he unexpectedly appeared before the ſeditious troops, and without fear or concern boldly aſked them, whether they who were bound by duty to defend the perſon of their prince and emperor were come to betray him and to ſhed his blood? His undaunted courage and intrepidity would have had the deſired effect, and the ſoldiers had begun to retire, when one of the moſt ſeditious of them advanced and darted his javelin at the emperor's breaſt, exclaiming, *The ſoldiers ſend you this.* The reſt inſtantly followed the example; and Pertinax, muffling up his head, and calling upon Jupiter to avenge his death, remained unmoved, and was immediately diſpatched. His head was cut off and carried upon the point of a ſpear in triumph to the camp. This abominable murder happened in the 193d year of the Chriſtian æra.

It was no ſooner known that Pertinax had been murdered, than the enraged populace flocked from all quarters of the city, and, uttering dreadful menaces againſt the authors of his death, ran up and down the ſtreets in queſt of them. The ſenators were no leſs concerned for his death than the people; the more, becauſe they were now convinced that the ſoldiers would ſuffer none to reign but tyrants. However, as they had more to loſe than the common people, they did not offer to revenge his death; but either ſhut themſelves up in their own houſes, or in thoſe of the ſoldiers of their acquaintance, thinking themſelves there moſt ſafe. Such was the unfortunate and much-lamented end of Publius Helvius Pertinax, after he had lived 66 years

7 months and 26 or 28 days; and reigned, according to Dio Caſſius, 87 days; that is, from the 1ſt of January to the 28th of March. His body, together with his head, was interred with great pomp by Didius Julianus, his ſucceſſor, in the burying-place of his wife's family. The emperor Septimius Severus, with the title of emperor, aſſumed the name of Pertinax, which he knew would above any thing elſe recommend him to the army in Illyricum, and to the Roman people. He puniſhed with great ſeverity all thoſe who had been acceſſary to his death, diſbanded the pretorian guards, honoured his memory with a moſt magnificent funeral, at which was carried the effigies of the deceaſed prince, pronounced his panegyric, and caſted him to be ranked in the number of the gods, appointing the ſon chief prieſt to his father. The day of his acceſſion to the empire was yearly celebrated with the Circenſian games; and his birth-day, for many years after, with other ſports. He performed great things, ſays Herodian, during his ſhort adminiſtration, and would have reſtored the empire to its former luſtre, had he been indulged with a longer reign.

PERU, a country of South America, bounded on the north by the viceroyalty of New Grenada, on the eaſt by the provinces which depend on the viceroyalty of Buenos Ayres, on the ſouth by Chili, and on the weſt by the Pacific Ocean, and extends from the 52d to the 63d degree of longitude weſt from Ferro, and from the 4th to the 22d degree of ſouth latitude. The Spaniards were unacquainted with Peru till they were become maſters of Mexico: a young cacique, in the neighbourhood of the iſthmus of Darien, gave them the firſt information. in the year 1513, when 190 Spaniards, attended by a thouſand Indians, loaded with their baggage, as porters and guides, croſſed the continent, and firſt diſcovered the Pacific Ocean, and the rich country of Peru, under the conduct of two ſoldiers of mean deſcent, Francis Pizarro and Diego Almagro. Huana Capac, the inca or emperor of Peru, had ſubdued Quito, and dying in the year 1529 left two ſons, one by a princeſs of the blood royal, the other by a daughter of the king of Quito, and divided between them his empire. Huaſcar reigned at Cuſco, and Atahualpa in Quito; but theſe two princes quarrelled and engaged in a war; when Huaſcar was vanquiſhed, and made priſoner. At this time Pizarro arrived with the Spaniards. Some negotiations took place between Atahualpa and Pizarro, which ended in the impriſonment and ſubſequent death of the inca. Huaſcar had been already put to death in priſon, by order of his brother. Some unavailing attempts were made to drive away the Spaniards; but the whole empire was ſoon compelled to ſubmit to the yoke. The empire of the incas is, according to the account of the Peruvians themſelves, ſaid to have been founded by Manco Capac, and to have continued for thirteen generations. Theſe incas called themſelves the deſcendants of the ſun which was the object of their adoration, as the ſource of light, of joy, and fertility: next to the ſun they worſhipped the moon and the ſtars. The lands of the kingdom, that were ſuſceptible of cultivation, were divided into three parts: one appropriated to the ſun, another to the inca, and a third to the people. The firſt were cultivated in common; as were, likewiſe, the lands of orphans, of widows, of old men of the infirm, and of the ſoldiers who were with the army. Theſe were cultivated immediately after the lands appropriated to the ſun, and before thoſe of the emperor. The ſeaſon of this labour was announced by feſtivals: it was begun and continued with the ſound of muſical inſtruments, and the chaunting of hymns. The emperor levied no tribute, and exacted nothing from his ſubjects, but that they ſhould cultivate his lands; the whole produce of which being depoſited in public magazines, was ſufficient to defray all expences of the empire. The lands dedicated to the ſun provided for the maintenance of the prieſts, and for the expences of conſecrating thoſe magnificent temples that were covered with gold, and whoſe roofs were of ſilver. The Peruvians, though at the very ſource of gold and ſilver, knew not the uſe of coin. They had neither commerce nor luxury; and the more minute arts, which owe their exiſtence to the immediate wants of ſocial life, were in a very imperfect ſtate among them. They had not even hieroglyphics, which, among all nations, were the firſt eſſays toward writing. All their ſciences conſiſted in memory, and all their arts in example. They learned their religion and their hiſtory by hymns, and their duties and profeſſions by labour and imitation. From the conqueſt, there hath only been one trifling inſurrection in Peru. An Indian of the province of Xauxa, who declared himſelf of the blood of the incas, was proclaimed king in 1742. His countrymen, who flattered themſelves that they ſhould ſoon recover their religion, their laws, their lands, and their glory, flocked in crowds to his ſtandard; but they were beaten and diſperſed, after having made a conſiderable progreſs. This country, which is very irregular, may be divided into three claſſes. The principal Cordilleras form the firſt. The ſummits of theſe, ſays M. de la Condamine, are loſt in the clouds, and almoſt all of them are covered with enormous maſſes of ſnow, as old as the world. From ſeveral of theſe ſummits, which have in part tumbled down, and from thoſe immenſe heaps of ſnow, torrents of ſmoke and flame iſſue. Such are the ſummits of Colopaxi, Tongourargua, and Sangai. The greateſt part of the reſt have formerly been volcanos, or will, probably, one day become ſuch. Hiſtory has only preſerved to us the æra of their eruptions ſince the diſcovery of America; but the pumice-ſtones the calcined earths with which they are ſtrowed, and the evident veſtiges that the flame has left, are authentic teſtimonies of the reality of former eruptions: their height is prodigious. From this boundary, which is where the ſnow never melts, not even in the torrid zone, one hardly ſees, in deſcending a hundred or a hundred and fifty toiſes down, any thing except naked rocks, or dry ſands: a little lower one may perceive ſome moſs that covers the rocks; various kinds of heath, which, though green and damp, make a clear fire; round hillocks of ſpongy earth, on which grow ſmall radiated and ſtarry plants, whoſe petals are like the leaves of yew. Throughout the whole of this ſpace the ſnow is only temporary, but it continues ſometimes whole weeks and months. Lower ſtill the ground is commonly covered with a ſort of looſe graſs, which riſes a foot and a half high, or two feet. When we come down from theſe mountains we find others that are leſs conſiderable, which occupy the middle of Peru. The ſummit of theſe is commonly cold, barren, and full of mines. The valleys between them are covered with numerous flocks, and ſeem to offer to agriculture the moſt copious harveſts. There are ſeldom above two months of winter here; and in the greateſt heat we need only paſs out of the ſun into the ſhade to enjoy the temperate zone. This rapid alternative of ſenſation is not, however, invariable in a climate which, by the diſpoſition of the ground alone, often changes in the courſe of a league. But let it be as it will, it is always found healthy. There is no malady peculiar to theſe countries, and thoſe of our climate ſeldom prevail there. An European veſſel, however, in 1719, brought thither an epidemic diſorder, which carried off a great number of Spaniards and Meſtees, and above two hundred thouſand Indians. A more fatal preſent ſtill, which theſe people have received in exchange for their gold, is the ſmall pox. It ſhowed itſelf here, for the firſt time, in the year 1588, and has not failed ſince to make at intervals inexpreſſible ravages. The people are not leſs expoſed to this fatal diſtemper on the coaſt, known by the name of Valleys. Their temperature is not the ſame as is elſewhere found in the ſame latitude. It is very agreeable; and though the four ſeaſons of the year are ſenſibly felt here,

there is none that can, with propriety, be deemed inconvenient. The winter is the moſt ſtrongly marked. Whatever may be the cauſe of ſo regular a winter under the torrid zone, it is certain that theſe valleys, which are covered with heaps of ſand, are abſolutely barren for a ſpace of more than a hundred leagues, from Truxillo to Lima. The reſt of the coaſt is leſs ſandy, but it is ſtill too much ſo to be fruitful. No fields are there found that can be ſtyled fertile, except in ſuch lands as are watered by the ſtreams which deſcend from the mountains. Rain might contribute to impart to the ſoil the fertility of which it is deſtitute; but it is never known to rain in Lower Peru. The ſame reaſons that prevent its raining in valleys undoubtedly alſo hinder ſtorms. Thoſe of their inhabitants who never travelled in the mountains, are perfect ſtrangers to thunder and lightning. Their terror is equal to their aſtoniſhment, when, out of their country, they firſt behold ſo uncommon a ſpectacle. But they have a phænomenon much more dangerous and dreadful; and which, in its conſequences, leaves much deeper impreſſions in the human imagination than thunder, and the ravages that accompany it. Earthquakes, which in other countries are ſo rare that whole generations paſs without beholding one, are ſo common in the valleys of Peru, that they have there contracted a habit of reckoning them as a ſeries of dates; and they are ſo much the more memorable, as their frequent return does not diminiſh their violence. There are few places on this extenſive coaſt which preſent not moſt dreadful monuments of theſe horrible convulſions of the earth.—The Peruvians were at firſt deprived of their poſſeſſions as the Mexicans had been. Only a part of thoſe lands, which, in the times of the incas, had been conſecrated to the public occaſions, was left to them in common. Each native is ſubject to a poll-tax, from the age of 18 to 50. The liberty of the Indians underwent the ſame fate as their property. Thoſe who were the ſlaves of government, and were employed in the labours indiſpenſably neceſſary for new eſtabliſhments, were ill fed and ill clothed. When there was no longer any occupation for them, they were transferred to private perſons, whoſe fiefs ſtood in need of hands to cultivate them. It is expreſsly prohibited by law, that the Peruvians ſhould be obliged to work in the ſubterraneous mines; and yet there is no miner who, by his influence or by his profuſion, cannot compel them to it: continual oppreſſion prevents the Indians from having any thing, even common neceſſaries; they ſow no maize but what is abſolutely neceſſary for them, and they conceal it in ſecret caverns. The heads of a family poſſeſs alone the ſecret of this depoſit, and go every eight days there to fetch proviſions for the week. In fine, the corregidors have, for the moſt part, appropriated to themſelves the excluſive right of ſelling to the Indians of their diſtrict the merchandiſe of Europe, and they either make them pay an exorbitant price for it, or oblige them to purchaſe what they do not want. The court of Madrid has given the Peruvians a Spaniſh protector, who is obliged to defend them; and a cacique of the country, who is charged with the management of their affairs. But too often the protector ſells the Indians to any that will purchaſe them, and the cacique is too much debaſed to be able to oppoſe this oppreſſion. Religion has not more power than the laws; it has ſtill leſs. Theſe people go to church as they do to their labours impoſed upon them, execrating thoſe foreign barbarians, who overwhelm both their bodies and their ſouls with intolerable yokes and burdens. They have in general preſerved the religion of their anceſtors; and even in the great towns, where they are under the eyes of their tyrants, they have ſolemn days, on which they aſſume their ancient dreſs, and carry along the ſtreets the images of the ſun and moon. Some among them repreſent a tragedy, the ſubject of which is the death of Atahualpa. One day, perhaps, this tragedy will end in the maſſacre of the whole race of the murderers of Atahualpa. The Peruvians are moreover an inſtance of that profound ſtupidity in which it is in the power of tyranny to plunge men. They are fallen into a liſtleſs and univerſal indifference. The riches which their country hath offered them do not tempt them; luxury, to which nature invites them, has no attraction for them. They are even inſenſible to honours. They are whatever one pleaſes, without any ill-humour or choice, caciques or matayos, the objects of diſtinction, or of public deriſion. They have loſt all their paſſions; that of fear itſelf has often no effect on them, through the little attachment they have to life. They intoxicate themſelves and dance; theſe are all the pleaſures they have when they are able to forget their miſery. Indolence is their predominant habit. "I am not hungry," they ſay to the perſon who would pay them for their labour.—Among the animals of Peru are the llama, the vicuna, and guanaco. The llama, in ſeveral particulars, reſembles the camel, as in the ſhape of its neck, head, and ſome other parts, but has no bunch, and is much ſmaller, cloven-footed, and different in colour; for, though moſt of them are brown, ſome are white, others black, and others of different colours: its pace reſembles that of a camel, and its height is equal to that of an aſs betwixt a year and two old. The Indians uſe them as beaſts of carriage; and they anſwer very well for any load under a hundred weight. Anciently the Indians uſed to eat the fleſh of them, and ſtill continue to make that uſe of thoſe which are paſt labour. They ſay there is no difference betwixt it and mutton, except that the former is ſomething ſweeter; it is a very docile creature, and eaſily kept. Its whole defence is to eject from its noſtrils ſome viſcoſities, which are ſaid to give the itch to any on which they fall; ſo that the Indians, who firmly believe this, are very cautious of provoking the llama. In the ſouthern provinces of Peru are two other animals, not very different from the llama; theſe are the vicuna and the guanaco: the only difference between them being that the vicuna is ſomething ſmaller, its wool ſhorter and finer, and brown all over the body except the belly, which is whitiſh. The guanaco, on the contrary, is much larger, its wool long and harſh; but the ſhape of both is pretty nearly alike. Theſe laſt are of great ſervice in mines, carrying metals in ſuch rugged roads as would be impracticable to any other beaſt. Among the birds are found the gallinazos, a ſpecies of the vulture. Theſe birds often make it their ſole employment to watch the female alligator, during the dry ſeaſon, when ſhe lays her eggs, the ſides of the river not being then covered with water; the bird concealing itſelf among the branches of a tree, where it ſilently obſerves the female alligator till ſhe has laid her eggs and retires; but ſhe is no ſooner under water than the gallinazos darts down on the repoſitory, and with beak, claws, and wings, tears up the ſand, and devours the eggs, leaving only the ſhells. In the deſert country only are found condors and zumbadors. The condor is the largeſt bird in theſe parts of the world; its colour and appearance reſemble thoſe of the gallinazos, and ſometimes it ſoars from the higheſt mountains ſo as to be almoſt out of ſight; and by its being ſeldom ſeen in low places, a ſubtile air ſeems beſt to agree with it, though ſome, which have been tamed when young, live in the villages and plantations: they are extremely carnivorous, and are known frequently to ſeize and fly away with lambs that feed on the heaths. The zumbador, or hummer, is a night-bird peculiar to the mountains and deſerts; and they are ſeldom ſeen, though frequently heard both by their ſinging and a ſtrange humming made in the air by the rapidity of their flight. The gardens of all kinds in the villages are much frequented by the humming-bird, very remarkable both for its ſmallneſs and

the vivid colours of its feathers. Peru is governed by a viceroy, and is divided into the archbiſhopric of Lima, the biſhopric of Arequipa, the biſhopric of Cuſco, the biſhopric of Guamanga, and the biſhopric of Truxillo, each of which is ſubdivided into juriſdictions. The revenue ariſing to the crown of Spain is very great, but the amount is not well known.

Balſam of Peru. See Myroxylon.

PERUGIA, a town of Italy, in the pope's territories, and capital of Perugino. It is an ancient, handſome, populous, and large city, with a ſtrong citadel, an univerſity, and a biſhop's ſee. The churches, and many other buildings as well public as private, are very handſome. It is ſeated on a hill, in E. lon. 12. 30. N. lat. 43. 6.

PERUGINO, a province of Italy, in the territory of the church, bounded on the weſt by Tuſcany, on the ſouth by Orvietano, on the eaſt by the duchies of Spoleto and Urbino, and on the north by the county of Citta Caſtellana. It is one of the ſmalleſt provinces in the territory of the church. The air is very pure, and the ſoil fertile in corn and good wine; beſides, the lake Perugia ſupplies them with plenty of fiſh. The capital town is Perugia. The lake is eight miles from the city, and is almoſt round, being about five miles in diameter: in it there are three iſlands. This province is about 25 miles in length, and near as much in breadth.

Perugino. See Montanini.

PERUKE. See Perruke.

PERUVIAN bark. See Cinchona, and *Jeſuits* bark.

PERUVIANA, a general name given to that vaſt peninſula, extending itſelf from the iſthmus of Darien to Cape Horn, in the form of a triangle, of which the *Terra Magellanica* and the Cape form the vertex. It includes the whole of South America, although, as is well known, all the countries included within theſe limits do not acknowledge the dominion of the crown of Spain. See Terra *Firma*.

PESARO, a town of Italy, in the territory of the pope, and duchy of Urbino, with a biſhop's ſee. It is a large place, whoſe ſtreets are paved with bricks. The caſtle is very well fortified, the harbour excellent, and the cathedral church magnificent. The environs are remarkable for producing good figs, of which they ſend large quantities to Venice. It is ſeated on an eminence at the mouth of the river Fogha, on the Gulph of Venice. E. lon. 13. 0. N. lat. 43. 56.

PESCARA, a very ſtrong town in the kingdom of Naples, and in the Hither Abruzzo; ſeated at the mouth of a river of the ſame name, which falls into the Gulph of Venice. E. lon. 15. 2. N. lat. 42. 27.

PESCENIUS Niger. See Niger.

PESCHIERA, a ſmall but ſtrong town of Italy, in the Veroneſe, with a caſtle and a ſtrong fort, ſeated on the river Mincio, or Menzo. E. lon. 11. 4. N. lat. 45. 27.

Pesenas, an ancient town of France, in the department of Herault and late province of Languedoc. It is delightfully ſeated on the river Pein, 12 miles north-eaſt of Beziers. E. lon. 3. 34. N. lat. 43. 28.

PESSARY, in medicine, a ſolid ſubſtance compoſed of wool, lint, or linen, mixed with powder, oil, wax, &c. made round and long like a finger, in order to be introduced into the exterior neck of the matrix, for the cure of ſeveral uterine diſorders: alſo a ring for preventing prolapſus uteri. See Surgery.

PEST, a town of Upper Hungary, and capital of a county of the ſame name, ſeated on the Danube, in a fine plain, over-againſt Buda, 85 miles ſouth-eaſt of Preſburg. E. lon. 18. 25. N. lat. 47. 24.

PESTILENCE, in medicine, the ſame with the Plague.

PETAGUEL, a territory of South America, in Braſil, bounded on the north by Dele; on the eaſt by the ſea; on the ſouth by the captainſhip of Rio-Grande; and on the weſt by Tupuys. It contains mines of ſilver.

PETAL, in botany, one of the coloured leaves which compoſe the flower.

PETALISM, a mode of deciding on the guilt of citizens, ſimilar to the Athenian Ostracism. It was introduced in Syracuſe about the year before Chriſt 460, in order to prevent the tyranny of the richer citizens, who had often about that time aimed at the diadem. To prevent, therefore, the evils daily ariſing from thence, and to bring down the aſpiring minds of the wealthy citizens, the Syracuſans were forced to make a law not unlike that of the Athenian oſtraciſm; for, as at Athens every citizen was to write on a ſhell the name of the perſon whom they conceived to be the moſt likely, on account of his wealth and adherents, to aſpire to the crown; ſo at Syracuſe they were to write on a leaf the names of ſuch as they apprehended powerful enough to uſurp the ſovereignty. When the leaves were counted, he who had the moſt ſuffrages againſt him was, without any farther inquiry, baniſhed for five years. This new-contrived method of impairing the eſtates, and weakening the intereſt, of the overgrown citizens was called *petaliſm*, from the Greek word *petalon*, which ſignifies "a leaf." This law was attended with many evil conſequences; for, thoſe who were moſt capable of governing the commonwealth were driven out, and the adminiſtration of public affairs was committed to the meaneſt of the people; nay, many of the chief citizens, who were able to render their country great ſervice, fearing to fall under penalties of this law, withdrew from the city, and lived private in the country, not concerning themſelves with public affairs: whence all the employments being filled with men of no merit or experience, the republic was on the brink of ruin, and ready to fall into a ſtate of anarchy and confuſion. The law, therefore, of petaliſm, upon more mature deliberation, was repealed ſoon after it had been firſt enacted, and the reins of government were again put into the hands of men who knew how to manage them.

PETARD, in the art of war. See Gunnery, and pl. 2. Vol. IV.

PETAU (Denis), or *Dionyſius* Petavius, a French jeſuit of great erudition, born at Orleans in 1583. His father was a man of literature; and obſerving ſtrong parts, and an excellent genius for letters, in his ſon, he took every means in his power to improve them. He uſed to tell his ſon that he ought to qualify himſelf ſo as to be able to attack and confound "the giant of the Allophylæ;" meaning that moſt eminent ſcholar Joſeph Scaliger, whoſe abilities and learning were allowed to have done great honour and much ſervice to the reformed. Young Petavius ſeems to have entered readily into his father's views; for he ſtudied moſt intenſely, and afterwards levelled much of his erudition againſt Scaliger. He joined the ſtudy of the mathematics to that of the belles lettres, and afterwards applied himſelf to a courſe of philoſophy, which he began in the college of Orleans, and finiſhed at Paris. He afterwards maintained theſes in Greek, which was as familiar to him as Latin; and the Latin, it is ſaid, he underſtood better than he did his own native language. When he was pretty well advanced, he had free acceſs to the king's library, which he often viſited on account of the Latin and Greek manuſcripts. Among other advantages which accompanied his literary purſuits was the friendſhip of Iſaac Caſaubon, whom Henry IV. called to Paris in 1600. It was at Caſaubon's inſtigation that Petavius, though then but very young, undertook an edition of The Works of Syneſius. In this edition he corrected the Greek from the manuſcripts, tranſlated that part which yet remained to be tranſlated into Latin, and wrote notes upon the whole. He was but nineteen years of age when he was made profeſſor.

of philoſophy in the univerſity of Bourges; and he ſpent the two following years in ſtudying the ancient philoſophers and mathematicians. In 1604, when Morel, profeſſor of Greek at Paris, publiſhed The Works of Chryſoſtom, ſome part of Petavius's labours on Syneſius were added to them; from the title of which we learn, that he then took the name of *Pætus*, which he afterwards changed into *Petavius*. His own edition of The Works of Syneſius did not appear till 1612.

He entered into the ſociety of the Jeſuits in 1605, and did great credit to it by his vaſt and profound erudition. He became a zealous advocate for the church of Rome; and there was no way of ſerving it more agreeable to him than that of criticiſing and abuſing its adverſaries. He was moſt bitter againſt Scaliger; nor did he even ſpare his friend Caſaubon whenever he came in his way. Petavius excelled particularly in the dark ſcience of chronology; the learned world in general being obliged to him for ſome exact and nice diſquiſitions on this ſubject. His chief work, which is in great repute to this day, he entitled, *Rationarium Temporum*. It is an abridgement of univerſal hiſtory, from the earlieſt times to 1632, in chronological order, with references to proper authorities. It was improved, and ſeveral additions made to it, by Perizonius, and others after his death. This eminent father, after a very laborious life, died at Paris in the end of the year 1652, aged 69. Gaſſendus, in his Life of Pereſchius, ſays he was the moſt conſummate ſcholar the Jeſuits ever had; an opinion very likely to be true, when we conſider that he often contended ſucceſsfully with Scaliger, Salmaſius, and others, whoſe abilities have been univerſally acknowledged. His judgment, however, was not equal to his erudition, and his controverſial writings are full of ſourneſs and ſpleen. We have the following character of a great work of Petavius by an author of much celebrity, but who perhaps is as much biaſſed on the ſide of infidelity as he thinks this learned Jeſuit was in favour of the church of Rome. The *Dogmata Theologica* of Petavius are a work of incredible labour and compaſs: the volumes which relate ſolely to the incarnation (two folios, 5th and 6th, of 837 pages) are divided into 16 books—the firſt of his hiſtory, the remainder of controverſy and doctrine. The Jeſuit's learning is copious and correct; his Latinity is pure, his method clear, his argument profound and well connected: but he is the ſlave of the fathers, the ſcourge of heretics, and the enemy of truth and candour as often as they are inimical to the Catholic cauſe.

PETAW, an ancient town of Germany, in the circle of Auſtria, and in Stiria. It is a handſome place, and is ſeated on the river Drave, 35 miles north-eaſt of Cilley, and 109 ſouth of Vienna. E. lon. 15. 36. N. lat. 46. 40.

PETCHELI, a province of Aſia, in China, and the chief in the whole empire; bounded on the eaſt by the ſea, on the north by the great wall, on the weſt by Chanſi, and on the ſouth by Chantong and Honan. "This province contains nine cities of the firſt claſs, which have ſeveral others under their juriſdiction; theſe are about 40 in number, leſs conſiderable indeed, but all ſurrounded with walls and ditches. Petcheli has few mountains. Its ſoil is ſandy, and produces very little rice; but all other kinds of grain abound there, as well as the greater part of the fruit-trees we have in Europe. It pays an annual tribute to the emperor, which, according to Father Martini, conſiſts of 601,153 bags of rice, wheat, and millet; 224 pounds of linſeed; 45,135 of ſpun ſilk; 13,748 of cotton; 8,737,248 truſſes of ſtraw for the horſes belonging to the court; and 180,870 meaſures of ſalt, each containing 124 pounds; which is proportionably much inferior to that paid by other provinces.

"It is remarked that the people of this province have not the ſame aptitude for acquiring the ſciences as thoſe who inhabit the ſouthern provinces of the empire; but they are more robuſt and warlike, and better calculated to endure the hardſhips and fatigue of war. This is the caſe with the Chineſe of all the other northern countries.

"The face of the country here being flat and level, permits the uſe of a kind of carriage, the conſtruction of which appears to be rather ſingular. Father Martini, one of the firſt miſſionaries in China, thus deſcribes it: 'They uſe, in the province of Petcheli, a kind of chariot with one wheel, and conſtructed in ſuch a manner, that there is room in the middle for only one perſon, who ſits as if on horſeback; the driver puſhes behind, and, by means of wooden levers, makes the chariot advance with ſafety and expedition. This has perhaps given riſe to the report of chariots driven in that country by the wind, which the Chineſe direct over land with ſails, as they do ſhips at ſea.' A French miſſionary, who traverſed this province in 1768, ſeems to have made uſe of the ſame kind of carriage. 'We quitted the canal (ſays he) to travel in carts, which is cuſtomary in this part of China; but it is diſagreeable beyond deſcription. The cart is amazingly clumſy, and has a great reſemblance to the carriage of a gun: there is room in it for only one perſon, who is frequently obliged to ſit croſs legged, as our taylors do in Europe; it jolts prodigiouſly; and, while the traveller is expoſed to the ſcorching rays of the ſun, ſuch clouds of duſt ſometimes ariſe as almoſt ſuffocate him.'

"The temperature of the air of this province does not ſeem to agree with its latitude. Although Petcheli extends no farther than to the 42d degree of north latitude, yet all the rivers there are ſo much frozen during four months in the year, that horſes and waggons with the heavieſt loads may ſafely paſs them. It deſerves to be remarked, that the whole body of ice is formed in one day, and that ſeveral are neceſſary to thaw only the ſurface. What may appear no leſs extraordinary is, that during theſe ſevere froſts one does not feel that ſharp and pinching cold which accompanies the production of ice in Europe. Theſe phenomena cannot be accounted for, but by attributing them to the great quantity of nitre which is found diſperſed throughout this province, and to the ſerenity of the ſky, which, even during winter, is ſeldom obſcured by a cloud. The phyſical explanation which we have given of this ſingular temperature is fully confirmed by experiments lately made by Father Amiot at Peking, which convinced him, that in this capital and neighbourhood, as far as ſeven or eight leagues around, the water, air, and earth, equally abound with nitre.

"With regard to the water, the facility with which it freezes, the ſolidity of the ice and its duration, evidently announce the preſence of nitre. A tub filled with water, placed near one of Reaumur's thermometers, had its ſurface immediately frozen, when the mercury ſtood only one degree above the freezing point; and when it ſtood three degrees below freezing, the water became a ſolid maſs of ice, if the diameter of the veſſel did not exceed a foot and a half, and the depth of the water four or five inches. This water, when the weather was fine, continued in the ſame ſtate of congelation as long as the mercury in the thermometer did not riſe higher than three degrees above 0; when the mercury roſe higher, it then began to diſſolve, but ſo ſlowly, that two or three days were ſcarcely ſufficient to reſtore it to its former fluidity." Groſier goes on to relate other experiments of Father Amiot, which were made with a view to diſcover the cauſe of the water's freezing ſo in this temperate climate; and he then proceeds to tell us, that "if the waters of the province of Petcheli contain much nitre, it is no leſs certain, that the air which one breathes there is abundantly impregnated with it. The following are indubitable proofs of it: 1ſt, Notwithſtanding unwholeſome food, ſuch as the fleſh of the greater part of domeſtic animals that

have died of old age or diſeaſe, which the people of this province greedily devour; notwithſtanding filth, and all the inconveniences reſulting from low, damp, and confined lodgings, where all the individuals of the ſame family are, as it were, heaped one upon another, the plague never makes its appearance in Petcheli; and the people are ſeldom attacked by any of thoſe epidemical diſtempers which are ſo common in Europe. 2dly, Proviſions of every kind may be kept at Peking a long while, without being ſubject to corruption. Raiſins are eaten there freſh even in May, apples and pears till midſummer; wild boars, ſtags, deer, roebucks, rabbits, hares, pheaſants, ducks, geeſe, and all kinds of game brought from Tartary to Peking after the commencement of winter; fiſh of every ſpecies, tranſported from the rivers of Leaotong—will keep without the aſſiſtance of ſalt, in their ſtate of congelation, for two or three months, although they are expoſed every day in the markets, carried from the markets to private houſes, and from private houſes brought back to the markets until they are all ſold, which does not happen before the end of March. It is certain, that theſe facts announce an antiſeptic quality in the air, which muſt undoubtedly proceed from the great quantity of nitre contained in it.

"3dly, The earth which forms the ſoil of Petcheli abounds no leſs with nitre; whole fields may be ſeen in the neighbourhood of Peking which are covered with it. Every morning at ſunriſe the country in certain cantons appears as white as if ſprinkled by a gentle fall of ſnow. If a quantity of this ſubſtance be ſwept together, a great deal of kien, nitre, and ſalt, may be extracted from it. The Chineſe pretend, that this ſalt may be ſubſtituted for common ſalt; however this may be, it is certain, that, in the extremity of the province towards Siuenhoa-fou, poor people and the greater part of the peaſants make uſe of no other. With regard to the kien procured from the earth, they uſe it for waſhing linen, as we do ſoap. Although the land of Petcheli is replete with nitrous particles, it does not, however, form dry deſerts; it is cultivated with care, and becomes fruitful by inceſſant labour. The earth is frozen in winter to the depth of two or three feet, and does not become ſoft before the end of March. This may ſufficiently explain why the froſt kills plants in the neighbourhood of Peking, which Mr. Linnæus raiſed in Sweden, although it is 20 degrees farther north than the capital of the Chineſe empire."

PETECHIÆ, in medicine, a name given to thoſe ſpots, whether red or of any other colour, which appear in malignant fevers.

PETELIA. See STRONGOLI.

PETER (St.), the apoſtle, born at Bethſaida, was ſon of John, Jona, or Joanna, and brother of St. Andrew (John i. 42, 43.). His firſt name was Simon or Simeon; but when our Saviour called him to the apoſtleſhip, he changed his name into Cephas, that is, in Syriac, a *ſtone* or a *rock*; in Latin, *petra*, whence *Peter*. He was a married man; and had his houſe, his mother-in-law, and his wife, at Capernaum, upon the lake of Genneſareth (Mark i. 29. Mat. viii. 14. Luke iv. 38.). St. Andrew, having been firſt called by Jeſus Chriſt, met his brother Simon, and told him, (John i. 41.) We have found the Meſſiah, and then brought him to Jeſus. Jeſus beholding him, ſaid to him, You are Simon ſon of Jona; henceforth you ſhall be called *Cephas*, that is, *ſtone* or *rock*. After having paſſed one day with our Saviour, they returned to their ordinary occupation, which was fiſhing. Yet it is thought they were preſent with him at the marriage of Cana in Galilee. This happened in the 30th year of the vulgar Chriſtian era.

The acts which diſtinguiſh the apoſtleſhip of St. Peter are fully detailed in the ſacred ſcriptures; for which reaſon we forbear to introduce them in this place.

"St. Peter's ſtyle, ſays a modern author, expreſſes the noble vehemence and fervour of his ſpirit, the full knowledge he had of Chriſtianity, and the ſtrong aſſurance he had of the truth and certainty of his doctrine; and he writes with the authority of the firſt man in the college of the apoſtles. He writes with that quickneſs and rapidity of ſtyle, with that noble neglect of ſome of the formal conſequences and niceties of grammar, ſtill preſerving its true reaſon, and natural analogy (which are always marks of a ſublime genius), that you can ſcarce perceive the pauſes of his diſcourſe and diſtinction of his periods. The great Joſeph Scaliger calls St. Peter's firſt epiſtle majeſtic; and we hope he was more judicious than to exclude the ſecond, though he did not name it.

A noble majeſty, and becoming freedom, is what diſtinguiſhes St. Peter; a devout and judicious perſon cannot read him without ſolemn attention and awful concern. The conflagration of this lower world, and future judgment of angels and men, in the third chapter of the ſecond, is deſcribed in ſuch ſtrong and terrible terms, ſuch awful circumſtances, that in the deſcription we ſee the planetary heavens and this our earth wrapped up with devouring flames, hear the groans of an expiring world, and the cruſhes of nature tumbling into univerſal ruin.

The authority of the ſecond epiſtle of St. Peter was for ſome time doubted of, as Origen, Euſebius, St. Jerome, and others have obſerved. What made the ancients call it in queſtion, is the difference of its ſtyle from the firſt. The third chapter, which deſcribes the cataſtrophe of the viſible world, made Grotius think this epiſtle was wrote after the taking of Jeruſalem; becauſe that was not to happen till after the deſtruction of that city; upon which he conjectures, that Simeon biſhop of Jeruſalem is the author of this epiſtle, and that the inſcription which carries St. Peter's name is corrupted. But the beſt critics admit this epiſtle to be the genuine work of St. Peter, who diſcovers himſelf where he ſays that he was preſent at our Lord's transfiguration; and where he tells the Jews, this was the ſecond letter he had written to them. The reader may ſee this queſtion fully diſcuſſed, and the authority of this epiſtle eſtabliſhed beyond all doubt, hy the learned Dr. Sherlock, in his *Diſſertation* on the authority of the Second Epiſtle of St. Peter.

St. Peter has been made the author of ſeveral books; ſuch were, his Acts, his Goſpel, his Revelation, his work about preaching, and another about judgment. There is extant a large hiſtory of St. Peter, called the *Recognitions*, aſcribed to St. Clement.

PETER *of Blois*, a learned man of the 12th century, was born about the year 1120, at the city of Blois in France, from whence he derived his name. His parents, being opulent, gave him a learned education. In his youth, when he ſtudied in the univerſity of Paris, he was exceſſively fond of poetry; and when he was a little further advanced in life, he became no leſs fond of rhetoric, to the ſtudy of which he applied with the greateſt ardour. From Paris he removed to Bononia in Italy, to acquire the civil and canon law; in the knowledge of both which he very much excelled. He appears from his writings to have cultivated medicine, and ſeveral branches of the mathematics, with no little care and ſucceſs. The ſtudy of theology was the chief delight and buſineſs of his life, in which he ſpent the greateſt part of his time, and made the greateſt progreſs. But unfortunately it was that ſcholaſtic theology, which conſiſted in vain attempts to prove and explain the many abſurd opinions which then prevailed in the church, by the ſubtleties of Ariſtotelian logic. In attempting to explain in this manner the moſt abſurd of all opinions that ever exiſted amongſt mankind, he was the very firſt perſon who employed the famous word *tranſubſtantiation*, which was ſoon after adopted by the church of Rome, and hath ever ſince made ſo great a noiſe. Being appointed preceptor to William II. king of

Sicily in 1167, he obtained the cuſtody of the privy ſeal, and, next to the archbiſhop of Palermo, the prime miniſter, had the greateſt influence in all affairs. But his power was not of long duration; for, the archbiſhop being baniſhed in 1168, our author ſoon after left the court of Sicily, and returned into France. He was not long, however, without a royal patron, being invited into England by Henry II. who employed him as his private ſecretary, made him archdeacon of Bath, and gave him ſome other benefices. When he had ſpent a few years at court, he conceived a diſguſt at that way of life (of which he hath drawn a very unpleaſing picture in one of his letters), and retired into the family of Richard, archbiſhop of Canterbury, who made him his chancellor about the year 1176. In this ſtation he continued to the death of the archbiſhop in 1183, enjoying the higheſt degree of favour with that prelate, though he uſed much freedom in reproving him for his remiſſneſs in the government of the church. Our author remained in the ſame ſtation in the family of archbiſhop Baldwin, who ſucceeded Richard, acting both as his ſecretary and chancellor. He was alſo ſent by that prelate on an embaſſy to Rome in 1187, to plead his cauſe before pope Urban III. in the famous controverſy between him and the monks of Canterbury about the church of Hackington. After the departure of his friend and patron Baldwin for the Holy Land in 1192, our author was involved in various troubles in his old age, the cauſes of which are not diſtinctly known; and died about the end of the 12th century. He appears from his works, which may be juſtly reckoned among the moſt valuable monuments of the age in which he flouriſhed, to have been a man of great integrity and ſincere piety, as well as of a lively inventive genius and uncommon erudition. His printed works conſiſt of 134 letters, which he collected together at the deſire of Henry II.; of 65 ſermons, delivered on various occaſions; and of 17 tracts on different ſubjects.

PETER *the Hermit*. See CROISADE and HERMIT.

PETER I. juſtly ſtyled *Peter the Great*, czar, and afterwards emperor of Ruſſia, founder of the Ruſſian empire; for though the country was well known, and of great antiquity, yet it had no extent of power, of political influence, or of general commerce in Europe, till his time. He was born in 1672; and was proclaimed czar when but ten years of age, in excluſion of John his elder brother, who, being of a ſickly conſtitution, was at the ſame time very weak in his underſtanding. The princeſs Sophia, his half ſiſter, made an inſurrection in favour of John; and to put an end to the civil war, it was at laſt agreed that the two brothers ſhould jointly ſhare the imperial dignity. Peter had been very ill brought up, not only through the general defects of the Ruſſian education, but likewiſe through the arts of the princeſs Sophia, who ſurrounded him with every thing that might ſtifle his natural deſire of knowledge, deprave his mind, and enervate it with pleaſures. Notwithſtanding this, his inclination for military exerciſes diſcovered itſelf in his tendereſt years. He formed a company of 50 men, commanded by foreign officers, clothed and exerciſed after the German manner. He entered himſelf into the loweſt poſt, that of a drummer; and never roſe otherwiſe than as a ſoldier of fortune. Herein his deſign was to teach his nobility, that merit, not birth, was the only title to military employments. He reinforced his company with ſeveral others, till at laſt he had got together a conſiderable body of ſoldiers. As he then had no war on his hands, he exerciſed them in all ſorts of mock-engagements, and by this means ſecured to himſelf a body of well-diſciplined troops. The ſight of a Dutch veſſel, which he had met with on a lake belonging to one of his pleaſure-houſes, made ſuch an impreſſion on his mind, that he conceived the almoſt impracticable deſign of forming a navy. His firſt care was to get ſome Hollanders to build ſome ſmall veſſels at Moſcow; and he paſſed two ſucceſſive ſummers on board Engliſh or Dutch ſhips, which ſet out from Archangel, that he might inſtruct himſelf in every branch of naval affairs. In 1696 czar John died, and Peter was now ſole maſter of the empire. In 1698 he ſent an embaſſy to Holland; and went *incognito* in the retinue, and viſited England as well as Holland; in order to inform himſelf fully in the art of ſhip-building. At Amſterdam he worked in the yard as a private ſhip-carpenter, under the name of *Peter Michaelof*; but he has been often heard to ſay, that if he had never gone to England, he had ſtill remained ignorant of that art. In 1700 he had got together a body of ſtanding forces, conſiſting of 30,000 foot; and now the vaſt project he had formed diſplayed itſelf in all its parts. He opened his dominions, which till then had been ſhut up, having firſt ſent the chief nobility of his empire into foreign countries to improve themſelves in knowledge and learning. He invited into Ruſſia all the foreigners he could meet with who were capable of inſtructing his ſubjects in any manner, and offered them great encouragement to ſettle in his dominions. This raiſed many diſcontents; and the deſpotic authority he exerted on that occaſion was ſcarcely powerful enough to ſuppreſs them. In 1700, being ſtrengthened by the alliance of Auguſtus king of Poland, he made war on Charles XII. king of Sweden. His firſt ill ſucceſs did not deter him; for he uſed to ſay, I know that my armies muſt be overcome for a great while; but even this will at laſt teach them to conquer. He afterwards gained conſiderable advantages; and founded Peterſburg in 1703. In 1709 he gained a complete victory over the Swedes at Pultowa. In 1712 he was incloſed by the Turks on the banks of the Pruth; and ſeemed inevitably loſt, had not the czarina Catherine bribed the grand viſir, and the czar's prudence completed his deliverance. In 1716 he made a tour through Germany and Holland, and viſited the royal academy of ſciences at Paris. It would be endleſs to enumerate all the various eſtabliſhments for which the Ruſſians are obliged to him. He formed an army according to the manner of the politeſt and moſt experienced nations: he fitted out fleets in all the four ſeas which border upon Ruſſia: he cauſed many ſtrong fortreſſes to be raiſed after the beſt plans; and made convenient harbours: he introduced arts and ſciences into his dominions, and freed religion from any ſuperſtitious abuſes: he made laws, built cities, cut canals, &c.; was generous in rewarding, impartial in puniſhing; faithful, laborious, and humble: yet was not free from a certain roughneſs of temper natural to his nation. He had indeed cured himſelf of exceſs in drinking; but he has been branded with ſeveral other vices, particularly cruelty. He publiſhed the unfortunate hiſtory of his ſon prince Alexis; towards whom ſome blame his ſeverity, while others think it no more than was neceſſary. He perfectly knew the honour due to perſons of merit; and not only heaped honours upon them during their life, but gave them marks of eſteem even after their death. He died of the ſtrangury in 1725, and left the world with the magnanimity of a hero and the piety of a chriſtian.

Peter was tall of ſtature, and of a bold and majeſtic aſpect, though ſometimes diſfigured by convulſions, which altered his features. This deformity was aſcribed to poiſon, given him, as it is ſaid, by his ſiſter Sophia; but it was indeed no other than wine and brandy, which he often drank to exceſs, relying too much on the ſtrength of his conſtitution. He converſed with perſons in all ſtations, from the mechanic to the general of an army; and his converſation was neither like that of a barbarian who makes no diſtinction between men, nor of a popular prince who ſeeks to pleaſe all the world, but that of a perſon who aims at inſtruction. He loved women as much as the king of Sweden, his rival, dreaded them, and all were equally agreeable to him as well in bed as at board; he valued

himſelf on drinking large draughts, rather than ſipping delicious wines. We are told that kings and legiſlators ſhould never ſuffer themſelves to be tranſported by paſſion; but never was any man more paſſionate than Peter the Great, nor more mercileſs. In a king, this is more than an infirmity for which we make amends by confeſſing it; but it was generally remarked of Peter, and he himſelf ſaid to a magiſtrate of Holland, at his ſecond voyage, "I have reformed my nation, and have not been able to reform myſelf." It is true, the cruelties with which he is reproached were not novelties at the court of Moſcow, any more than at that of Morocco: it was not uncommon to ſee a czar, with his own royal hand, inflict 100 laſhes of a bull's pizzle on the naked ſhoulders of a prime officer of the crown, or of a lady of the palace, for failing in their duty, by getting drunk; or to try the goodneſs of his ſabre, by ſtriking off the head of a criminal. Peter had himſelf performed ſome of thoſe ceremonies of his country: Le Fort, however, had authority enough over him at times to ſtay his hand, even when liſted up to ſtrike; but he had not Le Fort always near him.

The czar's firſt marriage is thus related in the memoirs of Peter Henry Bruce, Eſq. "It took place in 1690, when he was only eighteen. He was married to Ottokeſſa Lapuchin, a boyar's daughter, by whom he had prince Alexis; ſome time after he turned her away, and ſhut her up in a monaſtery, on ſuſpicion of diſloyalty to his bed. It was ſaid, that in one of her jealous fits ſhe charged prince Menzikoff with carrying the czar to drabs of his former acquaintance, who had been his cuſtomers for cakes; upbraiding him with his firſt occupation; and that Menzikoff ever after bore an irreconcileable enmity to both her and her ſon. After the divorce, one miſs Mons, a very beautiful young lady, born at Moſcow of foreign parents, was much in favour with the czar; but when he was abroad, Mr. Keyſerling, then reſiding at Moſcow as envoy from the king of Pruſſia, paid his addreſſes to, and married her. When the czar returned, he was ſo much offended at Keyſerling, that he ordered him to leave Moſcow; which occaſioned his immediate recall by the king his maſter, who ſent another in his room. It was believed, if his public character had not protected him, he would have ſeverely felt his majeſty's diſpleaſure.

"The czar was ſome time after ſmitten with the charms of another beautiful young lady, the daughter of a foreign merchant in this city: he firſt ſaw her in her father's houſe, where he dined one day. He was ſo much taken with her appearance, that he offered her any terms ſhe pleaſed, if ſhe would live with him; which this virtuous young woman modeſtly refuſed: but dreading the effects of his authority, ſhe put on a reſolution, and left Moſcow in the night, without communicating her deſign even to her parents. Having provided a little money for her ſupport, ſhe travelled on foot ſeveral miles into the country, till ſhe arrived at a ſmall village where her nurſe lived with her huſband and their daughter, the young lady's foſter-ſiſter, to whom ſhe diſcovered her intention of concealing herſelf in the wood near that village; and to prevent any diſcovery, ſhe ſet out the ſame night, accompanied by the huſband and daughter. The huſband being a timber-man by trade, and well acquainted with the wood, conducted her to a little dry ſpot in the middle of a moraſs, and there he built a hut for her habitation. She had depoſited her money with her nurſe to procure little neceſſaries for her ſupport, which were faithfully conveyed to her at night by the nurſe or her daughter, by one of whom ſhe was conſtantly attended in the night-time.

"The next day after her flight, the czar called at her father's to ſee her, and finding the parents in anxious concern for their daughter, and himſelf diſappointed, fancied it a plan of their own concerting. He became angry, and began to threaten them with the effects of his diſpleaſure if ſhe was not produced: nothing was left to the parents but the moſt ſolemn proteſtations, with tears of real ſorrow running down their cheeks, to convince him of their innocence, and ignorance of what was become of her; aſſuring him of their fears that ſome fatal diſaſter muſt have befallen her, as nothing belonging to her was miſſing, except what ſhe had on at the time. The czar, ſatisfied of their ſincerity, ordered great ſearch to be made for her, with the offer of a conſiderable reward to the perſon who ſhould diſcover what was become of her, but to no purpoſe: the parents and relations, apprehending ſhe was no more, went into mourning for her.

"About a year after this ſhe was diſcovered by an accident. A colonel who had come from the army to ſee his friends, going a-hunting into that wood, and following his game through the moraſs, came to the hut, and looking into it ſaw a pretty young woman in a mean dreſs. After inquiring of her who ſhe was, and how ſhe came to live in ſo ſolitary a place, he found out at laſt that ſhe was the lady whoſe diſappearance had made ſo great a noiſe: in the utmoſt confuſion, and with the moſt fervent entreaties, ſhe prayed him on her knees that he would not betray her; to which he replied, that he thought her danger was now paſt, as the czar was then otherwiſe engaged, and that ſhe might with ſafety diſcover herſelf, at leaſt to her parents, with whom he would conſult how matters ſhould be managed. The lady agreed to this propoſal; and he ſet out immediately, and overjoyed her parents with the happy diſcovery: the iſſue of their deliberations was to conſult madame Catherine (as ſhe was then called) in what manner the affair ſhould be opened to the czar. The colonel went alſo upon this buſineſs, and was adviſed by Madame to come next morning, and ſhe would introduce him to his majeſty, when he might make the diſcovery and claim the promiſed reward. He went according to appointment; and being introduced, told the accident by which he had diſcovered the lady, and repreſented the miſerable ſituation in which he found her, and what ſhe muſt have ſuffered by being ſo long ſhut up in ſuch a diſmal place, from the delicacy of her ſex. The czar ſhewed a great deal of concern that he ſhould have been the cauſe of all her ſufferings, declaring that he would endeavour to make her amends. Here madame Catherine ſuggeſted, that ſhe thought the beſt amends his majeſty could make, was to give her a handſome fortune, and the colonel for a huſband, who had the beſt right, having caught her in purſuit of his game. The czar, agreeing perfectly with madame Catherine's ſentiments, ordered one of his favourites to go with the colonel, and bring the young lady home; where ſhe arrived, to the inexpreſſible joy of her family and relations, who had all been in mourning for her. The marriage was under the direction and at the expence of the czar, who himſelf gave the bride to the bridegroom; ſaying, that he preſented him with one of the moſt virtuous of women; and accompanied his declaration with very valuable preſents, beſides ſettling on her and her heirs three thouſand rubles a-year. This lady lived highly eſteemed by the czar, and every one who knew her. Beſides the concurring reports of other people, I had the ſtory from her own mouth."

On the whole, that Peter I. was a great man, few will deny who know what real greatneſs is. A minute account of the life of this diſtinguiſhed emperor would make a large volume; we have been able to give but the mere outlines of it: the anecdotes, however, at the end, ſhow in ſome degree the nature of the man; at all events they ſhow one important truth, that it is a more difficult thing to reform one's ſelf than to reform a kingdom; to conquer one's paſſions, than to conquer the world. The Ruſſians, however, if there is any good in civilization, owe to him every thing: and they ſeem to be ſenſible of it; for a very pompous oration was delivered to his memory

by Michael Lomonoſſoff before the academy of ſciences at St. Peterſburg, on the 26th of April 1755.

Peter *the Wild Boy*. This extraordinary creature occaſioned great ſpeculation among the learned; but we do not know that any ſatisfactory cauſes have been aſſigned for the ſtriking difference betwixt him and other human beings.

The following account of him is extracted from the pariſh-regiſter of North-church, in the county of Hertford. "Peter, commonly known by the name of *Peter the Wild Boy*, lies buried in this church-yard, oppoſite to the porch. In the year 1725 he was found in the woods near Hamelen, a fortified town in the electorate of Hanover, when his majeſty George I. with his attendants, was hunting in the foreſt of Hertſwold. He was ſuppoſed to be then about 12 years of age, and had ſubſiſted in thoſe woods upon the bark of trees, leaves, berries, &c. for ſome conſiderable length of time. How long he had continued in that wild ſtate is altogether uncertain; but that he had formerly been under the care of ſome perſon, was evident from the remains of a ſhirt collar about his neck at the time when he was found. As Hamelen was a town where criminals were confined to work upon the fortifications, it was then conjectured at Hanover that Peter might be the iſſue of one of thoſe criminals, who had either wandered into the woods and could not find his way back again, or being diſcovered to be an idiot was inhumanly turned out by his parents, and left to periſh or ſhift for himſelf. In the following year, 1726, he was brought over to England by the order of queen Caroline then princeſs of Wales, and put under the care of Dr. Arbuthnot, with proper maſters to attend him. But notwithſtanding there appeared to be no natural defect in his organs of ſpeech, after all the pains that had been taken with him he could never be brought diſtinctly to articulate a ſingle ſyllable, and proved totally incapable of receiving any inſtruction. He was afterwards intruſted to the care of Mrs. Titchbourn, one of the queen's bed-chamber women, with a handſome penſion annexed to the charge. Mrs. Titchbourn uſually ſpending a few weeks every ſummer at the houſe of Mr. James Fenn, a yeoman farmer at Axter's End in this pariſh, Peter was left to the care of the ſaid Mr. Fenn, who was allowed 35l. a year for his ſupport and maintenance. After the death of James Fenn he was tranſferred to the care of his brother Thomas Fenn, at another farm-houſe in this pariſh called Broadway, where he lived with the ſeveral ſucceſſive tenants of that farm, and with the ſame proviſion allowed by government, to the time of his death, Feb. 22, 1785, when he was ſuppoſed to be about 72 years of age.

"Peter was well made, and of the middle ſize. His countenance had not the appearance of an idiot, nor was there any thing particular in his form, except that two of the fingers of his left hand were united by a web up to the middle joint. He had a natural ear for muſic, and was ſo delighted with it, that if he heard any muſical inſtrument played upon, he would immediately dance and caper about till he was almoſt quite exhauſted with fatigue: and though he could never be taught the diſtinct utterance of any word, yet he could eaſily learn to hum a tune. All thoſe idle tales which have been publiſhed to the world about his climbing up trees like a ſquirrel, running upon all fours like a wild beaſt, &c. are entirely without foundation; for he was ſo exceedingly timid and gentle in his nature, that he would ſuffer himſelf to be governed by a child. There have been alſo many falſe ſtories propagated of his incontinence; but, from the minuteſt inquiries among thoſe who conſtantly lived with him, it does not appear that he ever diſcovered any natural paſſion for women, though he was ſubject to the other paſſions of human nature, ſuch as anger, joy, &c. Upon the approach of bad weather he always appeared ſullen and uneaſy. At particular ſeaſons of the year he ſhowed a ſtrange fondneſs for ſtealing away into the woods, where he would feed eagerly upon leaves, beech-maſt, acorns, and the green bark of trees; which proves evidently that he had ſubſiſted in that manner for a conſiderable length of time before he was firſt taken. His keeper therefore at ſuch ſeaſons generally kept a ſtrict eye over him, and ſometimes even confined him, becauſe, if he ever rambled to any diſtance from his home, he could not find his way back again: and once in particular, having gone beyond his knowledge, he wandered as far as Norfolk, where he was taken up, and, being carried before a magiſtrate, was committed to the houſe of correction in Norwich, and puniſhed as a ſturdy and obſtinate vagrant, who would not (for indeed he could not) give any account of himſelf: but Mr. Fenn having advertiſed him in the public papers, he was releaſed from his confinement, and brought back to his uſual place of abode.

"Notwithſtanding the extraordinary and ſavage ſtate in which Peter was firſt found greatly excited the attention and curioſity of the public; yet, after all that has been ſaid of him, he was certainly nothing more than a common idiot, without the appearance of one. But as men of ſome eminence in the literary world have in their works publiſhed ſtrange opinions and ill-founded conjectures about him, which may ſeem to ſtamp a credit upon what they have advanced; that poſterity may not through their authority be hereafter miſled upon the ſubject, this ſhort and true account of Peter is recorded in the pariſh-regiſter by one who conſtantly reſided above 30 years in his neighbourhood, and had daily opportunities of ſeeing and obſerving him."

Perhaps it may not be diſagreeable to our readers if we preſent them with lord Monboddo's account of this extraordinary creature *. "It was in the beginning of June 1782 (ſays his lordſhip) that I ſaw him in a farm-houſe called Broadway, within about a mile of Berkhamſted, kept there upon a penſion which the king pays. He is but low of ſtature, not exceeding five feet three inches; and although he muſt now be about 70 years of age, has a freſh healthy look. He wears his beard; his face is not at all ugly or diſagreeable; and he has a look that may be called ſenſible and ſagacious for a ſavage. About 20 years ago he was in uſe to elope, and to be miſſing for ſeveral days; and once, I was told, he wandered as far as Norfolk; but of late he has been quite tame, and either keeps in the houſe, or ſaunters about the farm. He has been the 13 laſt years where he lives at preſent; and before that he was 12 years with another farmer, whom I ſaw and converſed with. This farmer told me, that he had been put to ſchool ſomewhere in Hertfordſhire, but had only learned to articulate his own name Peter, and the name of King George, both which I heard him pronounce very diſtinctly. But the woman of the houſe where he now is (for the man happened not to be at home) told me, that he underſtood every thing that was ſaid to him concerning the common affairs of life; and I ſaw that he readily underſtood ſeveral things that ſhe ſaid to him while I was preſent. Among other things, ſhe deſired him to ſing Nancy Dawſon; which he did, and another tune which ſhe named. He never was miſchievous, but had always that gentleneſs of nature which I hold to be characteriſtical of our nature, at leaſt till we became carnivorous, and hunters or warriors. He feeds at preſent as the farmer and his wife do; but, as I was told by an old woman (one Mrs. Collop, living

* This eccentric writer, in ſupport of his hypotheſis, that man in a ſtate of nature is a mere animal, without clothes, houſes, the uſe of fire, or even ſpeech, adduces the oran-outang, or man in the woods, and this Peter the wild man and others, as examples. He denies the want of the organs of ſpeech as an objection, and inſiſts they only want the artificial uſe of them.

at a village in the neighbourhood called Hempſtead, who remembered to have ſeen him when he firſt came to Hertfordſhire, which ſhe computed to be 55 years before the time I ſaw her), he then fed very much upon leaves, and particularly upon the leaves of cabbage, which he ate raw. He was then, as ſhe thought, about 15 years of age, walked upright, but could climb trees like a ſquirrel. At preſent he not only eats fleſh, but has alſo got the taſte of beer, and even of ſpirits, of which he inclines to drink more than he can get. And the old farmer above mentioned, with whom he lived 12 years before he came to this laſt farmer, told me, that he had acquired that taſte before he came to him, which is about 25 years ago. He has alſo become very fond of fire, but has not yet acquired a liking for money; for, though he takes it, he does not keep it, but gives it to his landlord or landlady; which I ſuppoſe is a leſſon that they have taught him. He retains ſo much of his natural inſtinct, that he has a fore-feeling of bad weather, growling and howling, and ſhowing great diſorder, before it comes.

"Theſe are the particulars concerning him which I obſerved myſelf, or could learn by information from the neighbourhood." From all theſe facts put together his lordſhip makes the following obſervations:

"1ſt, Whatever doubts there may be concerning the humanity of the oran-outang, it was never made a queſtion but that Peter was a man.

"2dly, That he was, as the Dean [Swift] ſays, of a father and mother like one of us. This, as I have ſaid, was the caſe of two ſavages found in the diſmal ſwamps in Virginia, of the one found in the iſland of Diego Garcia, and of him that was diſcovered by M. le Roy in the Pyrenees, and in general of all the ſavages that have been found in Europe within theſe laſt 300 years; for I do not believe, that for theſe 2000 years paſt there has been a race of ſuch ſavages in Europe.

"3dly, I think there can be no reaſon to doubt of what was written from Hanover, and publiſhed in the newſpapers, that he was found going upon all-four, as well as other ſolitary ſavages that have been found in Europe. It is true that others have been found erect; which was the caſe of the two found in the diſmal ſwamp of Virginia likewiſe of the man of the Pyrenees, and of him in the iſland of Diego Garcia: but theſe I ſuppoſe were not expoſed till they had learned to walk upright; whereas Peter appears to have been abandoned by his parents before he had learned that leſſon, but walked as we know children do at firſt.

"4thly, I think it is evident that he is not an idiot, not only from his appearance, as I have deſcribed it, and from his actions, but from all the accounts that we have of him, both thoſe printed and thoſe atteſted by perſons yet living; for, as to the printed accounts, there is not the leaſt information of that kind in any of them, except in one, viz. Wye's Letter, N° S. wherein is ſaid, that ſome imputed his not learning to ſpeak to want of underſtanding; which I ſhould think ſhowed rather want of underſtanding in thoſe who thought ſo, when it is conſidered that at this time he had not been a year out of the woods, and I ſuppoſe but a month or two under the care of Dr. Arbuthnot, who had taken the charge of his education. The Dean indeed tells us, that he ſuſpected he was a pretender, and no genuine wild man; but not a word of his being an idiot. And as to the perſons living, not one with whom I have converſed appeared to have the leaſt ſuſpicion of that kind; though it is natural that men who were not philoſophers, and knew nothing of the progreſs of man from the mere animal to the intellectual creature, nor of the improvement of our underſtanding by ſocial intercourſe and the arts of life, but believed that man, when he came to a certain age, has from nature all the faculties which we ſee him exert, and particularly the faculty of ſpeech, ſhould think him an idiot, and wanting even the capacity of acquiring underſtanding. I knew an officer of dragoons, a man of very good ſenſe, who was quartered where Peter then lived for ſome months, and ſaw him almoſt every day, and who aſſured me that he was not an idiot, but ſhowed common underſtanding, which was all that could be expected from one no better educated than he.

"Laſtly, thoſe who have conſidered what I have ſaid* of the difficulty of articulation will not be ſurpriſed that a man who had lived a ſavage for the firſt 14 or 15 years of his life, ſhould have made ſo little progreſs in that art. I cannot, however, have the leaſt doubt, that if he had been under the care of Mr. Braidwood of Edinburgh, he would have learned to ſpeak, though with much more difficulty than a man who had been brought up tame among people who had the uſe of ſpeech, and who conſequently muſt know the advantage of it. And I can have as little doubt that Mr. Braidwood could have taught the oran-outang in Sir Aſhton Lever's collection, who learned to articulate a few words, ſo as to ſpeak plainly enough."

ST. PETER, *Le Port*, a market-town of England, in the ſouth-eaſt part of Guernſey, in Hampſhire, in the Britiſh channel, conſiſting of only one long and narrow ſtreet. The mouth of the harbour is well ſet with rocks, and is on each ſide defended by a caſtle, one called the *old caſtle*, and the other *caſtle-cornet*. The governor of the iſland generally reſides here, who has the command of the garriſon in this and all the other caſtles. The harbour has a good road, from whence ſhips may ſail with any wind, and from the road paſs under the guns of the caſtle to the pier, cloſe up to the town. The pier is a noble work, formed of vaſt ſtones, joined together with great art and regularity; it is not only a ſecurity to the ſhips, but, being contiguous to the town, is handſomely paved at the top with large ſmooth flag-ſtone, guarded with parapets, and, being of a great length and breadth, forms a pleaſant walk, affording a free proſpect of the ſea and the neighbouring iſlands. Cornet-caſtle, which commands both the town and the harbour, ſtands on a rock, ſeparated from the land by an arm of the ſea, no leſs than 600 yards wide, and not fordable but at low water in great ſpring-tides.

ST. PETER'S *Iſland*, in the lake of Bienne in Switzerland, remarkable for being one of the retreats of Rouſſeau; whence it has alſo got the name of *Rouſſeau's Iſland*. It lies towards the ſouth ſide of the lake, and produces a great variety of ſhrubs and trees, particularly large oaks, beech, and Spaniſh chefnuts. The ſouthern ſhore ſlopes gradually to the lake, and is covered with herbage; the remaining borders are ſteep and rocky; their ſummits in a few places thinly covered with ſhrubs; in others their perpendicular ſides are clothed to the water's edge with hanging woods. The views from the different parts of the iſland are beautiful and diverſified; that to the north being the moſt extenſive and pleaſing. It commands the proſpect of the lake, which is of an oval form; its cultivated borders interſperſed with villages and caſtles, with the towns of Nidau and Bienne ſtanding upon the farther extremity. Agreeable walks are carried through the woods, and terminate in a circular pavilion placed in the centre of the iſland. Before the troubles in France, on Sunday, and particularly the vintage-time, this iſland was filled with parties who amuſed themſelves with wandering about the woods, or dancing in the circular pavilion. How they employ themſelves now it is not ſo eaſy to ſay, as it

* Lord Monboddo, far from thinking ſpeech or articulation natural to man, rather wonders how he can by any teaching or imitation attain to the ready performance of ſuch various and complicated operations. Add to this, when the organs are completely formed to one language, how hard it is to make them anſwer another!

was over-run and ſubjected by the forces of that unhappy nation, and of courſe tainted with their deſtructive principles. It was retaken by the Spaniards, and properly belongs to the king of Sardinia. There is only one farm-houſe on the iſland, in an apartment of which Rouſſeau was lodged.

PETER-*Pence*, was an annual tribute of one penny, paid at Rome out of every family at the feaſt of St. Peter. And this Ina, the Saxon king, when he went in pilgrimage to Rome, about the year 740, gave to the pope partly as alms and partly in recompenſe of a houſe erected in Rome for Engliſh pilgrims. And this continued to be paid generally until the time of king Henry VIII. when it was enacted that from henceforth no perſon ſhall pay any penſions, Peter-pence, or other impoſitions, to the uſe of the biſhop or ſee of Rome.

PETERBOROUGH, a city of Northamptonſhire, about 82 miles from London. It is the leaſt city except perhaps Ely, and unqueſtionably the pooreſt biſhopric, though one of the oldeſt towns in England. It had a monaſtery dedicated to St. Peter, and founded as early as the year 655, to which the abbot of Croyland and his monks flying for protection in the year 870, they were overtaken and murdered in a court of this monaſtery called the *monks church-yard*, becauſe they were all buried here; and to this day is to be ſeen the tombſtone, with their effigies, which had been erected over their common grave. Soon after this the Danes deſtroyed both the monaſtery and friars, ſo that it lay deſtitute for above 100 years. The monks were, however, reſtored, and lived very ſumptuouſly, with a mitred abbot at their head, till the Reformation, when Hen. VIII. converted it into a biſhop's ſee. The cathedral, which is ſaid to be more than 1000 years old, though apparently more modern, is a moſt noble Gothic fabric, and was much more ſo before it was defaced in the civil wars. The weſt front, which is 156 feet broad, is very ſtately, and, beſides columns curiouſly adorned, is ſupported by three of the talleſt arches in Britain. The windows of the cloiſters are finely ſtained with ſcripture-hiſtory and the ſucceſſion of its abbots. There are in the church monuments of queen Catharine wife of Henry VIII. and of Mary queen of Scots; and the figure of one Mr. Scarlet the ſexton, who buried them, and lived to 95, after he had buried all the houſekeepers of the town twice over. There is but one pariſh-church beſides the cathedral. The city is governed by a mayor, recorder, and aldermen, by a charter of Henry VIII. All its officers are elected by the dean and chapter, conſiſting of ſix prebendaries, who are all lords of the manor. Beſides the dean and chapter, who are an eccleſiaſtical corporation diſtinct from the biſhop, there are eight petty canons, four ſtudents in divinity, one epiſtler, one goſpeller, a ſubdean, ſubtreaſurer, and chanter, eight choriſters, eight ſinging men, two chancellors, beſides a ſteward, organiſt, &c. a grammar ſchool, and two charity-ſchools. The river Nen, over which there is here a wooden bridge, is navigable by barges to Northampton, 50 miles further, which bring coal, corn, &c. and by which they export in ſome years 6000 quarters of malt, beſides other goods, eſpecially the woollen manufactures either of cloth or ſtockings, in which the poor are employed. The air of Peterborough is ſaid not to be very wholeſome, by reaſon of the neighbouring fens; but the water of the river is freſh and good, the higheſt ſpring-tide never coming up within five miles of the town; and there is plenty of excellent water in their wells. The ſtreets are very poor, and the houſes but mean; there is, however, a handſome market-houſe, over which are kept the aſſizes and ſeſſions. Its juriſdiction extends over 32 towns and hamlets, wherein the civil magiſtrates appointed by the royal commiſſion are veſted with the ſame power as judges of aſſize, and hold their quarterly ſeſſions in this city.

PETERHEAD, a town in Aberdeenſhire, ſituated near the mouth of the Ugie. It has an excellent harbour, defended by a new pier; a conſiderable trade in the fiſhery, and to the Baltic; and a manufacture of ſewing thread. A mineral ſpring, of a powerful diuretic quality, and the ſea-bathing, bring a great reſort of company, for whoſe accommodation there is a ball-room and many elegant houſes. It is a little to the W. of Buchanneſs, the moſt eaſtern promontory of Scotland, and 34 miles N. E. of Aberdeen. W. lon. 1. 28. N. lat. 57. 28.

PETERHOFF, in Ruſſia, is ſituated about 20 miles from Peterſburg, and is diſtinguiſhed for its palace and gardens. The palace was begun by Peter I. and finiſhed by Elizabeth. As it is placed upon an eminence, it commands a moſt ſuperb view of Cronſtadt, Peterſburg, the intervening gulf, and the oppoſite coaſt of Carelia. The palace is moſt magnificently furniſhed, and the ſuite of apartments are truly princely. The preſence-chamber is richly ornamented with portraits of the ſovereigns of the houſe of Romanof, who have reigned in Ruſſia ſince 1613.

"The gardens of Peterhoff (ſays Mr. Coxe, an intelligent traveller) have been celebrated for their taſte and elegance; and from the number of jet d'eaus, fountains, baſons, caſcades, parterres, &c. they have been compared to thoſe of Verſailles: and indeed in one reſpect they are far ſuperior; for the water-works of the latter only play upon particular occaſions, while thoſe of Peterhoff are perennial. Theſe gardens, which at the time of their formation were greatly admired in this country, though not congenial to the taſte of the empreſs, are ſuffered to remain in their preſent ſtate; as during ſummer her majeſty principally reſides at Tzarſkoe-Selo, where the grounds are diſpoſed in a more modern and pleaſing manner." A vaſt number of ſilver dolphins and gilded ſtatues are ſcattered through them; but the moſt remarkable figures are thoſe of two gladiators placed in a baſon of water. Theſe are repreſented, not with the ſword and buckler, the ancient implements of war, but with a brace of piſtols. Theſe they point to each other in a threatening poſture, while the water guſhes impetuouſly from the barrels. In that part of the garden which lies between the palace and the gulf, cloſe to the water, is a building which was the favourite retreat of Peter I. It is preſerved, together with its furniture, entirely in its original ſtate, with a kind of religious veneration. Its plainneſs ſhows the frugal ſimplicity in which that monarch was accuſtomed to live. In the ſame celebrated gardens there is a remarkable building called the *mountain for ſledges*, and often by travellers the *flying mountain*. "It ſtands (ſays Mr. Coxe) in the middle of an oblong area, incloſed by an open colonnade, with a flat roof, which is railed for the convenience of holding ſpectators. The circumference of this colonnade is at leaſt half a mile. In the middle of the area ſtands the flying mountain, ſtretching nearly from one end to the other. It is a wooden building, ſupported upon pillars, repreſenting an uneven ſurface of ground, or a mountain compoſed of three principal aſcents, gradually diminiſhing in height, with an intermediate ſpace to reſemble valleys: from top to bottom is a floored way, in which three parallel grooves are formed. It is thus uſed: a ſmall carriage containing one perſon, being placed in the centre groove upon the higheſt point, goes with great rapidity down one hill; the velocity which it acquires in its deſcent carries it up a ſecond; and it continues to move in a ſimilar manner until it arrives at the bottom of the area, where it rolls for a conſiderable way on the level ſurface, and ſtops before it attains the boundary: it is then placed in one of the ſide grooves, and drawn up by means of a cord fixed to a windlaſs. To a perſon unacquainted with the mechaniſm, this entertainment would appear tremendous; but as the grooves always keep the carriage in its right direction, there is not the leaſt danger of being overturned. At the top of the mountain is a handſome apartment for the accommodation of the court and principal nobility; there is alſo room for many

thouſand ſpectators within the colonnade and upon its roof. Near the flying mountain is a ſpacious amphitheatre, in which tournaments are uſually exhibited."

PETERS (Father), a Jeſuit, was confeſſor and counſellor to James II. king of England. This prince diſmiſſed him in 1688, becauſe he was conſidered as the author of thoſe troubles in which the kingdom was then involved. "He was (ſays biſhop Burnet) the moſt violent of the king's adviſers, and the perſon moſt liſtened to. Though he had the honour of being nobly deſcended, he was a man of no extenſive erudition, and was eminent only for his bigotry and forwardneſs." Though Burnet is not always to be believed, yet certain it is, from the teſtimony of other hiſtorians, that father Peters was by no means a perſon properly qualified to direct king James in the critical ſituation in which he then ſtood.

PETERSBURG (St.), a city of the province of Ingria in Ruſſia, and capital of the whole empire. It is ſituated in N. lat. 59. 26. 23. and E. lon. 30. 25. from the firſt meridian of Greenwich. It was founded in the year 1703 by czar Peter the Great, whoſe ambition it was to have a fleet on the Baltic; for which reaſon he determined to found a city which might become the centre of trade throughout all his dominions. The ſpot he pitched upon was a low, fenny, uncultivated iſland, formed by the branches of the river Neva before they fall into the gulph of Finland. In the ſummer this iſland was covered with mud; and in winter became a frozen pool, rendered almoſt inacceſſible by dreary foreſts and deep moraſſes, the haunts of bears, wolves, and other ſavage animals. Having taken the fort of Nattebourg, and the town of Nieuſchants, in the year 1703, this mighty conqueror aſſembled in Ingria above 300,000 men, Ruſſians, Tartars, Coſſacks, Livonians, and others, even from the moſt diſtant parts of his empire, and laid the foundation of the citadel and fortifications, which were finiſhed in four months almoſt in deſpite of nature. He was obliged to open ways through foreſts, drain bogs, raiſe dykes, and lay cauſeways, before he could pretend to found the new city. The workmen were ill provided with neceſſary tools and implements, ſuch as ſpades, piek-axes, ſhovels, planks, and wheel-barrows; they were even obliged to fetch the earth from a great diſtance in the ſkirts of their garments, or in little bags made of old mats and rags ſewed together. They had neither huts nor houſes to ſhelter them from the ſeverity of the weather: the country, which had been deſolated by war, could not accommodate ſuch a multitude with proviſions; and the ſupplies by the lake Ladoga were often retarded by contrary winds. In conſequence of theſe hardſhips, above 100,000 men are ſaid to have periſhed: nevertheleſs the work proceeded with incredible vigour and expedition; while Peter, for the ſecurity of his workmen, formed a great camp, in ſuch a manner, that his infantry continued in Finland, and his cavalry were quartered in Ingria. Some Swediſh cruizers being deſcried in the neighbourhood, the czar poſted a body of troops in the iſle of Rutzari, by whom the Swedes were repulſed, and the work met with no farther interruption. The buildings of the city kept pace with the fortreſs, which is the centre of the town, ſurrounded on all ſides by the Neva; and in little more than a year, above 30,000 houſes were erected. At preſent there may be about double that number in Peterſburg, though many of them are paltry and inconſiderable. In order to people this city, Peter invited hither merchants, artificers, mechanics, and ſeamen, from all the different countries of Europe: he demoliſhed the town of Nieuſchants, and brought hither not only the materials of the houſes, but the inhabitants themſelves. A thouſand families were drawn from Moſcow: he obliged his nobility to quit their palaces and their villas in and about Moſcow, and take up their reſidence at Peterſburg, in a much more cold and comfortleſs climate. Finally, reſolving to remove hither the trade of Archangel, he iſſued an ordonnance, importing, that all ſuch merchandiſe as had been conveyed to Archangel, in order to be ſold to foreigners, ſhould now be ſent to Peterſburg, where they ſhould pay no more than the uſual duties. Theſe endeavours and regulations have rendered this one of the greateſt and moſt flouriſhing cities in Europe. The Ruſſian boyars and nobility have built magnificent palaces, and are now reconciled to their ſituation. At firſt many houſes were built of timber; but theſe being ſubject to ſudden conflagrations in ſpite of all the precautions that could be taken, the czar, in the year 1714, iſſued an order, that all new houſes ſhould be walled with brick and covered with tiles. The fort is an irregular hexagon, with oppoſite baſtions. This, together with all the reſt of the fortifications, was in the beginning formed of earth only; but in the ſequel they were faced with ſtrong walls, and provided with caſemates which are bomb-proof. In the curtain of the fort, on the right hand ſide, is a noble diſpenſary, well ſupplied with excellent medicines, and enriched with a great number of porcelain vaſes from China and Japan. From one of the gates of the fort a draw-bridge is thrown over an arm of the river, in which the czar's galleys and other ſmall veſſels are ſheltered in the winter. The moſt remarkable building within the fort is the cathedral, built by the direction of an Italian architect. Peterſburg is partly built on little iſlands, ſome of which are connected by draw-bridges; and partly on the continent. In the higheſt part, on the bank of the Neva, the czar fixed his habitation, or ordinary reſidence, built of freeſtone, and ſituated ſo as to command a proſpect of the greater part of the city. Here likewiſe is a royal foundery; together with the ſuperb houſes of many noblemen. The marſhy ground on which the city is built being found extremely ſlippery, dirty, and incommodious, the czar ordered every inhabitant to pave a certain ſpace before his own door. In the year 1716, Peter, taking a fancy to the iſland Waſili-Oſterno, which he had given as a preſent to prince Menzikoff, reſumed the grant, and ordered the city to be extended into this quarter. He even obliged the boyars or nobles, to build ſtone houſes on this ſpot, though they were already in poſſeſſion of others on the ſide of Ingria: accordingly this is now the moſt magnificent part of the city. On the other ſide of a branch of the Neva ſtands the czar's country or ſummer palace, provided with a fine garden and orangery. On the bank of the ſame river is the ſlaboda, or ſuburbs, in which the Germans generally chooſe their habitation. Peterſburg is very much ſubject to dangerous inundations. In the year 1715, all the baſtions and draw-bridges were either overwhelmed or carried away. The breadth, depth, and rapidity of the Neva have rendered it extremely difficult, if not impracticable, to join the iſlands and the continent by bridges. Beſides, Peter was averſe to this expedient for another reaſon: reſolved to accuſtom his ſubjects to navigation, he not only rejected the project of a bridge, but alſo ordered that no boat ſhould paſs between the iſlands and continent, except by the help of ſails only. In conſequence of this ſtrange regulation, many lives were loſt: but at length he gained his point, and, by habituating his ſluggiſh Muſcovites to the dangers of the ſea, in a little time produced a breed of hardy ſailors. The adjacent country is ſo barren, that the town muſt be ſupplied with proviſions from a great diſtance; conſequently they are extremely dear. Here are woods in plenty, conſiſting of pine, fir, alder, birch, poplar, and elm; but the oak and the beech are generally brought from Caſan. In winter the weather is extremely cold, and hot in the ſummer. In June the length of the night does not exceed three hours, during which the natives enjoy a continued twilight: but in December the ſun is not viſible more than three hours above the horizon.

The czar Peter, who was indefatigable in his endeavours to improve and civilize his ſubjects, neglected nothing which he thought could contribute to theſe purpoſes. He condeſcended even to inſtitute and regulate aſſemblies at Peterſburg: theſe were

opened at five in the afternoon, and the houſe was ſhut at ten: between theſe hours the faſhionable people of both ſexes met without ceremony, danced, converſed, or played either at cards or at cheſs, this laſt being a favourite diverſion among the Ruſſians. There was likewiſe an apartment appointed for drinking brandy and ſmoking tobacco. Plays and operas were likewiſe introduced for the ſame purpoſes; but as Peter had little reliſh, and leſs taſte, for thoſe entertainments, they were performed in a very awkward manner in his lifetime: however, ſince his death theſe performances have been brought to a greater degree of art and decorum.

This great northern legiſlator eſtabliſhed, in the neighbourhood of Peterſburg, manufactures of linen, paper, ſaltpetre, ſulphur, gunpowder, and bricks, together with water-mills for ſawing timber. He inſtituted a marine academy, and obliged every conſiderable family in Ruſſia to ſend at leaſt one ſon or kinſman, between the ages of ten and eighteen, to this ſeminary; where he was inſtructed in navigation, learned the languages, was taught to perform his exerciſes, and to live under the ſevereſt diſcipline. To crown his other plans of reformation, he granted letters patent for founding an academy, upon a very liberal endowment; and though he did not live to execute this ſcheme, his empreſs, who ſurvived him, brought it to perfection. It was modelled on the plans of the royal ſociety in London, and the academy of France. Mr. Bullfinger opened it in the year 1726, with an eloquent ſpeech on the deſign and utility of an academy of ſciences; and the profeſſors, who have always diſtinguiſhed themſelves by their merit and erudition, publiſhed an annual collection of their tranſactions; a taſk the more eaſy, as they have the benefit of printing preſſes, well managed, at Peterſburg.

Peter the Great has been much cenſured for transferring the ſeat of the empire from Moſcow to St. Peterſburg, the former of which lay nearer to the centre of his dominions. But theſe objections will have but little weight with thoſe who conſider the conſequences of the removal. The new city is nearer than Moſcow was to the more civilized parts of Europe; and from an intercourſe with them the manners of the Ruſſians have been improved, and the nobility in particular have loſt much of their feudal importance. Above all, the grand object of Peter, that of having a formidable navy in the Baltic, has certainly been obtained, and the empreſs of Ruſſia is now the arbitreſs of the north, and in ſome degree the mediatrix of all Europe. In ſhort, the erection of St. Peterſburg was perhaps one of the beſt acts of Peter's reign, and has in its conſequences been the moſt beneficial. Indeed, it is at leaſt probable, that if through any revolution the ſeat of government ſhould be again transferred to Moſcow, we ſhould nowhere ſee the traces of thoſe memorable improvements which the paſſing century has given birth to, but in the annals of hiſtory; and Ruſſia would again, in all probability, relapſe into her original barbariſm.

The erection of ſuch a city as Peterſburg in ſo ſhort a time is truly wonderful. Mr. Coxe ſays, his mind was filled with aſtoniſhment, when he reflected that ſo late as the beginning of this century the ground on which it ſtands was one vaſt moraſs, occupied by a very few fiſhermen's huts. The preſent diviſions of the town, ſome of which we have already mentioned, are called, 1. The Admiralty quarter; 2. The Vaſſili Oſtrof or Iſland; 3. The Fortreſs; 4. The Iſland of St. Peterſburg; and, 5. The various ſuburbs of Livonia, of Moſcow, of Alexander Neviki, and Wiburgh.

The preſent empreſs has done ſo much for this city, that ſhe may not improperly be called its ſecond foundreſs. It is, nevertheleſs, ſtill an infant place, and, as Mr. Wraxall obſerves, "only an immenſe outline, which will require future empreſſes, and almoſt future ages, to complete."

"The ſtreets in general, ſays Mr. Coxe, are broad and ſpacious; and three of the principal ones, which meet in a point at the Admiralty, and reach to the extremities of the ſuburbs, are at leaſt two miles in length. Moſt of them are paved; but a few are ſtill ſuffered to remain floored with planks. In ſeveral parts of the metropolis, particularly in the Vaſſili Oſtrof, wooden houſes and habitations, ſcarcely ſuperior to common cottages, are blended with the public buildings; but this motley mixture is far leſs common than at Moſcow, where alone can be formed any idea of an ancient Ruſſian city. The brick houſes are ornamented with a white ſtucco, which has led ſeveral travellers to ſay that they are built with ſtone; whereas, unleſs I am greatly miſtaken, there are only two ſtone ſtructures in all Peterſburg. The one is a palace, building by the empreſs upon the banks of the Neva, called *the marble palace*; it is of hewn granite, with marble columns and ornaments; the other is the church of St. Iſaac, conſtructed with the ſame materials, but not yet finiſhed.

"The manſions of the nobility are many of them vaſt piles of building, but are not in general upon ſo large and magnificent a ſcale as ſeveral I obſerved at Moſcow: they are furniſhed with great coſt, and in the ſame elegant ſtyle as at Paris or London. They are ſituated chiefly on the ſouth ſide of the Neva, either in the Admiralty quarter, or in the ſuburbs of Livonia and Moſcow, which are the fineſt parts of the city." See NEVA.

"Peterſburg, although it is more compact than the other Ruſſian cities, and has the houſes in many ſtreets contiguous to each other, yet ſtill bears a reſemblance to the towns of this country, and is built in a very ſtraggling manner. By an order lately iſſued from government, the city has been incloſed within a rampart, the circumference whereof is 21 verſts, or 14 Engliſh miles."

The ſame accurate obſerver calculates the number of inhabitants at Peterſburg, and makes the medium number 130,000.

We have already ſaid that Peterſburg is very liable to be inundated. An inundation of a very alarming nature took place when Mr. Coxe was there in September 1777, of which the following account was given in Journal St. Peterſburg, September 1777: "In the evening of the 9th, a violent ſtorm of wind blowing at firſt S. W. and afterwards W. raiſed the Neva and its various branches to ſo great an height that at five in the morning the waters poured over their banks, and ſuddenly overflowed the town, but more particularly the Vaſſili Oſtrof and the iſland of St. Peterſburg. The torrent roſe in ſeveral ſtreets to the depth of four feet and an half, and overturned, by its rapidity, various buildings and bridges. About ſeven, the wind ſhifting to N. W. the flood fell as ſuddenly; and at midday moſt of the ſtreets, which in the morning could only be paſſed in boats, became dry. For a ſhort time the river roſe 10 feet 7 inches above its ordinary level."

Mr. Kraft, profeſſor of experimental philoſophy to the Imperial Academy of Sciences, has written a judicious treatiſe upon the inundation of the Neva, from which the following obſervations were extracted by Mr. Coxe: "Theſe floods are leſs alarming than formerly, as the ſwellings of the river to about ſix feet above its uſual level, which uſed to overflow the whole town, have no longer any effect, excepting upon the lower parts of Peterſburg; a circumſtance owing to the gradual raiſing of the ground by buildings and other cauſes.

"Upon tracing the principal inundations, the profeſſor informs us, that the moſt ancient of which there is any tradition happened in 1691, and is mentioned by Weber, from the account of ſome fiſhermen inhabiting near Nieuſchants, a Swediſh redoubt upon the Neva, about three miles from the preſent fortreſs of Peterſburg. At that period the waters uſually roſe every five years; and the inhabitants of that diſtrict no ſooner perceived the particular ſtorms which they had been taught from fatal experience to conſider as forerunners of a flood, than they took their hovels to pieces, and, joining the timbers together in

the form of rafts, faſtened them to the ſummits of the higheſt trees, and repaired to the mountain of Duderof, which is diſtant ſix miles from their place of abode, where they waited until the waters ſubſided.

"The higheſt inundations, excepting the laſt of 1777, were thoſe of the firſt of November 1726, when the waters roſe 8 feet 2 inches; and on the 2d of October 1752, when they roſe 8 feet 5 inches.

"From a long courſe of obſervations the profeſſor draws the following concluſion: The higheſt floods, namely, thoſe which riſe about ſix feet, have generally happened in one of the four laſt months of the year: no ſenſible effect is ever produced by rain or ſnow; a ſwell is ſometimes occaſioned by the accumulation of maſſes of ice at the mouth of the Neva; but the principal cauſes of the overflowing of that river are derived from violent ſtorms and winds blowing ſouth-weſt or north-weſt, which uſually prevail at the autumnal equinox; and the height of the waters is always in proportion to the violence and duration of thoſe winds. In a word, the circumſtances moſt liable to promote the overflowings of the Neva, are, when, at the autumnal equinox, three or four days before or after the full or new moon, that luminary being near her perigæum, a violent north-weſt wind drives the waters of the northern ocean, during the influx of the tide, into the Baltic, and is accompanied, or inſtantaneouſly ſucceeded, by a ſouth-weſt wind in that ſea and the gulf of Finland. All theſe circumſtances concurred at the inundation of 1777: it happened two days before the autumnal equinox, four before the full moon, two after her paſſing through the perigæum, and by a ſtorm at ſouth-weſt, which was preceded by ſtrong weſt winds in the northern ocean, and ſtrong north winds at the mouth of the Baltic."

See *Notices et Remarques ſur les debordemens de la Neva à St. Peterſb urg, accompagnées d'une carte repreſentant la crue et la diminution des eaux*, &c. in Nov. Ac. Pet. tor 1777, P. II. p. 47. to which excellent treatiſe we would refer the curious reader for further information.

All our readers have unqueſtionably heard of the equeſtrian ſtatue of Peter I. in bronze. We ſhall give an account of that extraordinary monument in Mr. Coxe's own words. "It is (ſays he) of a coloſſal ſize, and is the work of Monſieur Falconet, the celebrated French ſtatuary, caſt at the expence of Catharine II. in honour of her great predeceſſor, whom ſhe reveres and imitates. It repreſents that monarch in the attitude of mounting a precipice, the ſummit of which he has nearly attained. He appears crowned with laurel, in a looſe Aſiatic veſt, and ſitting on a houſing of bear-ſkin: his right hand is ſtretched out, as in the act of giving benediction to his people; and his left holds the reins. The deſign is maſterly, and the attitude is bold and ſpirited. If there be any defect in the figure, it conſiſts in the flat poſition of the right hand; and for this reaſon the view of the left ſide is the moſt ſtriking, where the whole appearance is graceful and animated. The horſe is rearing up on its hind legs; and its tail, which is full and flowing, ſlightly touches a bronze ſerpent, artfully contrived to aſſiſt in ſupporting the vaſt weight of the ſtatue in due equilibrium. The artiſt has, in this noble eſſay of his genius, repreſented Peter as the legiſlator of his country, without any alluſion to conqueſt and bloodſhed; wiſely preferring his civil qualities to his military exploits. The contraſt between the compoſed tranquillity of Peter (though perhaps not abſolutely characteriſtic) and the fire of the horſe, eager to preſs forwards, is very ſtriking. The ſimplicity of the inſcription correſponds to the ſublimity of the deſign, and is far preferable to a pompous detail of exalted virtues, which the voice of flattery applies to every ſovereign without diſtinction. It is elegantly finiſhed in braſs characters, on one ſide in Latin, and on the oppoſite in Ruſſian. *Petro primo Catharina ſecunda* 1782, i. e. Catharine II. to Peter I.

"The ſtatue, when I was at Peterſburg, was not erected, but ſtood under a large wooden ſhed near the Neva, within a few yards of its enormous pedeſtal. When Falconet had conceived the deſign of his ſtatue, the baſe of which was to be formed by an huge rock, he carefully examined the environs of Peterſburg, if, among the detached pieces of granite which are ſcattered about theſe parts, one could be found of magnitude correſpondent to the dimenſions of the equeſtrian figure. After conſiderable reſearch, he diſcovered a ſtupendous maſs half buried in the midſt of a moraſs. The expence and difficulty of tranſporting it were no obſtacles to Catharine II. By her order the moraſs was immediately drained, a road was cut through a foreſt, and carried over the marſhy ground; and the ſtone, which after it had been ſomewhat reduced weighed at leaſt 1500 tons, was removed to Peterſburg. This more than Roman work was, in leſs than ſix months from the time of its firſt diſcovery, accompliſhed by a windlaſs, and by means of large friction-balls alternately placed and removed in grooves fixed on each ſide of the road. In this manner it was drawn, with forty men ſeated upon its top, about four miles to the banks of the Neva; there it was embarked in a veſſel conſtructed on purpoſe to receive it, and thus conveyed about the ſame diſtance by water to the ſpot where it now ſtands. When landed at Peterſburg, it was 42 feet long at the baſe, 36 at the top, 21 thick, and 17 high; a bulk greatly ſurpaſſing in weight the moſt boaſted monuments of Roman grandeur, which, according to the fond admirers of antiquity, would have baffled the ſkill of modern mechanics, and were alone ſufficient to render conſpicuous the reign of the moſt degenerate emperors.

"The pedeſtal, however, though ſtill of prodigious magnitude, is far from retaining its original dimenſions, as, in order to form a proper ſtation for the ſtatue, and to repreſent an aſcent, the ſummit whereof the horſe is endeavouring to attain, its bulk has been neceſſarily diminiſhed. But I could not obſerve without regret, that the artiſt has been deſirous to improve upon nature; and, in order to produce a reſemblance of an abrupt broken precipice, has been too laviſh of the chiſel. Near it was a model in plaſter, to the ſhape of which the workmen were faſhioning the pedeſtal. It appeared to me, that in this model the art was too conſpicuous; and that the effect would have been far more ſublime, if the ſtone had been left as much as poſſible in its rude ſtate, a vaſt unwieldy ſtupendous maſs. And indeed, unleſs I am greatly miſtaken, the pedeſtal, when finiſhed according to this plan, will have ſcarcely breadth ſufficient to afford a proper baſe for a ſtatue of ſuch coloſſal ſize.

"The ſtatue was erected on the pedeſtal on the 27th of Auguſt 1782. The ceremony was performed with great ſolemnity, and was accompanied with a ſolemn inauguration. At the ſame time the empreſs iſſued a proclamation, in which, among other inſtances of her clemency, ſhe pardons all criminals under ſentence of death; all deſerters, who ſhould return to their reſpective corps within a limited time; and releaſes all criminals condemned to hard labour, provided they had not been guilty of murder."

Mr. Coxe informs us, that the weather is extremely changeable in this capital, and the cold is at times extreme; againſt which the inhabitants take care to provide (ſee PEASANT), though ſome of them nevertheleſs unfortunately fall victims to it. "As I traverſed the city, ſays Mr. Coxe, on the morning of 12th January, I obſerved ſeveral perſons whoſe faces had been bitten by the froſt: their cheeks had large ſcars, and appeared as if they had been ſinged with an hot iron. As I was walking with an Engliſh gentleman, who, inſtead of a fur cap,

had put on a common hat, his ears were ſuddenly frozen: he felt no pain, and would not have perceived it for ſome time, if a Ruſſian, in paſſing by, had not informed him of it, and aſſiſted him in rubbing the part affected with ſnow; by which means it was inſtantly recovered. This, or friction with flannel, is the uſual remedy; but ſhould the perſon in that ſtate approach the fire, or dip the part in warm water, it immediately mortifies and drops off.—The common people continued at their work as uſual, and the drivers plied in the ſtreets with their ſledges, ſeemingly unaffected by the froſt; their beards were incruſted with clotted ice, and the horſes were covered with icicles.

"It ſometimes happens that coachmen or ſervants, while they are waiting for their maſters, are frozen to death. In order to prevent as much as poſſible theſe dreadful accidents, great fires of whole trees, piled one upon another, are kindled in the court-yard of the palace and the moſt frequented parts of the town. As the flames blazed above the tops of the houſes, and caſt a glare to a conſiderable diſtance, I was frequently much amuſed by contemplating the picturesque groups of Ruſſians, with their Aſiatic dreſs and long beards, aſſembled round the fire. The ſentinels upon duty, having no beards, which are of great uſe to protect the glands of the throat, generally tie handkerchiefs under their chins, and cover their ears with ſmall caſes of flannel."

PETERSBURG, in America, is a ſea-port town in Virginia, 25 miles ſouthward of Richmond, ſeated on the ſouth ſide of the Appamatox river, about 12 miles above its junction with James river, and contained nearly 300 houſes in 1787, in two diviſions; one is upon a clay, cold ſoil, and is very dirty; the other upon a plain of ſand or loam. There is no regularity, and very little elegance, in Peterſburg. It is merely a place of buſineſs. The Free Maſons have a hall tolerably elegant; and the ſeat of the Bowling family is pleaſant and well built. It is very unhealthy. About 2200 hogſheads of tobacco are inſpected here annually. Like Richmond, Williamſburg, Alexandria, and Norfolk, it is a corporation; and what is ſingular, Peterſburg city comprehends part of three counties. The celebrated Indian queen, Pocahonta, from whom deſcended the Randolph and Bowling families, formerly reſided at this place.

PETERSFIELD, is a handſome town of Hampſhire in England, and ſends two members to parliament. It is ſeated in W. lon. 1. 5. N. lat. 51. 5.

PETERWARADIN, a fortified town in Sclavonia, and one of the ſtrongeſt frontier places the houſe of Auſtria has againſt the Turks, ſeated on the Danube between the Drave and the Save. E. lon. 20. 0. N. lat. 45. 20.

PETIOLE, in botany, the ſlender ſtalks that ſupport the leaves of a plant.

PETIT, or PETITE, a French word ſignifying *little* or *ſmall*.

PETITE *Guerre*, denotes the operations of detached parties and the war of poſts. See WAR.

PETIT *Sergeanty*. See SERGEANTY.

PETIT *Treaſon*. See TREASON.

PETIT (John), a doctor of the Sorbonne, very early gained to himſelf a character by his knowledge, and thoſe eloquent orations which he pronounced before the univerſity of Paris. He was employed in the famous embaſſy which was ſent from France to Rome, for the purpoſe of healing the ſchiſm in 1407; but he ſoon loſt all the honour which he had acquired. John Sans Peur, duke of Burgundy, having treacherouſly contrived to aſſaſſinate Louis of France, duke of Orleans, only brother to Charles VI. John Petit, entirely devoted to the views of the murderer, maintained in a public diſputation, at Paris, the 8th of March 1408, that the murder was lawful. He had the effrontery to aſſert, that "it is allowable to employ fraud, treaſon, and every other method, however baſe, in order to get rid of a tyrant; and that no faith ought to be kept with him." He dared to add further, that "the man who ſhould commit ſuch an action, not only deſerved to be exempted from puniſhment, but to receive a reward." This ſanguinary doctrine was loudly exclaimed againſt; but the duke of Burgundy's powerful influence ſheltered Petit for ſome time. Some eminent writers, however, of that period, with Gerſon at their head, denounced the doctrine to John de Montaigu, biſhop of Paris, who condemned it as heretical the 23d of November 1414. It was likewiſe condemned by the council of Conſtance the year following, at the inſtigation of Gerſon; but no notice was taken either of Petit's name or his writings. In fine, the king, on the 16th of September 1416, ordered the parliament of Paris to pronounce a ſevere decree againſt this dangerous performance; and it was alſo cenſured by the univerſity. But the duke of Burgundy, in 1418, had intereſt enough to compel the grand vicars of the biſhop of Paris, who then lay ſick at St. Omer's, to retract the ſentence which that prelate had paſſed in 1414. Petit died three years before, *i. e.* in 1411, at Heſdin; and his apology in favour of the duke of Burgundy, with all the particulars of that infamous tranſaction, may be ſeen in the fifth volume of the laſt edition of Gerſon's works. Father Pinchinat, of the order of St. Francis, and author of the Dictionary of Hereſies, in 4to, has endeavoured to vindicate his order from a charge brought by ſome writers who have called Petit a *Cordelier* or *Franciſcan friar*. "He proves very clearly (ſays Abbé Prevot) that he was a ſecular prieſt; and adds, that upon the ſame evidence, Father Mercier, a Cordelier, had a warm diſpute in 1717 with M. Dupin, who had given this title to Petit in his Collection of Cenſures. He repreſented to him (ſays he), before a meeting of the Faculty, the falſity of ſuch a claim, and the injury which he offered to the order of St. Francis. Dupin, convinced of his error, candidly owned that he was led into it by following ſome infidel writers, and promiſed to retract it in the new edition of the Cenſures, which was publiſhed in 1720. M. Fleury, who had committed the ſame miſtake, promiſed alſo to make amends for it by a ſolemn recantation; but dying before he had an opportunity of doing that piece of juſtice to the Cordeliers, the continuator of his Eccleſiaſtical Hiſtory, who had not ſuch opportunities of information, fell into the ſame fault." (*Pour & contre*, tom. x. p. 23.) If we take the opinion of L'Advocat's Dictionary, it would appear no fault was committed; for it gives a liſt of the penſioners of the dukes of Burgundy, in order to prove that John Petit was a Cordelier. Indeed, it is highly probable that if Dupin, Fleury, and Father Fabré did not alter their opinion, it was owing to a firm perſuaſion that they had committed no error.

PETIT (John Lewis), an eminent ſurgeon, born at Paris in 1674. He had ſo early an inclination to ſurgery, that Mr. Littre, a celebrated anatomiſt, being in his father's houſe, he regularly attended that gentleman's lectures, from his being ſeven years of age. He was received maſter in ſurgery in the year 1700; and acquired ſuch reputation in the practice of that art, that in 1726 the king of Poland ſent for him to his court, and in 1734 the king of Spain prevailed on him to go into that kingdom. He reſtored the health of thoſe princes; and they endeavoured to detain him by offering him great advantages, but he choſe rather to return to France. He was received into the academy of ſciences in 1715; became director of the royal academy of ſurgery; made ſeveral important diſcoveries; and invented new inſtruments for the improvement of ſurgery. He died at Paris in 1750. He wrote an excellent Treatiſe on the Diſeaſes of the Bones, the beſt edition of which is that of 1723; and many learned Diſſertations in the Me-

moirs of the Academy of Sciences, and in the firſt volume of the Memoirs of Surgery.

PETITIO PRINCIPII, in logic, the taking a thing for true, and drawing concluſions from it as ſuch, when it is really falſe; or at leaſt wants to be proved before any inferences can be drawn from it.

PETITION, a ſupplication made by an inferior to a ſuperior, and eſpecially to one having juriſdiction. It is uſed for that remedy which the ſubject hath to help a wrong done by the king, who hath a prerogative not to be ſued by writ: In which ſenſe it is either general, That the king do him right; whereupon follows a general indorſement upon the ſame, *Let right be done the party:* Or it is ſpecial, when the concluſion and indorſement are ſpecial, for this or that to be done, &c.

By ſtatute, the ſoliciting, labouring, or procuring the putting the hands or conſent of above twenty perſons to any petition to the king or either houſe of parliament, for alterations in church or ſtate, unleſs by aſſent of three or more juſtices of the peace of the county, or a majority of the grand jury at the aſſizes or ſeſſions, &c. and repairing to the king or parliament to deliver ſuch petition with above the number of ten perſons, is ſubject to a fine of 100l. and three months impriſonment, being proved by two witneſſes within ſix months, in the court of *B. R.* or at the aſſizes, &c. And if what is required by this ſtatute be obſerved, care muſt be taken that petitions to the king contain nothing which may be interpreted to reflect on the adminiſtration; for, if they do, it may come under the denomination of a libel: and it is remarkable, that the petition of the city of London for the ſitting of a parliament was deemed libellous, becauſe it ſuggeſted that the king's diſſolving a late parliament was an obſtruction of juſtice; alſo the petition of the ſeven biſhops ſent to the Tower by James II. was called a libel, &c. To ſubſcribe a petition to the king, *to frighten him into a change of his meaſures, intimating, that if it be denied many thouſands of his ſubjects will be diſcontented,* &c. is included among the contempts againſt the king's perſon and government, tending to weaken the ſame, and is puniſhable by fine and impriſonment.

PETITOT (JOHN), a curious painter in enamel, was born at Geneva in 1607. He ſtudied the art with ſuch application, that he arrived to a degree of perfection that may almoſt be accounted inimitable. He was wonderfully patient in finiſhing his works, though he had the addreſs to conceal his labour: however, he only painted the heads and hands of the figures: the hair, grounds, and drapery, being executed by Bordier his brother-in-law. Theſe two artiſts had the credit of aſſociating and labouring together for fifty years, without the leaſt miſunderſtanding happening between them. It is aſſerted by an ingenious French writer, that Petitot and Bordier derived the knowledge of the moſt curious and durable colours proper for enamelling, from Sir Theodore Mayerne at London, who recommended Petitot to Charles I. He had the honour to paint the portraits of that monarch and the whole royal family, and continued in England until Charles's unhappy end: he then went to Paris, where he was highly favoured by Louis XIV. and acquired an ample fortune. Being a proteſtant, the revocation of the edict of Nantz obliged him to retire to Geneva; but ſettling ſoon after at Veray in the canton of Berne, he paſſed the remainder of his life in eaſe and affluence. He died in 1691; and had 1 children: of whom one took to painting, and ſettled at London, where he gained good reputation; but was much inferior to his father.

Petitot may be called the inventor of painting portraits in enamel. Though his friend Bordier made ſeveral attempts before him, and Sir Theodore Mayerne had facilitated the means of employing the moſt beautiful colours; yet Petitot completed the works, which under his hand acquired a ſoftneſs and livelineſs of colouring that will never change, and will ever render his works valuable. He made uſe of gold and ſilver plates, and ſeldom enamelled on copper. When he firſt came in vogue, his price was 20 louis a head, which he ſoon raiſed to 40. It was his cuſtom to take a painter with him, who painted the picture in oil; after which Petitot ſketched out his work, which he always finiſhed after the life. When he painted the king of France, he took thoſe pictures for his copies that moſt reſembled him; and the king afterwards gave him a ſitting or two to finiſh his work.

PETIVERIA, in botany: A genus of the tetragynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The calyx is tetraphyllous; there is no corolla; and but one ſeed, with reflexed awns at the top.

PETRA (Cæſar, Lucian), a town of Greece, on the coaſt of Illyricum, near Dyrrhachium, and not far from the mouth of the river Panyaſus. Another PETRA, (Livy); a town of Mædica, a diſtrict of Thrace, lying towards Macedonia; but in what part of Macedonia, he does not ſay.

PETRA (Ptolemy), *Petræa* (Silius Italicus), *Petrina* (Italicus), in both which laſt *urbs* is underſtood; an inland town of Sicily, to the ſouth-weſt of Engyum, now *Petraglia* (Cluverius).

PETRA *Jecktael* (2 Kings xiv.), a town of the Amalekites; near the Adſcenſus Scorpionis (Judges i.) and the valley of Salt in the ſouth of Judæa: afterwards in the poſſeſſion of the Edomites, after deſtroying the Amalekites.

PETRA *Reem*, or *Rekem*, ſo called from Rekem king of the Midianites, ſlain by the Iſraelites (Num. xxxi.) Formerly called *Arce*, now *Petra*; the capital of Arabia Petræa (Joſephus). Ptolemy places it in lon. 66. 45. from the Fortunate Iſlands, and lat. 30. 20. It declines therefore 80 miles to the ſouth of the parallel of Jeruſalem, and 36 miles, more or leſs, from its meridian to the eaſt. Joſephus ſays, that the mountain on which Aaron died ſtood near Petra; which Strabo calls the capital of the Nabatæi; at the diſtance of three or four days journey from Jericho. This Petra ſeems to be the Sela of Iſa. xvi. 1. and xlii. 11. the Hebrew name of *Petra* "a rock:" though ſome imagine Petra to be no older than the time of the Macedonians.

PETRARCH (FRANCIS), a celebrated Italian poet, was born at Arezzo in 1304, and was the ſon of Petrarco di Parenzo. He ſtudied grammar, rhetoric, and philoſophy for four years at Carpentras; from whence he went to Montpelier, where he ſtudied the law under John Andreas and Cino of Piſtoia, and probably from the latter received a taſte for Italian poetry. As Petrarch only ſtudied the law out of complaiſance to his father, who on viſiting him at Bologna had thrown into the fire all the Latin poets and orators except Virgil and Cicero; he, at 22 years of age, hearing that his father and mother were dead of the plague at Avignon, returned to that city to ſettle his domeſtic affairs, and purchaſed a country-houſe in a very ſolitary but agreeable ſituation, called *Vaucluſe*; where he firſt knew the beautiful Laura, with whom he fell in love, and whom he has immortaliſed in his poems. He at length travelled into France, the Netherlands, and Germany; and at his return to Avignon entered into the ſervice of pope John XXII. who employed him in ſeveral important affairs. Petrarch was in hopes of being raiſed to ſome conſiderable poſt: but being diſappointed, he applied himſelf entirely to poetry; in which he met with ſuch applauſe, that in one and the ſame day he received letters from Rome and the chancellor of the univerſity of Paris, by which they invited him to receive the poetic crown. By the advice of his friends he preferred Rome to Paris, and received that crown from the ſenate and people on the 8th of

April 1341. "The ceremony of his coronation (ſays Gibbon) was performed in the Capitol, by his friend and patron the ſupreme magiſtrate of the republic. Twelve patrician youths were arrayed in ſcarlet; ſix repreſentatives of the moſt illuſtrious families, in green robes, with garlands of flowers, accompanied the proceſſion; in the midſt of the princes and nobles, the ſenator, count of Anguillara, a kinſman of the Colonna, aſſumed his throne; and at the voice of an herald Petrarch aroſe. After diſcourſing on a text of Virgil, and thrice repeating his vows for the proſperity of Rome, he knelt before the throne, and received from the ſenator a laurel crown, with a more precious declaration, 'This is the reward of merit.' The people ſhouted, 'Long life to the Capitol and the Poet!' A ſonnet in praiſe of Rome was accepted as the effuſion of genius and gratitude; and after the whole proceſſion had viſited the Vatican, the profane wreath was ſuſpended before the ſhrine of St. Peter. In the act or diploma which was preſented to Petrarch, the title and prerogatives of poet-laureat are revived in the Capitol after the lapſe of 1300 years; and he receives the perpetual privilege of wearing, at his choice, a crown of laurel, ivy, or myrtle; of aſſuming the poetic habit; and of teaching, diſputing, interpreting, and compoſing, in all places whatſoever, and on all ſubjects of literature. The grant was ratified by the authority of the ſenate and people; and the character of citizen was the recompenſe of his affection for the Roman name. They did him honour, but they did him juſtice. In the familiar ſociety of Cicero and Livy, he had imbibed the ideas of an ancient patriot; and his ardent fancy kindled every idea to a ſentiment, and every ſentiment to a paſſion." His love of ſolitude at length induced him to return to Vaucluſe; but, after the death of the beautiful Laura, Provence became inſupportable to him, and he returned to Italy in 1352; when, being at Milan, Galeas Viceconti made him counſellor of ſtate. Petrarch ſpent almoſt all the reſt of his life in travelling to and from the different cities in Italy. He was archdeacon of Parma, and canon of Padua; but never received the order of prieſthood. All the princes and great men of his time gave him public marks of their eſteem; and while he lived at Arcqua, three miles from Padua, the Florentines deputed Boccace to go to him with letters, by which they invited him to Florence, and informed him, that they reſtored to him all the eſtate of which his father and mother had been deprived during the diſſenſions between the Guelphs and Ghibelines. He died a few years after at Arcqua, in 1374. He wrote many works that have rendered his memory immortal; theſe have been printed in four volumes folio. His life has been written by ſeveral authors. Amongſt theſe there was one by Mrs. Suſanna Dobſon, in two volumes 8vo, collected and abridged from the French. In this work we have the following elegant and juſt character of Petrarch:

"Few characters, perhaps, have ſet in a ſtronger light the advantage of well-regulated diſpoſitions than that of Petrarch, from the contraſt we behold in one particular of his life, and the extreme miſery he ſuffered from the indulgence of an affection, which, though noble and delightful when juſtly placed, becomes a reproach and a torment to its poſſeſſor when once directed to an improper object. For, let us not deceive ourſelves or others; though (from the character of Laura) they are acquitted of all guilt in their perſonal intercourſe, yet, as ſhe was a married woman, it is not poſſible, on the principles of religion and morality, to clear them from that juſt cenſure which is due to every defection of the mind from thoſe laws which are the foundation of order and peace in civil ſociety, and which are ſtamped with the ſacred mark of divine authority.

"In this particular of his character, therefore, it is ſincerely hoped that Petrarch will ſerve as a warning to thoſe unhappy minds, who, partaking of the ſame feelings under the like circumſtances, but not yet ſuffering his miſery, may be led, by the contemplation of it, by a generous regard to the honour of human nature, and by a view to the approbation of that all-ſeeing Judge who penetrates the moſt ſecret receſſes of the heart, to check every unhappy inclination in its birth, and deſtroy, while yet in their power, the ſeeds of thoſe paſſions which may otherwiſe deſtroy them.

"As to the cavils or cenſures of thoſe who, incapable of tenderneſs themſelves, can neither enjoy the view of it when preſented in its moſt perfect form, nor pity its ſufferings when, as in this work, they appear unhappily indulged beyond the bounds of judgment and tranquillity; to ſuch minds I make no addreſs, well convinced, that, as no callous heart can enjoy, neither will it ever be in danger of being miſled by the example of Petrarch in this tender but unfortunate circumſtance of his character.

"To ſuſceptible and feeling minds alone Petrarch will be ever dear. Such, while they regret his failings, and conſider them as warnings to themſelves, will love his virtues; and, touched by the glowing piety and heart-felt contrition which often impreſſed his ſoul, will ardently deſire to partake with him in thoſe pathetic and ſublime reflections which are produced in grateful and affectionate hearts, on reviewing their own lives, and contemplating the works of God.

"Petrarch had received from nature a very dangerous preſent. His figure was ſo diſtinguiſhed as to attract univerſal admiration. He appears, in his portraits, with large and manly features, eyes full of fire, a blooming complection, and a countenance that beſpoke all the genius and fancy which ſhone forth in his works. In the flower of his youth, the beauty of his perſon was ſo very ſtriking, that wherever he appeared he was the object of attention. He poſſeſſed an underſtanding active and penetrating, a brilliant wit, and a fine imagination. His heart was candid and benevolent, ſuſceptible of the moſt lively affections, and inſpired with the nobleſt ſentiments of liberty.

"But his failings muſt not be concealed. His temper was, on ſome occaſions, violent, and his paſſions headſtrong and unruly. A warmth of conſtitution hurried him into irregularities, which were followed with repentance and remorſe. No eſſential reproach, however, could be caſt on his manners, till after the 23d year of his age. The fear of God, the thoughts of death, the love of virtue, and thoſe principles of religion which were inculcated by his mother, preſerved him from the ſurrounding temptations of his earlier life."

A reſemblance has been traced, in ſeveral inſtances, between this admired poet and our late famous Yorick.—Both, we know, had great wit and genius, and no leſs imprudence and eccentricity; both were canons, or prebendaries, the Italian of Padua, &c. and the Engliſhman of York; they both "ran over France, without any buſineſs there." If the biſhop of Lombes patroniſed and correſponded with the one, a prelate of the Engliſh church, now deceaſed, deſired, in a letter, to *ſhandyiſe* with the other. In their attachments to Laura and Eliza, both married women, theſe two prebendaries were equally warm, and equally innocent. And, even after death, a moſt remarkable circumſtance has attended them both: ſome perſons, we are told, ſtole Petrarch's bones, in order to ſell them; and, in like manner, Yorick's body, it is confidently affirmed, was alſo ſtolen, and his ſkull has been exhibited at Oxford.

PETRE, or SALTPETRE, more properly NITRE, in chemiſtry. See CHEMISTRY.

PETREA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quinquepartite, very large, and coloured; the corolla rotaceous; the capſule bilocular, and ſituated in the bottom of the

calyx; the ſeeds ſolitary. There is only one ſpecies, a native of New Spain. It riſes to the height of 15 or 16 feet, with a woody ſtalk covered with grey bark, ſending out ſeveral long branches. Theſe have a whiter bark than the ſtem, and are garniſhed with leaves at each joint, which, on the lower part of the branches, are placed by three round them; but, higher up, they are rough, and have a rough ſurface. The flowers are produced at the ends of the branches, in looſe bunches nine or ten inches long, each flower ſtanding on a ſlender flower-ſtalk about an inch long: the empalement of the flower is compoſed of five narrow obtuſe leaves about an inch long, which are of a fine blue colour, and much more conſpicuous than the petals, which are white, and not more than half the length of the empalement. The plant is propagated by ſeeds procured from the places where they are natives, and of which very few are good; for though Dr. Houſton, the diſcoverer of the plant, ſent parcels of ſeeds to ſeveral perſons in England, only two plants were produced from the whole. The ſeeds muſt be ſown in a good hot-bed; and when the plants come up, they ſhould all be planted in a ſeparate ſmall pot filled with light loamy earth, and plunged into a hot-bed of tanners bark, where they ſhould afterwards conſtantly remain.

PETREL, in ornithology. See PROCELLARIA.

PETRIDIA, in natural hiſtory, a genus of ſcrupi, of a plain, uniform texture; of no great variety of colours, and emulating the external form of pebbles.

PETRIFACTION, in phyſiology, denotes the converſion of wood, bones, and other ſubſtances, principally animal or vegetable, into ſtone. Theſe bodies are more or leſs altered from their original ſtate, according to the different ſubſtances they have lain buried among in the earth; ſome of them having ſuffered very little change, and others being ſo highly impregnated with cryſtalline, ſparry, pyritical, or other extraneous matter, as to appear mere maſſes of ſtone, or lumps of the matter of the common pyrites; but they are generally of the external dimenſions, and retain more or leſs of the internal figure, of the bodies into the pores of which this matter has made its way. The animal-ſubſtances thus found petrified are chiefly ſea-ſhells; the teeth, bony palates, and bones, of fiſh; the bones of land-animals, &c. Theſe are found variouſly altered, by the inſinuation of ſtony and mineral matter into their pores; and the ſubſtance of ſome of them is now wholly gone, there being only ſtony, ſparry, or other mineral matter remaining in the ſhape and form.

Reſpecting the manner in which petrifaction is accompliſhed, we know but little. It has been thought by many philoſophers, that this was one of the rare proceſſes of nature; and accordingly ſuch places as afforded a view of it have been looked upon as great curioſities. However, it is now diſcovered, that petrifaction is exceedingly common; and that every kind of water carries in it ſome earthy particles, which being precipitated from it, become ſtone of a greater or leſſer degree of hardneſs; and this quality is moſt remarkable in thoſe waters which are much impregnated with ſelenitic matter. Of late, it has alſo been found by ſome obſervations on a petrifaction in Eaſt Lothian in Scotland, that iron contributes greatly to the proceſs: and this it may do by its precipitation of any aluminous earth which happens to be diſſolved in the water by means of an acid; for iron has the property of precipitating this earth, though it cannot precipitate the calcareous kind. The calcareous kinds of earth, however, by being ſoluble in water without any acid, muſt contribute very much to the proceſs of petrifaction, as they are capable of a great degree of hardneſs by means only of being joined with fixed air, on which depends the ſolidity of our common cement or mortar uſed in building houſes.

The name *petrifaction* belongs only, as we have ſeen, to bodies of vegetable or animal origin; and in order to determine their claſs and genus, or even ſpecies, it is neceſſary that their texture, their primitive form, and in ſome meaſure their organization, be ſtill diſcernible. Thus, we ought not to place the ſtony kernels moulded in the cavity of ſome ſhell, or other organized body, in the rank of petrifactions properly ſo called.

Petrifactions of the vegetable kingdom are almoſt all either gravelly or ſiliceous; and are found in gullies, trenches, &c. Thoſe which ſtrike fire with ſteel are principally found in ſandy fiſſures; thoſe which effervеſce in acids are generally of animal origin, and are found in the horizontal beds of calcareous earth, and ſometimes in beds of clay or gravel; in which caſe the nature of the petrifaction is different. As to the ſubſtances which are found in gypſum, they ſeldom undergo any alteration, either with reſpect to figure or compoſition, and they are very rare.

Organized bodies, in a ſtate of petrifaction, generally acquire a degree of ſolidity of which they were not poſſeſſed before they were buried in the earth, and ſome of them are often fully as hard as the ſtones or matrices in which they are enveloped. When the ſtones are broken, the fragments of petrifactions are eaſily found, and eaſily diſtinguiſhed. There are ſome organized bodies, however, ſo changed by petrifaction, as to render it impoſſible to diſcover their origin. That there is a matter more or leſs agitated, and adapted for penetrating bodies, which crumbles and ſeparates their parts, draws them along with it, and diſperſes them here and there in the fluid which ſurrounds them, is a fact of which nobody ſeems to entertain any doubt. Indeed we ſee almoſt every ſubſtance, whether ſolid or liquid, inſenſibly conſume, diminiſh in bulk, and at laſt, in the lapſe of time, vaniſh and diſappear.

A petrified ſubſtance, ſtrictly ſpeaking, is nothing more than the ſkeleton, or perhaps image, of a body which has once had life, either animal or vegetable, combined with ſome mineral. Thus, petrified wood is not in that ſtate wood alone. One part of the compound or maſs of wood having been deſtroyed by local cauſes, has been compenſated by earthy and ſandy ſubſtances, diluted and extremely minute, which the waters ſurrounding them had depoſited while they themſelves evaporated. Theſe earthy ſubſtances, being then moulded in the ſkeleton, will be more or leſs indurated, and will appear to have its figure, its ſtructure, its ſize, in a word, the ſame general characters, the ſame ſpecific attributes, and the ſame individual differences. Farther, in petrified wood, no veſtige of ligneous matter appears to exiſt. We know that common wood is a body in which the volume of ſolid parts is greatly exceeded by that of the pores. When wood is buried in certain places, lapidific fluids, extremely divided and ſometimes coloured, inſinuate themſelves into its pores and fill them up. Theſe fluids are afterwards moulded and condenſed. The ſolid part of the wood is decompoſed and reduced into powder, which is expelled without the maſs by aqueous filtrations. In this manner, the places which were formerly occupied by the wood are now left empty in the form of pores. This operation of nature produces no apparent difference either of the ſize or of the ſhape; but it occaſions, both at the ſurface and in the inſide, a change of ſubſtance, and the ligneous texture is inverted; that is to ſay, that which was pore in the natural wood, becomes ſolid in that which is petrified; and that which was ſolid or full in the firſt ſtate, becomes porous in the ſecond. In this way, ſays M. Mufard, petrified wood is much leſs extended in pores than ſolid parts, and at the ſame time forms a body much more denſe and heavy than the firſt. As the pores communicate from the circumference to the centre, the petrifaction ought to begin at the centre, and end with the circumference of the organic body ſubjected to the action of the lapidific fluids. Such is the origin of petrifactions. They are organized bodies which have undergone changes at the bottom of the ſea or the ſurface of the earth,

and which have been buried by various accidents at different depths under the ground.

In order to underſtand properly the detail of the formation of petrified bodies, it is neceſſary to be well acquainted with all their conſtituent parts. Let us take wood for an example. Wood is partly ſolid and partly porous. The ſolid parts conſiſt of a ſubſtance hard, ligneous, and compact, which forms the ſupport of the vegetable; the porous parts conſiſt of veſſels or interſtices which run vertically and horizontally acroſs the ligneous fibres, and which ſerve for conducting air, lymph, and other fluids. Among theſe veſſels, the trachiæ, which riſe in ſpiral forms, and which contain only air, are eaſily diſtinguiſhed. The cylindric veſſels, ſome of which contain lymph, and others the *ſuccus proprius*, are full only during the life of the vegetable. After its death they become vacant by the evaporation and abſence of the fluids with which they were formerly filled. All theſe veſſels, whether aſcending or deſcending, unite with one another, and form great cavities in the wood and in the bark. According to Malpighi and Duhamel, the ligneous fibres are themſelves tubular, and afford a paſſage to certain liquors; in ſhort, the wood and bark are interſperſed with utriculi of different ſhapes and ſizes. The augmentation of the trunk in thickneſs, according to Malpighi, is accompliſhed by the annual addition of a new exterior covering of fibres and of trachiæ. Others think that a concentric layer of ſap-wood is every year hardened, whilſt a new one is forming from the bark. But it is on all ſides agreed, that the concentric layers of wood are diſtinct from one another, becauſe, at the point of contact betwixt any two of them, the new veſſels, as well as new fibres, are more apparent and perceptible than they are in any other place. Having made theſe preliminary remarks on the ſtructure of vegetables, we ſhall now proceed to give an abridged account of the manner in which M. Mongez explains their petrifaction.

In proportion to the tenderneſs and bad quality of wood, it imbibes the greater quantity of water; therefore this ſort will unqueſtionably petrify more eaſily than that which is hard. It is thought that all the petrified wood ſo often found in Hungary has been originally ſoft, ſuch as firs or poplars. Suppoſe a piece of wood buried in the earth; if it be very dry, it will ſuck up the moiſture which ſurrounds it like a ſponge. This moiſture, by penetrating it, will dilate all the parts of which it is compoſed. The trachiæ, or air-veſſels, will be filled firſt, and then the lymphatic veſſels and thoſe which contain the *ſuccus proprius*, as they are likewiſe empty. The water which forms this moiſture keeps in diſſolution a greater or a leſs quantity of earth; and this earth, detached, and carried along in its courſe, is reduced to ſuch an attenuated ſtate, that it eſcapes our eyes and keeps itſelf ſuſpended, whether by the medium of fixed air or by the motion of the water. Such is the lapidific fluid. Upon evaporation, or the departure of the menſtruum, this earth, ſand, or metal, again appears in the form of precipitate or ſediment in the cavities of the veſſels, which by degrees are filled with it. This earth is there moulded with exactneſs: the lapſe of time, the ſimultaneous and partial attraction of the particles, make them adhere to one another; the lateral ſuction of the ſurrounding fibres, the obſtruction of the moulds, and the hardening of the moulded earth, become general; and there conſiſts nothing but an earthy ſubſtance which prevents the ſinking of the neighbouring parts. If the depoſit is formed of a matter in general pretty pure, it preſerves a whiter and clearer colour than the reſt of the wood; and as the concentric layers are only perceptible and diſtinct in the wood, becauſe the veſſels are there more apparent on account of their ſize, the little earthy cylinders, in the ſtate of petrified wood, muſt be there a little larger, and conſequently muſt repreſent exactly the turnings and ſeparations of theſe layers. At the place of the utriculi, globules are obſerved, of which the ſhapes are as various as the moulds wherein they are formed. The anaſtomoſes of the proper and lymphatic veſſels form, beſides, points of ſupport or reunion for this ſtony ſubſtance.

With regard to holes formed by worms in any bits of wood, before they had been buried in the earth, the lapidific fluid, in penetrating theſe great cavities, depoſits there as eaſily the earthy ſediment, which is exactly moulded in them. Theſe vermiform cylinders are ſomewhat leſs in bulk than the holes in which they are found, which is owing to the retreat of the more refined earth, and to its drying up.

Let any one repreſent to himſelf this collection of little cylinders, vertical, horizontal, inclined in different directions, the ſtony maſſes of utriculi and of anaſtomoſes, and he will have an idea of the ſtony ſubſtance which forms the ground-work of petrifaction. Hitherto not a ſingle ligneous part is deſtroyed; they are all exiſting, but ſurrounded on every ſide with earthy depoſits; and that body which, during life, was compoſed of ſolid and of empty parts, is now entirely ſolid: its deſtruction and decompoſition do not take place till after the formation of theſe little depoſits. In proportion as the water abandons them, it penetrates the ligneous ſubſtance, and deſtroys it by an inſenſible fermentation. The woody fibres being decompoſed, form in their turn voids and interſtices, and there remains in the whole piece nothing but little ſtony cylinders. But in proportion as theſe woody fibres diſappear, the ſurrounding moiſture, loaded with earth in the ſtate of diſſolution, does not fail to penetrate the piece of wood, and to remain in its new cavities. The new depoſit aſſumes exactly the form of decompoſed fibres; it envelops in its turn the little cylinders which were formed in their cavities, and ends by incorporating with them. We may ſuppoſe here, that in proportion as it decompoſes, there is a reaction of the ligneous part againſt the lapidific fluid: from this reaction a colour ariſes which ſtains more or leſs the new depoſit; and this colour will make it eaſily diſtinguiſhable from that which has been laid in the inſide of the veſſels. In all petrified wood this ſhade is generally perceptible.

We have then, ſays M. Mongez, four diſtinct epochs in the proceſs by which nature converts a piece of wood into ſtone, or, to ſpeak more juſtly, by which ſhe ſubſtitutes a ſtony depoſit in its place: 1. Perfect vegetable wood, that is to ſay, wood compoſed of ſolid and of empty parts, of ligneous fibres, and of veſſels. 2. Wood having its veſſels obſtructed and choked up by an earthy depoſit, while its ſolid parts remain unaltered. 3. The ſolid parts attacked and decompoſed, forming new cavities betwixt the ſtony cylinders, which remain in the ſame ſtate, and which ſupport the whole maſs. 4. Theſe new cavities filled with new depoſits, which incorporate with the cylinders, and compoſe nothing elſe but one general earthy maſs repreſenting exactly the piece of wood.

Among the petrifactions of vegetables called *dendrolites*, are found parts of ſhrubs, ſtems, roots, portions of the trunk, ſome fruits, &c. We muſt not, however, confound the impreſſions of moſſes, ferns, and leaves, nor incruſtations, with petrifactions.

Among the petrifactions of animals, we find ſhells, cruſtaceous animals, polyparii, ſome worms, the bony parts of fiſhes and of amphibious animals, few or no real inſects, rarely birds and quadrupeds, together with the bony portions of the human body. The cornua ammonis are petrified ſerpents; and with regard to figured and accidental bodies theſe are *luſus naturæ*.

In order, ſays M. Bertrand, in his *Dictionnaire des Foſſiles*, that a body ſhould become petrified, it is neceſſary that it be, 1. Capable of preſervation under ground: 2. That it be ſheltered from the air and running water (the ruins of Herculaneum prove that bodies which have no connection with free air preſerve themſelves untouched and entire). 3. That it be ſecured from

corrosive exhalations. 4. That it be in a place where there are vapours or liquids, loaded either with metallic or stony particles in a state of dissolution, and which, without destroying the body, penetrate it, impregnate it, and unite with it in proportion as its parts are dissipated by evaporation.

It is a question of great importance among naturalists, to know the time which nature employs in petrifying bodies of an ordinary size. It was the wish of the late emperor, duke of Lorraine, that some means should be taken for determining this question. M. le chevalier de Baillu, director of the cabinet of natural history of his imperial majesty, and some other naturalists, had, several years ago, the idea of making a research which might throw some light upon it. His imperial majesty being informed by the unanimous observations of modern historians and geographers, that certain pillars which are actually seen in the Danube in Gervia, near Belgrade, are remains of the bridge which Trajan constructed over that river, presumed that these pillars having been preserved for so many ages behoved to be petrified, and that they would furnish some information with regard to the time which nature employs in changing wood into stone. The emperor thinking this hope well founded, and wishing to satisfy his curiosity, ordered his ambassador at the court of Constantinople to ask permission to take up from the Danube one of the pillars of Trajan's bridge. The petition was granted, and one of the pillars was accordingly taken up; from which it appeared that the petrifaction had only advanced three-fourths of an inch in the space of 1500 years. There are, however, certain waters in which this transmutation is more readily accomplished. Petrifactions appear to be formed more slowly in earths that are porous and in a slight degree moist than in water itself.

When the foundations of the city of Quebec in Canada were dug up, a petrified savage was found among the last beds to which they proceeded. Although there was no idea of the time at which this man had been buried under the ruins, it is however true, that his quiver and arrows were still well preserved. In digging a lead-mine in Derbyshire in 1744, a human skeleton was found among stags horns. It is impossible to say how many ages this carcase had lain there. In 1695 the entire skeleton of an elephant was dug up near Tonna in Thuringia. Some time before this epoch the petrified skeleton of a crocodile was found in the mines of that country. We might cite another fact equally curious which happened at the beginning of the last century. John Munte, curate of Slægarp in Scania, and several of his parishioners, wishing to procure turf from a drained marshy soil, found, some feet below ground, an entire cart with the skeletons of the horses and carter. It is presumed that there had formerly been a lake in that place, and that the carter attempting to pass over on the ice had by that means probably perished. In fine, wood partly fossil and partly coaly has been found at a great depth, in the clay of which tile was made for the abbey of Fontenay. It is but very lately that fossil wood was discovered at the depth of 75 feet in a well betwixt Issi and Vauvres near Paris. This wood was in sand betwixt a bed of clay and pyrites, and water was found four feet lower than the pyrites. M. de Laumont, inspector general of the mines, says (*Journal de Physique*, Mai 1736), that in the lead-mine at Pontpéan near Rennes is a fissure, perhaps the only one of its kind. In that fissure, sea-shells, rounded pebbles, and an entire beech, have been found 240 feet deep. This beech was laid horizontally in the direction of the fissure. Its bark was converted into pyrites, the sap-wood into jet, and the centre into coal.

A great many pieces of petrified wood are found in different counties of France and Savoy. In Cobourg in Saxony, and in the mountains of Misnia, trees of a considerable thickness have been taken from the earth, which were entirely changed into a very fine agate, as also their branches and their roots. In sawing them, the annual circles of their growth have been distinguished. Pieces have been taken up, on which it was distinctly seen that they had been gnawed by worms; others bear visible marks of the hatchet. In fine, pieces have been found which were petrified at one end, while the other still remained in the state of wood fit for being burned. It appears then that petrified wood is a great deal less rare in nature than is commonly imagined.

Cronstedt has excluded petrifactions from any place in the body of his System of Mineralogy, but takes notice of them in his appendix. He distinguishes them by the name of *Mineralia Larvata*, and defines them to be "mineral bodies in the form of animals or vegetables." The most remarkable observations concerning them, according to Mr. Kirwan, who differs in some particulars from Mongez, are as follow: 1. Those of shells are found on or near the surface of the earth; those of fish deeper; and those of wood deeper still. Shells in substance are found in vast quantities, and at considerable depths. 2. The substances most susceptible of petrifaction are those which most resist the putrefactive process; of which kind are shells, the harder kinds of wood, &c.; while the softer parts of animals, which easily putrefy, are seldom met with in a petrified state. 3. They are most commonly found in strata of marl, chalk, limestone, or clay; seldom in sandstone, still more seldom in gypsum; and never in gneiss, granite, basaltes, or schoerl. Sometimes they are found in pyrites, and ores of iron, copper, and silver; consisting almost always of that kind of earth or other mineral which surrounds them; sometimes of silex, agate, or cornelian. 4. They are found in climates where the animals themselves could not have existed. 5. Those found in slate or clay are compressed and flattened.

The different species of petrifactions, according to Cronstedt, are,

I. *Terræ Larvatæ*; extraneous bodies changed into a limy substance or calcareous changes. These are, 1. Loose or friable. 2. Indurated. The former are of a chalky nature in form of vegetables or animals; the second filled with solid limestone in the same forms. Some are found entirely changed into a calcareous spar. All of them are found in France, Sweden, and other countries in great plenty.

On these petrifactions Cronstedt observes, that shells and corals are composed of limy matter even when still inhabited by their animals, but they are classed among the petrifactions as soon as the calcareous particles have obtained a new arrangement: for example, when they have become sparry; filled with calcareous earth either hardened or loose, or when they lie in the strata of the earth. "These, says he, form the greatest part of the fossil collections which are so industriously made, often without any regard to the principal and only use they can be of, viz. that of enriching zoology. Mineralogists are satisfied with seeing the possibility of the changes the limestone undergoes in regard to its particles; and also with receiving some insight into the alteration which the earth has been subject to from the state of the strata which are now found in it." The calcined shells, where the petrifactions are of a limy or chalky nature, answer extremely well as a manure; but the indurated kind serve only for making grottoes. Gypseous petrifactions are extremely rare: however, Chardin informs us that he had seen a lizard inclosed in a stone of that kind in Persia.

II. *Larvæ*, or bodies changed into a flinty substance. These are all indurated, and are of the following species: 1. Cornelians in form of shells from the river Tomin in Siberia. 2. Agate in form of wood; a piece of which is said to be in the collection of the count de Tessin. 3. Coralloids of white flint (*Mills-*

pora) found in Sweden. 4. Wood of yellow flint found in Italy, in Turkey near Adrianople, and produced by the waters of Lough-neagh in Ireland.

III. *Larvæ Argillaceæ*; where the bodies appear to be changed into clay. Theſe are found either looſe and friable, or indurated. Of the former kind is a piece of porcelain clay met with in a certain collection, with all the marks of the root of a tree upon it. Of the latter kind is the oſteocolla; which is ſaid to be the roots of the poplar-tree changed, and not to conſiſt of any calcareous ſubſtance. A ſort of foſſil ivory, with all the properties of clay, is ſaid likewiſe to be found in ſome places.

IV. *Larvæ Inſalitæ*; where the ſubſtances are impregnated with great quantities of ſalts. Human bodies have been twice found impregnated with vitriol of iron in the mine of Fahlun, in the province of Dalarne in Sweden. One of them was kept for ſeveral years in a glaſs-caſe, but at laſt began to moulder and fall to pieces. Turf and roots of trees are likewiſe found in water ſtrongly impregnated with vitriol. They do not flame, but look like a coal in a ſtrong fire; neither do they decay in the air.

V. Bodies penetrated by mineral inflammable ſubſtances. 1. By pit-coal, ſuch as wood; whence ſome have imagined coal to have been originally produced from wood. Some of theſe ſubſtances are fully ſaturated with the coaly matter; others not. Among the former Cronſtedt reckons jet; among the latter the ſubſtance called *mumia vegetabilis*, which is of a looſe texture, reſembling amber, and may be uſed as ſuch. 2. Thoſe penetrated by aſphaltum or rock-oil. The only example of theſe given by our author is a kind of turf in the province of Skone in Sweden. The Egyptian mummies, he obſerves, cannot have any place among this ſpecies, as they are impregnated artificially with aſphaltum, in a manner ſimilar to what happens naturally with the wood and coaly matter in the laſt ſpecies. 3. Thoſe impregnated with ſulphur which has diſſolved iron, or with *pyrites*. Human bodies, bivalve and univalve ſhells and inſects, have been all found in this ſtate; and the laſt are found in the alum ſtate at Andrarum, in the province of Skone in Sweden.

VI. *Larvæ Metalliferæ*; where the bodies are impregnated with metals. Theſe are, 1. Covered with native ſilver; which is found on the ſurface of ſhells in England. 2. Where the metal is mineraliſed with copper and ſulphur. Of this kind is the fahlertz or grey ſilver ore, in the ſhape of ears of corn, and ſuppoſed to be vegetables, found in argillaceous ſlate at Frankenberg and Tahlitteren in Heſſe. 3. *Larvæ cupriferæ*, where the bodies are impregnated with copper. To this ſpecies principally belong the Turquoiſe or Turkey ſtones, improperly ſo called; being ivory and bones of the elephant or other animals impregnated with copper. See TURQUOISE. At Simore in Languedoc there are bones of animals dug up, which, during calcination, aſſume a blue colour; but according to Cronſtedt it is not probable that theſe owe their colour to copper. 3. With mineraliſed copper. Of theſe our author gives two examples. One is, where the copper is mineraliſed with ſulphur and iron, forming a yellow marcaſitical ore. With this ſome ſhells are impregnated which lie upon a bed of loadſtone in Norway. Other petrifactions of this kind are found in the form of fiſh in different parts of Germany. The other kind is where the copper is impregnated with ſulphur and ſilver. Of this kind is the grey ſilver ore, like ears of corn, found in the ſlate quarries at Heſſe. 4. *Larvæ ferriferæ*, with iron in form of a calx, which has aſſumed the place or ſhape of extraneous bodies. Theſe are either looſe or indurated. Of the looſe kind are ſome roots of trees found at the lake Langelma in Finland. The indurated kinds are exemplified in ſome wood found at Orbiſſan in Bohemia. 5. Where the iron is mineraliſed, as in the pyritaceous larvæ already deſcribed.

VII. Where the bodies are tending to decompoſition, or in a way of deſtruction. Among theſe, our author enumerates MOULD and TURF, which ſee; as alſo CEMENT, MORTAR, ROCK, SAND, SELENITÆ, STONE, and WATER. See alſo the article FOSSIL, plates 31 and 32, Vol. III. and MOUNTAIN.

We ſhall add the following deſcription of a very curious animal petrifaction. The Abbé de Sauvages, celebrated for his refined taſte and knowledge in natural hiſtory, in a tour through Languedoc, between Alais and Uzes, met with a narrow vein of no more than two toiſes wide, which croſſes the road, and is bordered on one ſide by a grey dirty ſoil, and on the other by a dry ſandy earth, each of a vaſt extent, and on a level with the narrow vein which ſeparates them. In this narrow vein only are contained petrified ſhells, cemented together by a whitiſh marl. They are in prodigious plenty; among which there is one ſpecies which the Abbé does not remember to have known to have been any where deſcribed, and may probably be a new acquiſition to natural hiſtory.

This ſhell has the ſhape of a horn, ſomewhat incurvated towards the baſe. (See fig. 9. plate 32.) It ſeems compoſed of ſeveral cups, let into each other, which are ſometimes found ſeparate. They have all deep channels, which extend, as in many other ſhells, from the baſe to the aperture; the projecting ribs which form theſe channels are moſtly worn away, being rarely to be found entire. Sometimes ſeveral are grouped together; and as a proof that they are not a fortuitous aſſemblage cauſed by the petrifaction, they are fixed together through their whole length, in ſuch ſort, that their baſe and aperture are regularly turned the ſame way. The Abbé ſhould have referred this to the genus which Linnæus and the marquis d'Argenville named *dentalis*, had they not been let into each other. He found ſome of them whoſe aperture or hollow was not ſtopped up by the petrifaction, and ſeemed as cones adapted to one another (fig. 10.), forming a row of narrow cells, ſeparated by a very thin partition: this row occupied not more than one-half of the cavity of the ſhell.

Our article has already extended to ſuch a length as to preclude any further additions: we cannot, however, finiſh it without obſerving, that foſſil bones are very common in Dalmatia. They are of various kinds, and in their nature apparently very extraordinary; but we have found no tolerable account or probable conjecture of their origin. Vitaliano Donati of Padua, in his *Saggio ſopra la ſtorie naturale dell' Adriatico*, was the firſt who took notice of them; and Fortis, in his Travels into Dalmatia, has given a copious account of them. They are moſt common in the iſlands of *Cherſo* and *Oſero*. See Fortis's Travels into Dalmatia, page 440—465, and our article VITALIANO.

PETRIFIED CITY. The ſtory of a petrified city is well known all over Africa, and has been believed by many conſiderable perſons even in Europe. Louis XIV. was ſo fully perſuaded of its reality, that he ordered his ambaſſador to procure the body of a man petrified from it at any price. Dr. Shaw's account of this affair is as follows: "About 40 years ago (now more than 80), when M. le Maire was the French conſul at Tripoli, he made great inquiries, by order of the French court, into the truth of the report concerning a petrified city at Ras Sem: and amongſt other very curious accounts relating to this place, he told me a remarkable circumſtance, to the great diſcredit, and even confutation, of all that had been ſo poſitively advanced with regard to the petrified bodies of men, children, and other animals.

"Some of the janizaries, who, in collecting tribute, traverſe the diſtrict of Ras Sem, promiſed him, that, as an adult perſon

would be too cumberſome, they would undertake, for a certain number of dollars, to bring him from thence the body of a little child. After a great many pretended difficulties, delays, and diſappointments, they produced at length a little Cupid, which they had found, as he learned afterwards, among the ruins of Leptis; and, to conceal the deceit, they broke off the quiver, and ſome other of the diſtinguiſhing characteriſtics of that deity. However, he paid them for it, according to promiſe, 1000 dollars, which is about 150l. ſterling of our money, as a reward for their faithful ſervice and hazardous undertaking; having run the riſk, as they pretended, of being ſtrangled if they ſhould have been diſcovered in thus delivering up to an infidel one of thoſe unfortunate Mahometans, as they take them originally to have been.

"But notwithſtanding this cheat and impoſition had made the conſul deſiſt from ſearching after the petrified bodies of men and other animals; yet there was one matter of fact, as he told me, which ſtill very ſtrangely embarraſſed him, and even ſtrongly engaged him in favour of the current report and tradition. This was, ſome little loaves of bread, as he called them, which had been brought to him from that place. His reaſoning, indeed, thereupon, provided the pretended matter of fact had been clear and evident, was juſt and ſatisfactory; for where we find loaves of bread, there, as he urged, ſome perſons muſt have been employed in making them, as well as others for whom they were prepared. One of theſe loaves he had, among other petrifactions, very fortunately brought with him to Cairo, where I ſaw it, and found it to be an echinites of the diſcoid kind, of the ſame faſhion with one I had lately found and brought with me from the deſerts of Marah. We may therefore reaſonably conclude, that there is nothing to be found at Ras Sem, unleſs it be the trunks of trees, echinites, and ſuch petrifactions as have been diſcovered at other places.

"M. le Maire's inquiries, which we find were ſupported by the promiſe and performance of great rewards, have brought nothing further to light. He could never learn that any traces of walls, or buildings, or animals, or utenſils, were ever to be ſeen within the verge of theſe pretended petrifications. The like account I had from a Sicilian renegado, who was the janizary that attended me whilſt I was in Egypt; and as in his earlier years he had been a ſoldier of Tripoli, he aſſured me that he had been ſeveral times at Ras Sem. This I had confirmed again in my return from the Levant by the interpreter of the Britiſh factory at Tunis, who was likewiſe a Sicilian renegado; and being the libertus or freedman of the baſhaw of Tripoli, was preferred by him to be the bey or viceroy of the province of Darna, where Ras Sem was immediately under his juriſdiction. His account was likewiſe the ſame; neither had he ever ſeen, in his frequent journeys over this diſtrict, any other petrifications than what are above mentioned. So that the petrified city, with its walls, caſtles, ſtreets, ſhops, cattle, inhabitants, and utenſils, were all of them at firſt the mere inventions of the Arabs, and afterwards propagated by ſuch perſons, who, like the Tripoli ambaſſador, and his friend above mentioned, were credulous enough to believe them.

"However, there is one remarkable circumſtance relating to Ras Sem that deſerves well to be recorded. When the winds have blown away the billows of ſand which frequently cover and conceal theſe petrifications, they diſcover, in ſome of the lower and more depreſſed places of this diſtrict, ſeveral little pools of water, which is uſually of ſo ponderous a nature, that, upon drinking it, it paſſes through the body like quickſilver. This perhaps may be that petrifying fluid which has all along contributed to the converſion of the palm-trees and the echini into ſtone: for the formation not only of theſe, but of petrifications of all kinds, may be entirely owing to their having firſt of all lodged in a bed of loam, clay, ſand, or ſome other proper nidus or matrix, and afterwards gradually been acted upon and pervaded by ſuch a petrifying fluid as we may ſuppoſe this to be."

To this account it may not be amiſs to ſubjoin the memorial of Caſſem Aga, the Tripoli ambaſſador at the court of Britain. The city, he ſays, is ſituated two days journey ſouth from Onguela, and 17 days journey from Tripoli by caravan to the ſouth-caſt. "As one of my friends (ſays the ambaſſador) deſired me to give him in writing an account of what I knew touching the petrified city, I told him what I had heard from different perſons, and particularly from the mouth of one man of credit who had been on the ſpot: that is to ſay, that it was a very ſpacious city, of a round form, having great and ſmall ſtreets therein, furniſhed with ſhops, with a vaſt caſtle magnificently built; that he had ſeen there ſeveral ſorts of trees, the moſt part olives and palms, all of ſtone, and of a blue or rather lead colour: that he ſaw alſo figures of men in a poſture of exerciſing their different employments; ſome holding in their hands ſtuffs, others bread, every one doing ſomething, even women ſuckling their children, and in the embraces of their huſbands, all of ſtone; that he went into the caſtle by three different gates, though there were many more, where he ſaw a man lying upon a bed of ſtone; that there were guards at the gates with pikes and javelins in their hands: in ſhort, that he ſaw in this wonderful city many ſorts of animals, as camels, oxen, horſes, aſſes, ſheep, and birds, all of ſtone, and the colour above mentioned."

We have ſubjoined this account, becauſe it ſhows in ſtriking colours the amazing credulity of mankind, and the avidity with which they ſwallow the marvellous; and the difficulty of diſcovering the truth reſpecting places or things at a diſtance from us.

PETROBRUSSIANS, a religious ſect, which had its riſe in France and the Netherlands about the year 1110. The name is derived from *Peter Bruys*, a Provençal, who made the mo laudable attempt to reform the abuſes and remove the ſuperſtition that diſgraced the beautiful ſimplicity of the goſpel. His followers were numerous; and for 20 years his labour in the miniſtry was exemplary and unremitted. He was, however, burnt in the year 1130 by an enraged populace ſet on by the clergy.

The chief of Bruys's followers was a monk named *Henry*; from whom the Petrobruſſians were alſo called *Henricians*. Peter the Venerable, abbot of Clugny, has an expreſs treatiſe againſt the Petrobruſſians; in the preface to which he reduces their opinions to five heads. 1. They denied that children before the age of reaſon can be juſtified by baptiſm, in regard it is our own faith that ſaves by baptiſm. 2. They held that no churches ſhould be built, but that thoſe that already are ſhould he pulled down; an inn being as proper for prayers as a temple, and a ſtable as an altar. 3. That the croſs ought to be pulled down and burnt, becauſe we ought to abhor the inſtruments of our Saviour's paſſion. 4. That the real body and blood of Chriſt are not exhibited in the euchariſt, but merely repreſented by their figures and ſymbols. 5. That ſacrifices, alms, prayers, &c. do not avail the dead. F. Langlois objects Manicheiſm to the Petrobruſſians; and ſays, they maintained two gods, the one good, the other evil: but this we rather eſteem an effect of his zeal for the catholic cauſe, which determined him to blacken the adverſaries thereof, than any real ſentiment of the Petrobruſſians.

PETROJOANNITES, were followers of Peter John, or Peter Joannis, *i. e.* Peter the ſon of John, who flouriſhed in the 12th century. His doctrine was not known till after his death, when his body was taken out of his grave and burnt. His opinions were, that he alone had the knowledge of the true ſenſe wherein the apoſtles preached the goſpel; that the reaſonable ſoul is not the form of man; that there is no grace infuſed by

baptiſm; and that Jeſus Chriſt was pierced with a lance on the croſs before he expired.

PETROLEUM, or Rock oil; a thick oily ſubſtance exuding out of the earth, and collected on the ſurface of wells in many parts of the world. It is found on ſome in Italy, and in a deſerted mine in the province of Dalarne in Sweden. In this laſt place it collects itſelf in ſmall hollows of limeſtone, like reſin in the wood of the pine-tree. It is found trickling from the rocks, or iſſuing from the earth, in many parts of the duchy of Modena, and in various parts of France, Switzerland, Germany, and Scotland, as well as in Aſia. It is alſo found not only on the ſurface of wells as already mentioned, but mixed with earth and ſand, from whence it may be ſeparated by infuſion in water. It is of a pungent and acrid taſte, and ſmells like the oil of amber, but more agreeable. It is very light and very pellucid; but, though equally bright and clear under all circumſtances, it is liable to a very great variety in its colour. It is naturally almoſt colourleſs, and in its appearance greatly reſembles the moſt pure oil of turpentine: this is called *white petroleum*, though it has no more colour than water. It is ſometimes tinged of a browniſh, reddiſh, yellowiſh, or faint greeniſh colour; but its moſt frequent colour is a mixture of the reddiſh and blackiſh, in ſuch a degree that it looks black when viewed behind the light, but purple when placed between the eye and a candle or window. It is rendered thinner by diſtillation with water, and leaves a reſinous reſiduum: when diſtilled with a volatile alkali, the latter acquires the properties of ſuccinated ammoniac, and contains the acid of amber. It is the moſt frequent of all the liquid bitumens, and is perhaps the moſt valuable of them all in medicine. It is to be choſen the pureſt, lighteſt, and moſt pellucid that can be had, ſuch as is of the moſt penetrating ſmell and is moſt inflammable. Monet informs us that ſome kinds of it are of the denſity of nut-oil. It is inſoluble in ſpirit of wine; which, though it be the great diſſolvent of ſulphur, has no effect upon petroleum, not even with ever ſo long a digeſtion. It will not take fire with the dephlegmated acid ſpirits, as oil of cloves and other of the vegetable eſſential oils do: and in diſtillation, either by balneum mariæ or in ſand, it will neither yield phlegm nor acid ſpirit; but the oil itſelf riſes in its own form, leaving in the retort only a little matter, thick as honey, and of a browniſh colour.

The finer kinds reſemble naphtha. Kirwan is of opinion that naphtha is converted into petroleum by a proceſs ſimilar to what takes place in eſſential oils when expoſed to the atmoſphere; in which caſe the oil abſorbs not only the pure, but alſo the phlogiſticated, part of the atmoſphere, in conſequence of which ſeveral alterations take place in them.

Mr. Bouldoc made ſeveral experiments with the white petroleum of Modena; an account of which he gave to the Paris academy.

It eaſily took fire on being brought near a candle, and that without immediately touching the flame; and when heated in any veſſel it will attract the flame of a candle, though placed at a great height above the veſſel; and the vapour it ſends up taking fire, the flame will be communicated to the veſſel of heated liquor, and the whole will be conſumed. It burns in the water; and when mixed with any liquor ſwims on the ſurface of it, even of the higheſt rectified ſpirit of wine, which is $\frac{1}{7}$th heavier than pure petroleum. It readily mixes with all the eſſential oils of vegetables, as oil of lavender, turpentine, and the reſt, and ſeems very much of their nature: nor is this very ſtrange, ſince the alliance between theſe bodies is probably nearer than is imagined, as the eſſential oils of vegetables may have been originally mineral ones, and drawn up out of the earth into the veſſels of the plants.

The diſtinguiſhing characteriſtic of the petroleum is its thickneſs, reſembling inſpiſſated oil: when pure it is lighter than ſpirit of wine; but, though ever ſo well rectified, it becomes in time thick and black as before. Petroleum, when ſhaken, yields a few bubbles; but they ſooner ſubſide than in almoſt any other liquor, and the liquor reſumes its clear ſtate again almoſt immediately. This ſeems owing to the air in this fluid being very equally diſtributed to all its parts, and the liquor being compoſed of particles very evenly and nicely arranged. This extenſibility of the oil is alſo amazing. A drop of it will ſpread over ſeveral feet of water, and in this condition it gives a great variety of colours; that is, the ſeveral parts of which this thin film is compoſed act as ſo many priſms. The moſt ſevere froſt never congeals petroleum into ice; and paper wetted with it becomes tranſparent as when wetted with oil; but it does not continue ſo, the paper becoming opaque again in a few minutes as the oil dries away.

There are three varieties of it according to Mongez: 1. The yellow, found at Modena in Italy; very light and volatile. 2. The reddiſh, or yellowiſh red; ſome of which is collected at Gabian in Languedoc and in Alſace. 3. The heavy, black, or brown kind, which is the moſt common, and met with in England, France, Germany, and ſome other countries. It generally runs out either from chinks or gaps of rocks, or is mixed with the earth, and guſhes out of it; or it ſwims on the water of ſome fountains, as already mentioned. According to Dr. Lippert, a kind of reſin is produced by mixing petroleum with ſmoking nitrous acid. The taſte of this ſubſtance is very bitter, but the ſmell reſembles that of muſk. The vitriolic acid, according to the ſame author, produces a reſin ſtill more bitter, but without any aromatic ſmell. Cronſtedt enumerates the following ſpecies:

I. *Maltha*, or Barbadoes tar, a thick ſubſtance reſembling ſoft pitch. It is found in ſeveral parts of Europe and Aſia; particularly Sweden, Germany, and Switzerland; on the coaſt of the Dead Sea in Paleſtine; in Perſia, in the chinks of rocks, and in ſtrata of gypſum and limeſtone, or floating upon water. It is found alſo in America, and at Colebrookdale in England. Kirwan tells us, that petroleum expoſed for a long time to the air forms this ſubſtance. It is of a viſcid conſiſtence; and of a brown, black, or reddiſh black colour. Sometimes it is inodorous, but generally of a more or leſs diſagreeable ſmell, particularly when burned. It melts eaſily, and burns with much ſmoke and ſoot, leaving either aſhes or a flag according to the heterogeneous matter it contains. It contains a portion of the acid of amber. It gives a bitter ſalt with mineral alkali, more difficult of ſolution than common ſalt, and which, when treated with charcoal, does not yield any ſulphur.

II. *Elaſtic Petrol*; a very ſingular kind of foſſil met with in ſome parts of England. This, in colour and conſiſtency, exactly reſembles the Caoutchouc, or elaſtic gum-reſin, commonly called *Indian rubber*, found in South America, and uſed for rubbing out the traces of black-lead pencils from paper. It is of a dark brown colour, almoſt black; and in ſome pieces has a yellowiſh brown caſt like the ſame gum-reſin. It can ſcarce be diſtinguiſhed from the caoutchouc with regard to its elaſtic property, excepting that the coheſion of its parts is not ſo great. It burns with a ſmoky flame, and melts likewiſe into a thick oily fluid; but emits a diſagreeable ſmell like the Foſſil *Pitch* or Barbadoes tar. "On the whole (ſays M. Magellan) this foſſile ſeems to confirm the opinion of thoſe mineralogiſts who believe that theſe oily combuſtibles derive their origin from the vegetable kingdom. It ſeems worth trying whether pieces of aſphaltum, buried in damp beds of ſparry rubbiſh or other kinds of earth, would take the ſame elaſtic conſiſtence." This ſubſtance was found in the year 1785 near Caſſelton in Derbyſhire, but in very ſmall quantities. Some of the ſpecimens were of a cylindrical form, like bits of ſmall branches or ſtalks of vegetables; though much more flexible, being perfectly elaſtic.

III. *Hardened rock-oil*, or foſſil pitch, an inflammable ſubſtance dug out of the ground in many parts of the world, and known by the names of *petroleum induratum*, *pix montana*, *indenpech*, *berghartz*, &c. There are two ſpecies. 1. The aſphaltum, or pure foſſil pitch, found on the ſhores of the Dead Sea and of the Red Sea; alſo in Sweden, Germany, and France: See ASPHALTUM. It is a ſmooth, hard, brittle, inodorous ſubſtance, of a black or brown colour when looked at; but, on holding it up betwixt the eye and the light, appears of a deep red. It ſwims in water; breaks with a ſmooth and ſhining ſurface; melts eaſily; and, when pure, burns without leaving any aſhes; but, if impure, leaves aſhes, or a ſlag. M. Monet aſſerts that it contains ſulphur, or at leaſt the vitriolic acid. It is ſlightly and partially acted upon by ſpirit of wine and ether. Beſides the countries above mentioned, Brunnich informs us that the aſphaltum comes from Porto Principe in the iſland of Cuba in the Weſt Indies. It is likewiſe found, according to Fourcroy, in many parts of China; and is uſed for a covering to ſhips by Arabs and Indians. 2. The *pix montana impura* contains a great quantity of earthy matter, which is left in the retort after diſtillation, or upon the charcoal if burnt in the open fire. It coheres like a ſlag, and is of the colour of black-lead; but in a ſtrong heat this earth is ſoon volatilized, ſo that its nature is not yet well known. During the diſtillation a liquid ſubſtance falls into the receiver, which is found to be of the ſame nature with rock-oil. The ſubſtance itſelf is found in Sweden and ſeveral other countries. The piſaſphaltum is of a mean conſiſtence between the aſphaltum and the common petroleum. Mongez ſays that it is the ſame with the bitumen collected from a well named *De la Pegé*, near Clermont Ferrand in France.

The people of mount Ciaro, in Italy, have ſome years ſince found out a much eaſier way of finding petroleum than that which they formerly had been uſed to. This mountain abounds with a ſort of greyiſh ſalt, which lies in large horizontal beds, mingled with ſtrata of clay, and large quantities of a ſpar of that kind called by the Germans *ſe'enites*; which is the common ſort, that ferments with acids, and readily diſſolves in them, and calcines in a ſmall fire. They pierce theſe ſlates in a perpendicular direction till they find water; and the petroleum which had been diſperſed among the cracks of thoſe ſlates is then waſhed out by the water, and brought from all the neighbouring places to the hole or well which they have dug, on the ſurface of the water of which it ſwims after eight or ten days. When there is enough of it got together, they lade it from the top of the water with braſs baſons; and it is then eaſily ſeparated from what little water is taken up with it. Theſe wells or holes continue to furniſh the oil in different quantities for a conſiderable time; and when they will yield no more, they pierce the ſlates in ſome other place.

It is never uſed among us as a medicine; but the French give it internally in hyſteric complaints, and to their children for worms; ſome alſo give it from 10 to 15 drops in wine for ſuppreſſions of the menſes. This, however, is rather the practice of the common people than of the faculty.

PETROMYZON, the LAMPREY, a genus of fiſhes belonging to the claſs of amphibia nantes. It has ſeven ſpiracula at the ſide of the neck, no gills, a fiſtula on the top of the head, and no breaſt or belly fins. There are three ſpecies, diſtinguiſhed by peculiarities in their back fins.

1. The *marinus*, or ſea-lamprey, is ſometimes found ſo large as to weigh four or five pounds. It greatly reſembles the eel in ſhape; but its body is larger, and its ſnout longer, narrower, and ſharper at the termination. The opening of the throat is very wide; each jaw is furniſhed with a ſingle row of very ſmall teeth; in the middle of the palate are ſituated one or two other teeth, which are longer, ſtronger, and moveable towards the inſide of the throat; the inferior part of the palate preſents moreover a row of very ſmall teeth, which reaches to the bottom of the throat, where we find four long notched bones; two ſhort fiſtulous proceſſes are obſervable at the extremity of the ſnout, and there are two others, thicker but ſtill ſhorter, above the eyes. Willughby ſuppoſes that the latter are the organ of hearing, and the former the organ of ſmell. His opinion with regard to the auditory faculty of this fiſh is founded on what we read in ancient authors, that the fiſhermen attracted the lampreys by whiſtling, and that Craſſus had tamed one of them to ſuch a degree that it knew his voice and obeyed his call.

The eyes of the lamprey are ſmall, and covered with a tranſparent light blue membrane; the pupil is bordered with a circle of a colour reſembling gold: near the gills, which are four in number, there is a round hole on both ſides, through which it diſcharges the water. The lamprey has no fins on his belly or breaſt; on the back we obſerve a fin, which begins pretty near the head, extends to the tail, which it turns round, and is afterwards continued to the anus: this fin is covered by the ſkin of the body, to which it adheres but looſely; the ſkin is ſmooth, of a red blackiſh colour, and ſtreaked with yellow; the lamprey advances in the water with winding motions like thoſe of a ſerpent, which is common to it, with all the anguiliform fiſhes.

The lamprey lives on fleſh. During the cold it lies concealed in the crevices of ſea-rocks, and conſequently is fiſhed for only at certain ſeaſons. It lives in a ſtate of hoſtility with the poulpe, a kind of ſea polypus, which ſhuns the combat as long as it can; but when it finds the impoſſibility of eſcape, it endeavours to ſurround the lamprey with its long arms. The latter ſlips away, and the poulpe becomes its prey. The lobſter, we are told, avenges the poulpe, and deſtroys the lamprey in its turn. See CANCER.

Rondelet ſays, that the fiſhermen conſider the bite of the lamprey as venomous and dangerous, and never touch it while alive but with pincers. They beat it on the jaws with a ſtick, and cut off its head. The ſame naturaliſt obſerves, that its aſhes are a cure for its bite, and for the king's evil. When any one has been bit by a lamprey, the moſt effectual method is to cut out the part affected. Lampreys are very dexterous in ſaving themſelves: when taken with a hook, they cut the line with their teeth; and when they perceive themſelves caught in a net, they attempt to paſs through the meſhes. They fiſh for lampreys only on the pebbly edges of ſea-rocks; ſome of theſe pebbles are drawn together to make a pit as far as the water-edge, or perhaps a little blood is thrown in, and the lamprey is immediately obſerved to put forth its head between two rocks. As ſoon as the hook, which is baited with crab or ſome other fiſh, is preſented to it, it ſwallows it greedily, and drags it into its hole. There is then occaſion for great dexterity to pull it out ſuddenly; for, if it is allowed time to attach itſelf by the tail, the jaw would be torn away before the fiſh could be taken. This ſhows that its ſtrength reſides in the end of its tail; the reaſon of which is, that the great bone of this fiſh is reverſed, ſo that the bones, which in all other fiſhes are bent towards the tail, are here turned in a contrary direction, and aſcend towards the head. After the lamprey is taken out of the water, it is not killed without a great deal of trouble: the beſt way is to cut the end of its tail, or perhaps to cruſh it with repeated blows on the ſpine, in order to prevent it from leaping. This ſhows that in the lamprey animal life extends to the end of the ſpinal marrow.

M. de Querhoent removes our fears concerning the ſuppoſed poiſon of the lamprey. This ſpecies of fiſh, he tells us, abounds on the coaſts of Africa and at the Antilles iſles; it is found likewiſe on the coaſt of Brazil, at Surinam, and in the Eaſt Indies. When taken with a hook, we muſt have the precaution to kill it before we take it off, otherwiſe it darts upon the fiſher and wounds him ſeverely. Its wounds, however, are not venom-

cus, M. de Querhoent having ſeen ſeveral ſailors who were bit by it, but experienced no diſagreeable conſequences. Lampreys are likewiſe found in great abundance at Aſcenſion Iſland, but particularly in the ſeas of Italy: their fleſh when dried is excellent; and boiling gives to the vertebræ the colour of gridelin.

The fleſh of the lamprey is white, fat, ſoft, and tender; it is pretty agreeable to the taſte, and almoſt as nouriſhing as that of the eel; thoſe of a large ſize are greatly ſuperior to the ſmall ones. We know that the moſt wealthy of the Romans kept them in fiſh-ponds at a great expence. Vedius Pollio, the friend of Auguſtus, who is diſtinguiſhed in hiſtory for his ſavage gluttony, on ſuppoſition that lampreys fed on human fleſh were more delicate, ordered his ſlaves when accuſed of the ſlighteſt faults to be thrown into his fiſh-ponds. We are no leſs ſurpriſed, in reading the ancient authors, to perceive the extraordinary attachment which the celebrated orators Hortenſius and Craſſus, men in other reſpects ſo grave and ſenſible, had to this animal. One of them ſhed tears at the loſs of a lamprey; the other improved upon this puerility, and wore mourning at the death of his favourite. It is remarkable, that this fiſh, which is proper to the ſea, and never comes into the rivers, can live and ſatten in freſh water. For the advancement of natural hiſtory, it were to be wiſhed, that ſome perſon who lives near the ſea-ſhore would make obſervations, in order to diſcover whether the lamprey is viviparous: its ſcales are ſo imperceptible, that they have been overlooked by moſt ichthyologiſts.

Mr. Pennant is of opinion, that the ancients were unacquainted with this fiſh; at leaſt, he ſays, it is certain, that which Dr. Arbuthnot and other learned men render the word *lamprey*, is a ſpecies unknown in our ſeas, being the *muræna* of Ovid, Pliny, and others, for which we want an Engliſh name. This fiſh, the *lupus* (our baſſe), and the *myxo* (a ſpecies of mullet), formed that pride of Roman banquets the *tripatinam*, ſo called, according to Arbuthnot, from their being ſerved up in a machine with three bottoms. The words *lampetra* and *petromyzon* are but of modern date, invented from the nature of the fiſh; the firſt *a lambendo petras*, the other from πετρος and μυσαω, becauſe they are ſuppoſed to lick or ſuck the rocks.

2. The *fluviatilis*, or leſſer lamprey, ſometimes grows to the length of ten inches. The mouth is formed like that of the preceding. On the upper part is a large bifurcated tooth: on each ſide are three rows of very minute ones: on the lower part are ſeven teeth, the exterior of which on one ſide is the largeſt. The irides are yellow. As in all the other ſpecies, between the eyes on the top of the head is a ſmall orifice, of great uſe to clear its mouth of the water that remains on adhering to the ſtones: for through that orifice it ejects the water in the ſame manner as cetaceous fiſh. On the lower part of the back is a narrow fin; and beneath that riſes another, which at the beginning is high and angular, then grows narrow, ſurrounds the tail, and ends near the anus. The colour of the back is brown or duſky, and ſometimes mixed with blue; the whole underſide ſilvery. Theſe are found in the Thames, Severn, and Dee; are potted with the larger kind; and are by ſome preferred to it, as being milder taſted. Vaſt quantities are taken about Mortlake, and ſold to the Dutch for bait for their cod-fiſhery. Above 430,000 have been ſold in a ſeaſon at 40s. per 1000; and of late, about 100,000 have been ſent to Harwich for the ſame purpoſe. It is ſaid that the Dutch have the ſecret of preſerving them till the turbot fiſhery.

3. The *bronchialis*, or lampern, is ſometimes found of the length of eight inches, and about the thickneſs of a ſwan's quill; but they are generally much ſmaller. The body is marked with numbers of tranſverſe lines, that paſs croſs the ſides from the back to the bottom of the belly, which is divided from the mouth to the anus by a ſtraight line. The back fin is not angular like that of the former, but of an equal breadth. The tail is lanceolated, and ſhort at the end. They are frequent in the rivers near Oxford, particularly the Iſis; but not peculiar to that county, being found in others of the Engliſh rivers, where, inſtead of concealing themſelves under the ſtones, they lodge themſelves in the mud, and never are obſerved to adhere to any thing like other lampreys.

PETRONIUS was a renowned Roman ſenator. When governor of Egypt, he permitted Herod, king of the Jews, to purchaſe in Alexandria any quantity of corn which he ſhould judge neceſſary for the ſupply of his ſubjects, who were afflicted with a ſevere famine. When Tiberius died, Caius Caligula, who ſucceeded him, took from Vitellius the government of Syria, and gave it to Petronius, who diſcharged the duties of his office with dignity and honour. From his inclination to favour the Jews, he ran the riſk of loſing the emperor's friendſhip and his own life; for, when that prince gave orders to have his ſtatue depoſited in the temple of Jeruſalem, Petronius, finding that the Jews would rather ſuffer death than ſee that ſacred place profaned, was unwilling to have recourſe to violent meaſures; and therefore preferred a moderation, dictated by humanity, to a cruel obedience. (We muſt not confound him with another of the ſame name, *viz.* Petronius Granius, who was a centurion in the eighth legion, and ſerved under Cæſar in the Gallic war.) In his voyage to Africa, of which country he had been appointed quæſtor, the ſhip in which he ſailed was taken by Scipio, who cauſed all the ſoldiers to be put to the ſword, and promiſed to ſave the quæſtor's life, provided that he would renounce Cæſar's party. To this propoſal Petronius replied, that "Cæſar's officers were accuſtomed to grant life to others, and not to receive it;" and at the ſame time he ſtabbed himſelf with his own ſword.

PETRONIUS *Arbiter* (Titus), a great critic and polite writer of antiquity, the favourite of Nero, ſuppoſed to be the ſame mentioned by Tacitus in the 16th book of his Annals. He was proconſul of Bithynia, and afterwards conſul, and appeared capable of the greateſt employments. He was one of Nero's principal confidents, and in a manner the ſuperintendant of his pleaſures: for that prince thought nothing agreeable or delightful but what was approved by Petronius. The great favour ſhown him drew upon him the envy of Tigellinus, another of Nero's favourites, who accuſed him of being concerned in a conſpiracy againſt the emperor; on which Petronius was ſeized, and ſentenced to die. He met death with a ſtriking indifference, and ſeems to have taſted it nearly as he had done his pleaſures. He would ſometimes open a vein and ſometimes cloſe it, converſing with his friends in the mean while, not on the immortality of the ſoul, which was no part of his creed, but on topics which pleaſed his fancy, as of love verſes, agreeable and paſſionate airs; ſo that it has been ſaid, "his dying was barely ceaſing to live." Of this diſciple of Epicurus, Tacitus gives the following character: "He was (ſays he) neither a ſpendthrift nor a debauchee, like the generality of thoſe who ruin themſelves; but a refined voluptuary, who devoted the day to ſleep, and the night to the duties of his office, and to pleaſure." This courtier is much diſtinguiſhed by a ſatire which he wrote, and ſecretly conveyed to Nero; in which he ingeniouſly deſcribes, under borrowed names, the character of this prince. Voltaire is of opinion that we have no more of this performance but an extract made by ſome obſcure libertine, without either taſte or judgment. Peter Petit diſcovered at Traw in Dalmatia, in 1665, a conſiderable fragment containing the ſequel of Trimalcion's Feaſt. This fragment, which was printed the year after at Padua and at Paris, produced a paper war among the learned. While ſome affirmed that it was the work of Petronius, and others denied it to be ſo, Petit continued to aſſert his right to the diſcovery of the manuſcript, and ſent it to Rome, where it was acknow-

ledged to be a production of the 15th century. The French critics who had attacked its authenticity, were silent from the moment it was deposited in the royal library. It is now generally attributed to Petronius, and found in every subsequent edition of the works of that refined voluptuary. The public did not form the same favourable opinion of some other fragments, which were extracted from a manuscript found at Belgrade in 1688, and printed at Paris by Nodot in 1694, though they are ascribed by the editor Charpentier, and several other learned men, to Petronius; yet, on account of the Gallicisms and other barbarous expressions with which they abound, they have generally been considered as unworthy of that author. His genuine works are, 1. A Poem on the Civil War between Cæsar and Pompey, translated into prose by Abbé de Marolles, and into French verse by President Bouhier, 1737, in 4to. Petronius, full of fire and enthusiasm, and disgusted with Lucan's flowery language, opposed Pharsalia to Pharsalia; but his work, though evidently superior to the other in some respects, is by no means in the true style of epic poetry. 2. A Poem on the Education of the Roman Youth. 3. Two Treatises; one upon the Corruption of Eloquence, and the other on the Causes of the Decay of Arts and Sciences. 4. A Poem on the Vanity of Dreams. 5. The Shipwreck of Lycas. 6. Reflections on the Inconstancy of Human Life. And, 7. Trimalcion's Banquet. To this last performance morality is not much indebted. It is a description of the pleasures of a corrupted court; and the painter is rather an ingenious courtier than a person whose aim is to reform abuses. The best editions of Petronius are those published at Venice, 1499, in 4to; at Amsterdam, 1669, in 8vo. *cum notis variorum*; ibid. with Beschius's notes, 1677, in 24to; and 1700, 2 vols. in 24to. The edition of *variorum* was reprinted in 1743, in 2 vols. 4to. with the learned Peter Burman's commentaries. Petronius died in the year 65 or 66.

Petronius (Maximus) was born in the year 395, of an illustrious family, being at first a senator and consul of Rome. He put on the imperial purple in 455, after having effected the assassination of Valentinian III. In order to establish himself upon the throne, he married Eudoxia the widow of that unfortunate prince; and, as she was ignorant of his villainy, he confessed to her, in a transport of love, that the strong desire he had of being her husband, had made him commit this atrocious crime. Whereupon Eudoxia privately applied to Genseric, king of the Vandals, who coming into Italy with a very powerful army, entered Rome, where the usurper then was. The unhappy wretch endeavoured to make his escape; but the soldiers and people, enraged at his cowardice, fell upon him, and overwhelmed him with a shower of stones. His body was dragged through the streets of the city for three days; and, after treating it with every mark of disgrace, they threw it into the Tiber the 12th of June the same year, 455. He reigned only 77 days. He had some good qualities. He loved and cultivated the sciences. He was prudent in his councils, circumspect in his actions, equitable in his judgments; a facetious companion, and steady friend. He had the good fortune to win the affections of every body, while he remained a private character; but, as a prince, he was so much the more detestable, in that, after he had obtained the throne by villainy, he kept possession of it only by violence. The crown was scarcely on his head before it appeared to him an insupportable burden. "Happy Damocles (exclaimed he in his despair), thou wert a king during a single entertainment!"

PETROSA OSSA, in anatomy, a name given to the fourth and fifth bones of the cranium, called also *ossa temporum* and *ossa squamosa*; the substance whereof, as their first and last names express, is squamose and very hard.

PETROSELINUM (APIUM PETROSELINUM, Lin.) *Parsley*. This plant is commonly cultivated for culinary purposes. The seeds have an aromatic flavour, and are occasionally used as carminatives, &c. The root of parsley is one of the five aperient roots, and with this intention is sometimes made an ingredient in apozems and diet-drinks: if liberally used, it is apt to occasion flatulencies; and thus, by distending the viscera, produces a contrary effect to that intended by it: the taste of this root is somewhat sweetish, with a light degree of warmth and aromatic flavour.

PETTEIA, in the ancient music, a term to which we have no one corresponding in our language. The *melopœia*, or the art of arranging sounds in succession so as to make melody, is divided into three parts, which the Greeks call *lepsis*, *mixis*, and *chresis*; the Latins *sumptio*, *mixtio*, and *usus*; and the Italians *presa*, *mescolamento*, and *uso*. The last of these is called by the Greeks πεττεια, and by the Italians *pettia*: which therefore means the art of making a just discernment of all the manners of ranging or combining sounds among themselves, so as they may produce their effect, *i. e.* may express the several passions intended to be raised. Thus, it shows what sounds are to be used, and what not; how often they are severally to be repeated; with which to begin, and with which to end; whether with a grave sound to rise, or an acute one to fall, &c. The petteia constitutes the manners of the music; chooses out this or that passion, this or that motion of the soul, to be awakened; and determines whether it be proper to excite it on this or that occasion. The petteia, therefore, is in music much what the manners are in poetry.

It is not easy to discover whence the denomination should have been taken by the Greeks, unless from πεττεια, their game of chess; the musical petteia being a sort of combination and arrangement of sounds, as chess is of pieces called πεττοι, *calculi*, or, "chess-men."

PETTY (Sir William), son of Anthony Petty a clothier, was born at Rumsey, a little haven-town in Hampshire, in 1623; and while a boy took great delight in spending his time among the artificers there, whose trades he could work at when but twelve years of age. Then he went to the grammar-school there: at 15 he was master of the Latin, Greek, and French tongues, and of arithmetic and those parts of practical geometry and astronomy useful in navigation. Soon after he went to Caen in Normandy, and Paris, where he studied anatomy, and read Vesalius with Mr. Hobbes. Upon his return to England, he was preferred in the king's navy. In 1643, when the war between the king and parliament grew hot, he went into the Netherlands and France for three years; and having vigorously prosecuted his studies, especially in physic, at Utrecht, Leyden, Amsterdam, and Paris, he returned home to Rumsey. In 1647, he obtained a patent to teach the art of double writing for seventeen years. In 1648, he published at London "Advice to Mr. Samuel Hartlib, for the Advancement of some particular Parts of Learning." At this time he adhered to the prevailing party of the kingdom; and went to Oxford, where he taught anatomy and chemistry, and was created a doctor of physic. In 1650, he was made professor of anatomy there; and soon after a member of the college of physicians in London. The same year he became physician to the army in Ireland; where he continued till 1659, and acquired a great fortune. After the Restoration, he was introduced to king Charles II. who knighted him in 1661. In 1662, he published "A Treatise of Taxes and Contributions." Next year he was greatly applauded in Ireland for his invention of a double-bottomed ship. He died at London of a gangrene in the foot, occasioned by the swelling of the gout, in 1687.

The character of his genius is sufficiently seen in his writings, which were much more numerous than those we have mentioned above. Amongst these, it is said, he wrote the his-

tory of his own life, which unqueſtionably contained a full account of his political and religious principles, as may be conjectured from what he has left us upon thoſe ſubjects in his will. In that he has theſe remarkable words: "As for legacies to the poor, I am at a ſtand; and for beggars by trade and election, I give them nothing: as for impotents by the hand of God, the public ought to maintain them: as for thoſe who can get no work, the magiſtrates ſhould cauſe them to be employed; which may be well done in Ireland, where are fifteen acres of improveable land for every head: as for priſoners for crimes by the king, or for debt by their proſecutors, thoſe who compaſſionate the ſufferings of any object, let them relieve themſelves by relieving ſuch ſufferers; that is, give them alms, &c. I am contented, that I have aſſiſted all my poor relations, and put many into a way of getting their own bread, and have laboured in public works and inventions, and have ſought out real objects of charity; and do hereby conjure all who partake of my eſtate, from time to time to do the ſame at their peril. Nevertheleſs, to anſwer cuſtom, and to take the ſure ſide, I give twenty pounds to the moſt wanting of the pariſh wherein I die." As for his religion, he ſays, "I die in the profeſſion of that faith, and in the practice of ſuch worſhip, as I find eſtabliſhed by the laws of my country; not being able to believe what I myſelf pleaſe, nor to worſhip God better than by doing as I would be done unto, and obſerving the laws of my country, and expreſſing my love and honour to Almighty God, by ſuch ſigns and tokens as are underſtood to be ſuch by the people with whom I live." He died poſſeſſed of a very large fortune, as appears by his will; where he makes his real eſtate about 6500l. *per annum*, his perſonal eſtate about 45,000l. his bad and deſperate debts 30,000l. and the demonſtrable improvements of his Iriſh eſtate, 4000l. *per annum*; in all, at ſix *per cent.* intereſt, 15,000l. *per annum*. This eſtate came to his family, who were afterwards ennobled.

The variety of purſuits in which Sir William Petty was engaged, ſhows him to have had a genius capable of any thing to which he choſe to apply it; and it is very extraordinary, that a man of ſo active and buſy a ſpirit could find time to write ſo many things as it appears he did.

PETTY, any thing little or diminutive, when compared with another.

PETTY *Bag*, an office in chancery; the three clerks of which record the return of all inquiſitions out of every county, and make all patents of comptrollers, gaugers, cuſtomers, &c.

PETTY-*Chaps*, in ornithology. See MOTACILLA.

PETTY-*Fogger*, a little tricking ſolicitor or attorney, without either ſkill or conſcience.

PETTY, or *Petit, Larceny*. See LARCENY.

PETTY-*Patees*, among confectioners, a ſort of ſmall pies, made of a rich cruſt filled with ſweet meats.

PETTY-*Singles*, among falconers, are the toes of a hawk.

PETTY *Tally*, in the ſea language, a competent allowance of victuals, according to the number of the ſhip's company.

PETTY, or *Petit, Treaſon*. See TREASON.

PETUNSE, in natural hiſtory, one of the two ſubſtances whereof porcelain or china-ware is made. The petunſe is a coarſe kind of flint or pebble, the ſurface of which is not ſo ſmooth when broken as that of our common flint. See PORCELAIN.

PETWORTH, in Suſſex in England, five miles from Midhurſt and the Suſſex Downs, and 49 from London, is a large, populous, and handſome town. It is adorned with ſeveral ſeats of gentlemen, particularly the magnificent ſeat of the Percies, earls of Northumberland, many of whom lie buried in a ſeparate vault of its church. The rectory, the richeſt in the county, is ſaid to be worth 600l. or 700l. a year, and is in the duke of Somerſet's gift; in whoſe armory, in this place, there is a ſword which, by circumſtances, appears to have been the weapon of the famous Henry Hotſpur, though it is not ſo unwieldy as other ancient ſwords generally are.

PEUCEDANUM, or SULPHUR-WORT: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order *Umbellatæ*. The fruit is lobated, ſtriated on both ſides, and ſurrounded by a membrane; the involucra are very ſhort. There are three ſpecies; none of which have any remarkable properties excepting the officinale, or common hog's-fennel, growing naturally in the Engliſh ſalt marſhes. This riſes to the height of two feet, with channelled ſtalks, which divide into two or three branches, each crowned with an umbel of yellow flowers, compoſed of ſeveral ſmall circular umbels. The roots, when bruiſed, have a ſtrong fetid ſcent like ſulphur, and an acrid, bitteriſh, unctuous taſte. Wounded in the ſpring, they yield a conſiderable quantity of yellow juice, which dries into a gummy reſin, and retains the ſtrong ſmell of the root. This ſhould ſeem to be poſſeſſed of ſome medicinal virtues, but they have never been aſcertained with any preciſion. The expreſſed juice was uſed by the ancients in lethargic diſorders.

PEUTEMAN (PETER) was born at Rotterdam in 1650, and was a good painter of inanimate objects; but the moſt memorable particular relative to this artiſt was that incident which occaſioned his death.

He was requeſted to paint an emblematical picture of mortality, repreſenting human ſkulls and bones, ſurrounded with rich gems and muſical inſtruments, to expreſs the vanity of this world's pleaſures, amuſements, or poſſeſſions; and that he might imitate nature with the greater exactneſs, he went into an anatomy-room, where ſeveral ſkeletons hung by wires from the ceiling, and bones, ſkulls, &c. lay ſcattered about; and immediately prepared to make his deſigns.

While he was thus employed, either by fatigue, or by intenſe ſtudy, inſenſibly he fell aſleep; but was ſuddenly roufed by a ſhock of an earthquake, which happened at that inſtant, on the 18th of September 1692. The moment he awoke, he obſerved the ſkeletons move about, as they were ſhaken in different directions, and the looſe ſkulls roll from one ſide of the room to the other; and being totally ignorant of the cauſe, he was ſtruck with ſuch a horror, that he threw himſelf down ſtairs, and tumbled into the ſtreet half dead. His friends took all poſſible pains to efface the impreſſion made on his mind by that unlucky event, and acquainted him with the real cauſe of the agitation of the ſkeletons; yet the tranſaction ſtill affected his ſpirits in ſo violent a manner, that it brought on a diſorder which in a very ſhort time ended his days. His general ſubjects were either allegorical or emblematical alluſions to the ſhortneſs and miſery of human life.

PEWIT, SEA CROW, or *Mire crow*, in ornithology. See LARUS.

PEWTER, a factitious metal uſed in making domeſtic utenſils, as plates, diſhes, &c. The baſis of the metal is tin; which is converted into pewter by mixing at the rate of an hundred weight of tin with 15 pounds of lead and ſix pounds of braſs. Beſides this compoſition, which makes the common pewter, there are other kinds, compounded of tin, regulus of antimony, biſmuth, and copper, in ſeveral proportions.

PEYRERE (ISAAC LA) was born at Bourdeaux, of proteſtant parents. He entered into the ſervice of the prince of Condé, who was much pleaſed with the ſingularity of his genius. From the peruſal of St. Paul's writings he took into his head to aver, that Adam was not the firſt of the human race; and in order to prove this extravagant opinion, he publiſhed in 1655 a book, which was printed in Holland in 4to and in 12mo, with this title, *Præadamitæ, ſive Exercitatio ſuper verſibus*

12, 13, 14. *cap.* 15. *Epiſtolæ Pauli ad Romanos.* This work was burnt at Paris, and the author impriſoned at Bruſſels, through the influence of the archbiſhop of Malines' grand vicar. The prince of Condé having obtained his liberty, he travelled to Rome in 1656, and there gave in to pope Alexander VII. a ſolemn renunciation both of Calviniſm and Præadamiſm. His converſion was not thought to be ſincere, at leaſt with regard to this laſt hereſy his ſincerity was much doubted. His deſire to be the head of a new ſect is evident; and his book diſcovers his ambition, for he there pays many compliments to the Jews, and invites them to attend his lectures. Upon his return to Paris, notwithſtanding the earneſt ſolicitations of his holineſs to remain at Rome, he went again into the prince of Condé's ſervice in the quality of librarian. Some time after he retired to the ſeminary *des Vertus*, where he died the 30th of January 1676, at the age of 82, after the ſacraments of the church had been adminiſtered to him. Father Simon ſays, that when he was importuned in his laſt moments to retract the opinion which he had formed reſpecting the Præadamites, his anſwer was, *Hi quæcunque ignorant, blaſphemant.* His having no fixed ſentiments of religion is ſuppoſed to proceed more from a peculiar turn of mind than a corruption of the heart; for good nature, ſimplicity of manners, and humanity, ſeem to have formed his character. "He was, ſays Niceron, a man of a very equal temper, and moſt agreeable converſation. He was a little too fond, however, of indulging his wit, which ſometimes bordered on raillery; but he took care never to hurt or wound the feelings of his neighbour. As to his learning, it was extremely limited. He knew nothing either of Greek or Hebrew; and yet he ventured to give a new interpretation of ſeveral paſſages of the ſacred volume. He piqued himſelf on his knowledge of the Latin; but, excepting a few poets which he had read, he was by no means an adept in that language. His ſtyle is very unequal; ſometimes too ſwelling and pompous, at other times low and grovelling." Beſides the work already mentioned, he has left behind him, I. A treatiſe as ſingular as it is ſcarce, entitled, *Du rappel des Juifs*, 1643, in 8vo. The recall of the Iſraelites, in the opinion of this writer, will be not only of a ſpiritual nature, but they will be reinſtated in the temporal bleſſings which they enjoyed before their rejection. They will again take poſſeſſion of the holy land, which will reſume its former fertility. God will then raiſe up to them a king more juſt, and more victorious, than any of their former ſovereigns had been. Now, though all this is doubtleſs to be underſtood ſpiritually of Jeſus Chriſt, yet our author is of opinion, that it ought alſo to be underſtood of a temporal prince, who ſhall ariſe for the purpoſe of effecting the temporal deliverance of the Jews; and that this prince ſhall be no other than the king of France, for the following reaſons, which, it is believed, will carry conviction to few minds: 1. Becauſe the two titles of *Moſt Chriſtian* and of *Eldeſt Son of the Church* are aſcribed to him by way of excellence. 2. Becauſe it is preſumable, if the kings of France poſſeſs the virtue of curing the evil or ſcrofula, which can only afflict the bodies of the Jews, that they will likewiſe have the power of curing their obſtinate incredulity and the other inveterate diſeaſes of their ſouls. 3. Becauſe the kings of France have for their arms a *fleur de luce*; and becauſe the beauty of the church is in ſcripture compared to the beauty of lilies. 4. Becauſe it is probable that France will be the country whither the Jews ſhall firſt be invited to come and embrace the Chriſtian faith, and whither they ſhall retreat from the perſecution of the nations that have dominion over them; for France is a land of freedom, it admits of no ſlavery, and whoever touches it is free. Peyrere, after explaining his ſtrange ſyſtem, propoſes a method of converting the Jews to Chriſtianity: a method, ſays Niceron, which will not be acceptable to many. He propoſes to reduce the whole of religion to a bare faith or belief in Jeſus Chriſt; taking it for granted, without any ſhadow of proof, that "it is as difficult to comprehend the articles of our faith, as to obſerve the ceremonies of Moſes. From this ſcheme (ſays he) there would reſult a double advantage to the church; the reunion of the Jews, and of all thoſe Chriſtians who are ſeparated from the body of the church." Peyrere, when he wrote this book, was a Calviniſt; but his Calviniſm too nearly reſembled the Deiſm of our age. He confeſſed himſelf, that his reaſon for quitting the Proteſtants was on account of their being the firſt and principal oppoſers of his book concerning the Præadamites. II. A curious and entertaining account of Greenland, printed in 8vo, 1647. When he was aſked, on occaſion of this work, why there were ſo many witches in the north? he replied, "It is becauſe part of the property of theſe pretended conjurers, when condemned to ſuffer death, is declared to belong to their judges." III. An equally intereſting account of Iceland, 1663, 8vo. IV. A letter to Philotimus, 1658, in 8vo, in which he explains the reaſons of his recantation, &c. We find in Moreri the following epitaph of him, written by a poet of his own times:

La Peyrere ici gît, ce Ion Iſraelite,
Huguenot, Catholique, enfin Preadamite:
Quatre religions lui plurent à la fois,
Et ſon indifférence étoit ſi peu commune,
Qu'après quatre-vingts ans qu'il eût à faire un choix,
Le bon homme partit, & n'en choiſit pas une.

PEYRONIUS (Francis de la), for a long time practiſed ſurgery at Paris with ſuch diſtinguiſhed eclat, that he obtained for himſelf the appointment of firſt ſurgeon to Louis XV. He improved this favourable ſituation with his majeſty, and procured to his profeſſion thoſe honours which had the effect to quicken its progreſs, and thoſe eſtabliſhments which contributed to extend its benefits. The Royal College of Surgery at Paris was founded by his means in 1731, was enlightened by his knowledge, and encouraged by his munificence. At his death, which happened at Verſailles the 24th of April 1747, he bequeathed to the ſociety of ſurgeons in Paris two-thirds of his effects, his eſtate of Marigni, which was ſold to the king for 200,000 livres, and his library. This uſeful citizen alſo left to the ſociety of ſurgeons at Montpellier two houſes, ſituated in that town, with 100,000 livres for the purpoſe of erecting there a chirurgical amphitheatre. He appointed the ſame ſociety univerſal legatee for the third of his effects; and all theſe legacies contain clauſes whoſe ſole object is to promote the public good, the perfection and improvement of ſurgery; for which he always ſolicited the protection of the court. At the time of the famous diſpute between the phyſicians and ſurgeons, he entreated the chancellor d'Agueſſan to build up a brazen wall between the two bodies. "I will do ſo, replied the miniſter, but on what ſide of the wall ſhall we place the ſick?" Peyronius afterwards behaved with more moderation.—He was a philoſopher without any oſtentation; but his philoſophy was tempered by a long acquaintance with the world and with the court. The acuteneſs and delicacy of his underſtanding, joined to his natural vivacity, rendered his converſation agreeable; and all theſe advantages were crowned with a quality ſtill more valuable, an uncommon degree of ſympathy for thoſe in diſtreſs. He was no ſooner known to be at his eſtate in the country, than his houſe was filled with ſick people, who came to him from the diſtance of 7 or 8 leagues round about. He had once a plan of eſtabliſhing, on this ſpot, an hoſpital, to which he intended to retire, that he might devote the remainder of his life to the ſervice of the poor.

PEZAY (N. Masson, marquis of), born at Paris, very early applied himſelf to the ſtudy of letters, and afterwards went into the army. He was made a captain of dragoons; and had

the honour of giving ſome leſſons on tactics to the ill-fated Louis XVI. Being appointed inſpector-general of ſome coaſting veſſels, he repaired to the maritime towns, and executed his commiſſion with more care and attention than was to have been expected from a votary of the muſes. But as, at the ſame time, he ſhowed too much haughtineſs, a complaint was brought againſt him to the court, and he was baniſhed to his country ſeat, where he died ſoon after, in the beginning of 1778. He was the intimate friend and companion of Dorat. He had ſtudied, and ſucceſsfully imitated, his manner of writing; but his poems have more delicacy, and are leſs disfigured with trifling converſations of gallantry. He has left behind him, 1. A tranſlation of Catullus, which is not much eſteemed. 2. Les Soirées Helvetiennes, Alſaciennes, & Franc-Comtoiſes, in 8vo, 1770; a work very agreeably diverſified, full of charming landſcapes, but written with too little accuracy. 3. Les Soirées Provençales, in manuſcript, which are ſaid to be nowiſe inferior in merit to the foregoing ones. 4. La Roſiere de Salency; a paſtoral in three acts, and which has been performed with ſucceſs on the Italian theatres. 5. Les Campagnes de Maillebois, in 3 vols. 4to, and a volume of maps.

PEZENAS, an ancient town of France, in the department of Herault and late province of Languedoc. It is delightfully ſeated on the river Pein, 12 miles N. E. of Beziers. E. lon. 3. 34. N. lat. 43. 28.

PEZIZA, cup-muſhroom, in botany; a genus of the natural order of fungi, belonging to the cryptogamia claſs of plants. The fungus campanulated and ſeſſile. Linnæus enumerates 8 ſpecies.

PEZRON (Paul), a very learned and ingenious Frenchman, born at Hennebon in Brittany in 1639, and admitted into the order of Citeaux in 1660. He was a great antiquary, and was indefatigable in tracing the origin of the language of the Goths; the reſult of which was, that he was led to eſpouſe a ſyſtem of the world's being much more ancient than modern chonologers have ſuppoſed. This he communicated to the public in a treatiſe printed at Paris in 1687, 4to, entitled, *The antiquity of Time reſtored, and defended againſt the Jews and modern chronologers.* This book of Pezron's was extremely admired for the ingenuity and learning in it; yet cauſed no ſmall alarm among the religious, againſt whom he nevertheleſs defended his opinions. He went through ſeveral promotions, the laſt of which was to the abbey of Charmoye, to which he was nominated by the king; and died in 1706.

PHACA, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ.* The legumen is ſemibilocular.

PHÆA, a famous ſow which infeſted the neighbourhood of Cromyon. Theſeus deſtroyed it as he was travelling from Trœzene to Athens to make himſelf known to his father. Some imagine that the boar of Calydon ſprang from this ſow. According to ſome authors, Phæa was a woman who proſtituted herſelf to ſtrangers, whom ſhe murdered, and afterwards plundered.

PHÆACIA, one of the names of the iſland Corcyra, (Homer, Stephanus). *Phæaces* the people, (Ovid), noted for their indolence and luxury: hence Horace uſes *Phæax* for a perſon indolent and ſleek; and hence aroſe their inſolence and pride, (Ariſtotle). The iſland was famous for producing large quantities of the fineſt flavoured apples, (Ovid, Juvenal, Propertius).

PHÆDON, a diſciple of Socrates, who had been ſeized by pirates in his youth; and the philoſopher, who ſeemed to diſcover ſomething uncommon and promiſing in his countenance, bought his liberty for a ſum of money, and ever after eſteemed him. Phædon, after Socrates's death, returned to Elis his native country, where he founded a ſect of philoſophers who compoſed what was called the *Eliac ſchool.* The name of Phædon is affixed to one of Plato's dialogues.

PHÆDRA (fab. hiſt.), was a daughter of Minos and Paſiphae; ſhe married Theſeus, by whom ſhe was the mother of Acamas and Demophoon. They had already lived for ſome time in conjugal felicity, when Venus, who hated all the deſcendants of Apollo, becauſe he had diſcovered her amours with Mars, inſpired Phædra with the ſtrongeſt paſſion for Hippolytus the ſon of Theſeus, by the amazon Hippolyte. This paſſion ſhe long attempted to ſtifle, but in vain; and therefore, in the abſence of Theſeus, ſhe addreſſed Hippolytus with all the impatience of deſponding love. He rejected her with horror and diſdain. She, however, incenſed by the reception ſhe had met, reſolved to puniſh his coldneſs and refuſal; and at the return of Theſeus ſhe accuſed Hippolytus of attempts upon her virtue. He liſtened to her accuſation; and without hearing Hippolytus's defence, he baniſhed him from his kingdom, and implored Neptune, who had promiſed to grant three of his requeſts, to puniſh him in an exemplary manner. As Hippolytus fled from Athens, his horſes were ſuddenly terrified by a ſea monſter, which Neptune had ſent on the ſhore; and he was thus dragged through precipices and over rocks, trampled under the feet of his horſes, and cruſhed under the wheels of his chariot. When his tragical end was known at Athens, Phædra confeſſed her crime, and hung herſelf in deſpair, unable to ſurvive one whoſe death her extreme guilt had occaſioned. The death of Hippolytus, and the infamous paſſion of Phædra, is the ſubject of one of the tragedies of Euripides and of Seneca. She was buried at Trœzene, where her tomb was ſtill to be ſeen in the age of the geographer Pauſanias, near the temple of Venus, which ſhe had built to render the goddeſs favourable to her inceſtuous paſſion. Near her tomb was a myrtle, whoſe leaves were full of ſmall holes, which, it was reported, Phædra had done with a hair pin, when the vehemence of her paſſion had rendered her melancholy and almoſt deſperate. She was repreſented in a painting in Apollo's temple at Delphi, as ſuſpended in the air, while her ſiſter Ariadne ſtood near to her, and fixed her eyes upon her.

PHÆDRUS, an ancient Latin writer, who compoſed five books of fables, in Iambic verſe. He was a Thracian; and was born, as there is reaſon to conclude, ſome years before Julius Cæſar made himſelf maſter of the Roman empire. How he came into the ſervice of Auguſtus is not known: but his being called *Auguſtus's freedman* in the title of the book, ſhows that he had been that emperor's ſlave. The fables of Phædrus are valued for their wit and good ſenſe, expreſſed in very pure and elegant language; and it is remarkable that they remained buried in libraries, altogether unknown to the public, until they were diſcovered and publiſhed by Peter Pithou, or Pithœus, a learned French gentleman, toward the cloſe of the 16th century.

Phædrus (Thomas) was a profeſſor of eloquence at Rome, early in the 16th century. He was canon of Lateran, and keeper of the library in the Vatican. He owed his riſe to the acting of Seneca's Hippolytus, in which he performed the part of Phædra; from whence he ever afterwards got the name of Phædrus. Eraſmus, who tells this, ſays he had it from cardinal Raphael Georgianus, in whoſe court-yard, before the palace, that tragedy was acted. The cauſe of his death was very remarkable; for, as he was riding through the city on a mule, he met a cart drawn by wild oxen, and was thrown by his mule, who took fright at them. Though corpulent, the cart fortunately paſſed over him without doing him any hurt, as he fell in the ſpace between the wheels; but fright and the fall together ſpoiled the whole maſs of his blood ſo much, that he contracted a diſtemper, of which, after languiſhing ſome time, he died un-

der the age of 50. If he had lived, he would moſt probably have become an author; and perhaps, adds Bayle, have confirmed what has been obſerved of him, that his tongue was better than his pen. The obſervation was made by Eraſmus, who tells us. that he knew and loved him; and owns that he was called the Cicero of his time. Janus Parrhaſius, his colleague, was much grieved at his death, and gave the titles of ſeveral works, which were almoſt ready for public view.

PHÆNOMENON, in philoſophy, denotes any remarkable appearance, whether in the heavens or earth, and whether diſcovered by obſervation or experiment.

PHAETON, in fabulous hiſtory, was the ſon of the Sun, or Phœbus and Clymene, one of the Oceanides. He was ſon of Cephalus and Aurora, according to Heſiod and Pauſanias; or of Tithonus and Aurora, according to Apollodorus. He is, however, more generally acknowledged to be the ſon of Phœbus and Clymene. He was naturally of a lively diſpoſition, and a handſome figure. Venus became enamoured of him, and entruſted him with the care of one of her temples. This diſtinguiſhing favour of the goddeſs rendered him vain and aſpiring; and when Epaphus, the ſon of Io, had told him, to check his pride, that he was not the ſon of Phœbus, Phaeton reſolved to know his true origin, and at the inſtigation of his mother he viſited the palace of the Sun. He begged Phœbus, that if he really were his father he would give him inconteſtable proofs of his paternal tenderneſs, and convince the world of his legitimacy. Phœbus received him with great tenderneſs, and ſwore by Styx to grant whatever he requeſted as a proof of his acknowledging him for his ſon. The youth boldly aſked the direction of the chariot of the ſun for one day. His father, grieved and ſurprifed at this demand, uſed all his arguments to diſſuade him from the raſh attempt; but all was in vain: and being by his oath reduced to ſubmit to his obſtinacy, he entruſted him with the reins, after he had directed him how to uſe them. The young adventurer was however ſoon ſenſible of his madneſs. He was unable to guide the fiery ſteeds; and looſing the reins, Jupiter, to prevent his conſuming the heavens and earth, ſtruck him with a thunderbolt, and hurled him from his ſeat into the river Eridanus or Po. His ſiſters Phaethuſa, Lambetia, and Phœbe, lamenting his loſs upon its banks, were changed by the gods into black poplar trees; and Cycnus king of Liguria, alſo grieving at his fate, was transformed into a ſwan.

The poets ſay, that while Phaeton was driving the chariot of his father, the blood of the Ethiopians was dried up, and their ſkin became black; a colour which is ſtill preſerved among the greateſt part of the inhabitants of the torrid zone. The territories of Libya were alſo, they tell us, parched up, on account of their too great vicinity to the ſun; and ever ſince, Africa, unable to recover her original verdure and fruitfulneſs, has exhibited a ſandy country and uncultivated waſte. According to thoſe who explain this poetical fable, Phaeton was a Ligurian prince, who ſtudied aſtronomy, and in whoſe age the neighbourhood of the Po was viſited with uncommon heats.

PHAETON, in ornithology, a genus of birds belonging to the order of anſeres; the characters of which are: The bill is ſharp, ſtraight, and pointed; the noſtrils are oblong, and the hinder toe is turned forward. There are two ſpecies, *viz.*

1. The *demerſus*, or red-footed pinguin, has a thick, arched red bill; the head, hind-part of the neck, and the back, of a duſky purpliſh hue, and breaſt and belly white; brown wings, with the tips of the feathers white; inſtead of a tail, a few black briſtles; and red legs. It is found on Pinguin iſle, near the Cape of Good Hope, is common all over the South Seas, and is about the ſize of a gooſe.

2. The *ethereus*, or tropic bird, is about the ſize of a partridge, and has very long wings. The bill is red, with an angle under the lower mandible. The eyes are encompaſſed with black; which ends in a point towards the back of the head. Three or four of the larger quill-feathers, towards their ends, are black, tipped with white; all the reſt of the bird is white, except the back, which is variegated with curved lines of black. The legs and feet are of a vermilion red. The toes are webbed. The tail conſiſts of two long ſtraight narrow feathers, almoſt of equal breadth from their quills to their points. See pl. 33.

"The name *tropic bird* (ſays Latham), given to this genus, ariſes from its being chiefly found within the tropic circles; but we are not to conclude, that they never ſtray voluntarily, or are driven beyond them: for we have met with a few inſtances to prove the contrary *. It is, however, ſo generally found within the tropical limits, that the ſight of this bird alone is ſufficient to inform the mariner of a very near approach to if not his entrance therein. It has alſo been thought to portend the contiguity of land †; but this has often proved fallacious, as it is not unfrequently found at very great diſtances therefrom. The flight of this bird is often to a prodigious height; but at other times it is ſeen along with the frigate pelican, booby, and other birds, attending the flying fiſhes at their riſe from the water, driven from their native element into the air by their watery enemies, the ſhark ‡, porpoiſe, albicore, bonito, and dolphin, which purſue them beneath, and prey upon them. Theſe birds are ſometimes obſerved to reſt on the ſurface of the water, and have been now and then ſeen in calm weather upon the backs of the drowſy tortoiſes, ſupinely floating in the ſea, ſo that they have been eaſily taken by the long boat manned. On ſhore they will perch on trees, and are ſaid to breed in the woods, on the ground beneath them. They have been met with in plenty on the iſlands of St. Helena, Aſcenſion, Mauritius, New Holland, and various places in the South Seas; but in no place ſo numerous as at Palmerſton Iſland, where theſe birds, as well as the frigates, were in ſuch plenty, that the trees were abſolutely loaded with them, and ſo tame, that they ſuffered themſelves to be taken off the boughs with the hand. At Otaheite, and in the Friendly iſles, the natives give them the names of *baingoo* and *toolaiee*.

"As the tropic bird ſheds the long tail feathers every year, the inhabitants of ſuch iſles as they frequent, collect and make uſe of them by way of ornament in various manners; they are worn in the caps of the Sandwich iſlanders, being in great plenty at Tahoora, as alſo in various parts of their dreſs; but in none more conſpicuous than in the mourning garment of Ota-

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* "Dr. Forſter obſerves, that they are never ſeen beyond 28 degrees of latitude; but others talk of their ſpreading far beyond it. In lat. 32. 45. *Ell. Narr.* iii. p. 64.—33. 10. N. *Cook's laſt Voy.* iii. p. 178.—38. 34. S. *Park. Voy.* p. 132.—38. 29. S. *Hawkeſ. Voy.* iii. p. 77. This is mentioned as not being common; but Kalm ſays he met with theſe in 40 degrees north. See *Trav.* i. p. 22.—And a friend of mine aſſured me, that he ſaw one in latitude 47½ north; but at the ſame time obſerved, that it was the firſt inſtance he had ever known of ſuch a circumſtance.

† "*Ulloa's Voy.* ii. p. 301. He obſerves, that they ſeldom are met with above eight or ten leagues from land.

‡ "*Squalus conductor, delphinus phocæna, ſcomber thynnus, ſcomber pelamis, delphinus coryphæna.* See *Phil. Tranſ.* vol. lxviii. p. 800. It is there obſerved, that the flying fiſh is able to fly 60 or more yards at one ſtretch, and repeat it a ſecond or even a third time, only the ſlighteſt momentary touch of the ſurface that can be conceived intervening; and it is common in theſe flights for them to fly againſt ſhips, or fall on the deck.

heite, in which iſland numbers are picked up in the mountainous parts, where it alſo breeds. The fleſh cannot be called good, but was found ſufficiently acceptable to thoſe who had long been confined to ſalt proviſions, and in which circumſtance the ſailors did not deſpiſe it."

There is a variety of this bird called by Latham the *white tropic bird*. It is leſs than the one we have already deſcribed, and is found in as many places as it. The plumage of this bird is in general of a ſilvery white. The yellow tropic bird is a further variety of the ſame ſpecies, the plumage being of a yellowiſh white. Theſe differences, Mr. Latham thinks, ariſe merely from age, if they are not the diſtinguiſhing mark of ſex.

3. The *black billed tropic bird* is ſmaller than any of the former. The bill is black; the plumage on the upper part of the body and wings is ſtriated, partly black and partly white; before the eye there is a large creſcent of black, behind it is a ſtreak of the ſame; the forehead and all the under parts of the body are of a pure white colour; the quills and tail are marked as the upper parts, but the ends of the firſt are white, and moſt of the feathers of the laſt are marked with duſky black at the tips; the ſides over the thighs are ſtriated with black and white; the legs are black. One of theſe was found at Turtle and Palmerſton iſlands, in the South Seas, and is in the poſſeſſion of Sir Joſeph Banks.

4. The *red-tailed tropic bird* is in length about two feet ten inches, of which the two tail feathers alone meaſure one foot nine inches. The bill is red; the plumage white, tinged of an elegant pale roſe-colour; the creſcent over the eyes is ſomewhat abrupt in the middle; the ends of the ſcapulars are marked with black. This bird is diſtinguiſhed from others by two middle long tail feathers, which are of a beautiful deep red colour, except the ſhafts and baſe, which are black; the ſides over the thighs are duſky; and the legs are black.

"This ſpecies (ſays Latham) is met with frequently as large as the others, but does not ſeem to be ſo far ſpread. Our navigators met with them in various places, though they were ſeldom ſeen by them on ſhore except in the breeding ſeaſon, which is in September and October. They are found in great numbers in the iſland of Mauritius, where they make the neſt in hollows in the ground under the trees; the eggs are two in number, of a yellowiſh white marked with ruſous ſpots. The ſame author gives an account of the introduction of paradiſe grackles into the iſland of Bourbon, from whence they ſpread into that of Mauritius; at firſt intended for the very uſeful purpoſe of deſtroying the locuſts and graſhoppers, which ſwarmed there to a great degree: the reſult of their prodigious increaſe, and the unlooked for conſequence of it, he has likewiſe mentioned. Theſe birds, we are told, are great enemies to the tropic birds, ocular demonſtration of which was had by M. de Querhoent; for, being ſeated beneath a tree in which were perched a number of the grackles, he obſerved a tropic bird come to its hole, in order to go to the neſt; but the grackles attacked the bird all at once, and obliged it to fly off: it then returned with its conſort in company, but without effect, as they were both driven away, as the ſingle one had been before; when the grackles returned to their tree, and the ſpectator left them in that ſituation.

"This ſpecies of tropic bird has been met with in ſeveral places of the South Seas; very common at Palmerſton and Turtle iſlands; at Hervey's iſland in the greateſt plenty, and of which conſiderable numbers were killed for proviſions; and here alſo they make the neſts in the ſame manner as at Mauritius. The name it is known by at Otaheite and the Friendly iſles is *tawagge* and *totto*." See DIOMEDEA and PINGUIN.

PHAGEDÆNA, in medicine, denotes a corroding ulcer, of which Celſus deſcribes two ſpecies.

PHAGEDENIC MEDICINES, thoſe uſed to eat off proud or fungous fleſh; ſuch as are all the cauſtics.

PHAGEDENIC *Water*, in pharmacy, denotes a water made from quicklime and ſublimate; and is very efficacious in the cure of phagedenic ulcers. To prepare this water, put two pounds of freſh quicklime in a large earthen pan, and pour upon it about ten pounds of rain water; let them ſtand together for two days, ſtirring them frequently: at laſt leave the lime to ſettle well, then pour off the water by inclination, filtrate it, and put it up in a glaſs bottle, adding to it an ounce of corroſive ſublimate in powder; which from white becomes yellow, and ſinks to the bottom of the veſſel. The water being ſettled, is fit for uſe in the cleanſing of wounds and ulcers, and to eat off ſuperfluous fleſh, and eſpecially in gangrenes; in which caſe may be added to it a third or fourth part of ſpirit of wine.

PHALÆNA, the MOTH, in zoology, a genus of inſects belonging to the order of lepidoptera. The feelers are cetaceous, and taper gradually towards the points; the wings are often bent backwards. See pl. *33*.

Barbut divides this genus into eight families, and we are told that there are no leſs than 460 ſpecies. The names of the ſeveral families are given by Barbut as follows: 1. The *attaci*, whoſe wings incline downwards and are ſpread open: they have pectinated antennæ without a tongue, or pectinated antennæ with a ſpiral tongue, or cetaceous antennæ with a ſpiral tongue. 2. The *bombyces*, whoſe wings cover the body in a poſition nearly horizontal, and which have pectinated antennæ. They are either elingues, which want the tongue, or have it ſo ſhort as not to be manifeſtly ſpiral; their wings are either reverſed or deflected: or ſpirilingues, which have a ſpiral tongue; and are either læves with ſmooth backs, or criſtatæ dorſo with a kind of creſt or tuft of hair on the back. 3. The *noctuæ*, whoſe wings are incumbent as in the bombyces, from which they differ chiefly in the formation of the antennæ, which are cetaceous. The noctuæ are either elingues, wanting tongues, or ſpirilingues, having ſpiral tongues. 4. The *geometræ*, whoſe wings when at reſt are extended horizontally: the antennæ in one ſubdiviſion of this ſection are pectinated, in another cetaceous; the under wings in each of theſe diviſions are either angulated, or round with entire edges. 5. The *tortrices*. The wings are exceeding obtuſe, their exterior margin is curved, and declines towards the ſides of the body. They have ſhort palpi. 6. The *pyralides*. The inner margins of the wings in this ſection are laid one over the other; the wings themſelves decline a little towards the ſides of the body, and in ſhape reſemble a delta; they have conſiderable palpi of different forms. 7. The *tineæ*. The wings are wrapped up or folded round the body, ſo as to give the inſect a cylindrical form; the forehead is ſtretched out or advanced forwards. 8. The *alucitæ*. The wings of this diviſion are ſplit, or divided into branches almoſt to their baſe.

The caterpillars of this genus vary much as to ſize, and conſiderably as to their ſhape and number of feet. It is remarkable, that caterpillars of almoſt every ſpecies of this genus are found with 10, 12, 14, and 16 feet. The laſt are the moſt common and the largeſt; thoſe of 10 and 12 feet are called *geometræ*. "Amongſt the geometræ caterpillars (ſays Barbut) there are ſome very ſingular, whether for their colour, or the tubercula which they bear, or laſtly for the difference of their attitudes. Many reſemble ſmall branches or bits of dry wood; and that reſemblance may be a means of ſaving many of thoſe inſects from the voraciouſneſs of birds, who do not ſo eaſily diſcern them. Other caterpillars are very hairy, while ſeveral are quite ſmooth; the latter have a cleanlier look, whereas the hairy ones have ſomething hideous, and may even be hurtful when touched.

" All the caterpillars of phalænæ, after having ſeveral times caſt their ſlough, ſpin their cod, in which they are transformed to chryſalids. But the texture of the cod, the fineneſs of the thread of which it is compoſed, and the different matters joined to the threads, are infinitely various.

" The chryſalids of phalænæ are generally oblong ovals, not angulous as thoſe of butterflies, nor ſo ſoon transformed to perfect inſects. They remain a much longer time within the cod, the greateſt part not coming forth till the enſuing year. Some I have met with that remained in that ſtate during two or three years ſucceſſively. Heat or cold contributes greatly to forward or put back their final metamorphoſis; a fact which may be aſcertained by procuring them a certain degree of moderate heat, by which means one may ſee phalænæ brought forth upon one's mantle-piece in the depth of winter.

" The phalænæ or perfect inſects ſprung from thoſe cods are generally more clumſy and heavy than butterflies; their colours are likewiſe more brown, dim, and obſcure, though there are ſome phalænæ whoſe colours are very lively and brilliant. Several of them fly only in the evening, keeping quiet and cloſe under leaves in the day-time; and this has induced ſome authors to give them the name of *night butterflies*. In ſummer evenings they find their way into rooms, attracted by the lights round which they are ſeen to hover. And indeed a ſure method of catching a great number of phalænæ is to hunt them by night in a bower with a lantern. They all reſort to the light of the lantern, about which great numbers of them may be caught.

" A remarkable circumſtance has been obſerved of theſe phalænæ, which is, that the females of ſome of them are without wings. By their looks they never would be taken for phalænæ. They have the appearance of a large, ſhort, ſix-legged, creeping animal, while their male is winged and active. Yet this heavy creature is a real phalæna, eaſily diſtinguiſhed by its antennæ. It even has wings, but ſo ſhort that they are no more than ſmall protuberances placed at the extremity of the thorax, and that appear quite uſeleſs. Thoſe phalænæ whoſe females are deſtitute of wings are generally in the number of thoſe whoſe antennæ are pectinated. The unwinged females have antennæ ſimilar to thoſe of the males, but with ſhorter beards only. Their body is alſo charged with ſcales, the characteriſtic of inſects of this order."

To deſcribe every ſpecies of this extenſive genus would be impoſſible; we ſhall therefore only take notice of a very few, of which we have given engravings.

The phalæna attacus pavonia minor. See fig. 1. Plate 33. The wings of this inſect, ſays Barbut, are brown, undulated, and variegated, having ſome grey in the middle, and a margin one line broad; in its colour yelloviſh grey. The under part has more of the grey caſt, but the extremities of the wings before the margin have a broad band of brown. The four wings, as well above as beneath, have each a large eye, which eyes are black encompaſſed with a dun-coloured circle, and above that with a ſemicircle of white, then another of red, and laſtly the eye is terminated by a whole circle of black. Acroſs the middle of the eye is drawn tranſverſely a ſmall whitiſh line. The caterpillar is green, has 16 feet with roſe-colour tubercula, charged with long hairs terminated by a ſmall knob; beſides which, it has dun-colour or reddiſh rings. It is found upon fruit-trees.

Phalæna glaucita pentadactyla, fig. 2. The eyes of this ſpecies are black; the body is of a pale yellow. The wings are ſnow white, and the inſect keeps them ſtretched aſunder when at reſt. The ſuperior are divided in two, or rather appear compoſed of two ſtumps of bird's feathers united at the baſe. The interior ones are likewiſe divided into three threads or briſtles, which are furniſhed on both ſides with fine fringes. The caterpillar is of a green colour, dotted with black, and charged with a few hairs. It feeds upon graſs, changes to a chryſalis in or about September, and appears a moth in Auguſt, frequenting woods.

Phalæna noctua elinguis humuli, fig. 3. In this ſpecies the wings of the male are of a ſnowy white; of the female yelloviſh, with ſtreaks of a deeper hue; the ſhoulders, abdomen, &c. in both ſexes, are deep yellow. The antennæ are pectinated, and ſhorter than the thorax. The caterpillar feeds upon the roots of burdock, hops, &c. changes into a chryſalis in May, appears in the winged ſtate in June, frequenting low marſhy grounds where hops grow.

Phalæna noctua pronuba ſpirilinguis, fig. 4. The thorax, head, antennæ, feet, and upper wings, are of a brown colour, more or leſs dark, ſometimes ſo deep as to be nearly black, but often of a blueiſh caſt. The upper wings are moreover ſomewhat clouded, and have two black ſpots, one on the middle, the other towards the outward angle of the lower part of the wing. The under ones are of a beautiful orange colour, with a broad black band near the lower edge of the wing, of which it follows the direction. The caterpillar is ſmooth; to be found on ſeveral plants, but particularly upon the thlaſpi and ſome other cruciferous plants. It keeps in concealment during the day, and only feeds by night. Its metamorphoſis is performed underground, and ſome varieties of colour are obſervable amongſt theſe caterpillars; ſome being green, others brown; which latter yield males, the former females.

Phalæna tortrix praſinana. The ſuperior wings of this ſpecies are of a fine green colour, having two diagonal yellow bars on each; the body and inferior wings are whitiſh, ſhaded with yelloviſh green. The caterpillar is a pale yelloviſh green, ornamented with ſmall brown ſpecks or ſpots, the tail being forked, and tipt with orange red colour; feeds on the oak, changes to a chryſalis in September, and aſſumes the fly-ſtate about May, frequenting woods.

PHALANGIUM, in zoology, a genus of inſects belonging to the order of aptera. They have eight feet, two eyes on the top of the head placed very near each other, and other two on the ſides of the head: the feelers reſemble legs, and the belly is round. There are nine ſpecies.

Mr. Barbut only deſcribes one ſpecies, *viz.* the phalangium opilis of Linnæus. His deſcription is as follows: " Its body is roundiſh, of a duſky brown on the back, with a dukier ſpot of a rhomboidal figure near the middle of it. The belly is whitiſh; the legs are extremely long and ſlender. On the back part of the head there ſtands a little eminence, which has on it a kind of double creſt, formed as it were of a number of minute ſpines; the eyes are ſmall and black, and are two in number. It is commonly called the *ſhepherd ſpider*.

" This ſpecies of ſpider multiplies ſingularly. They are great ſpinners. In autumn the ſtubble is quite covered with the threads of theſe ſpiders, by means of which they travel with eaſe, and entangle their prey. However, thoſe threads are thought rather to be the produce of a ſpecies of tick called *autumnal-weaver*. A ſmall degree of attention diſcovers an amazing multitude of thoſe ticks almoſt imperceptible, and that is their work. The threads, when united, appear of a beautiful white, wave about in the air, and are known in the country by the name of *virgin's threads*. Some naturaliſts think, that theſe threads, floating in the air, ſerve the inſect as ſails to waft it through the air, and as a net to entrap inſects on the wing; for remnants of prey, ſay they, are diſcoverable in them. As to thoſe parcels in which nothing is ſeen, they are only eſſays rejected by thoſe travelling inſects. The analogy between the phalangium and the crab, and the facility with which it parts with its legs to ſave the reſt of the body, has raiſed a preſumption that its legs might grow again, as do

thoſe of crabs and lobſters. Country people have an opportunity to endeavour at aſcertaining the truth of theſe obſervations."

PHALANGOSIS, in ſurgery, is a tumor and relaxation of the eye-lids, often ſo great as to deform the eye, and conſiderably to impede viſion. Sometimes the eye-lid when in this ſtate ſubſides or ſinks down, occaſioned perhaps either by a palſy of the muſcle which ſuſtains and elevates the eye-lid, or elſe from a relaxation of the cutis above, from various cauſes. Sometimes an œdematous or aqueous tumor is formed on the eye-lids, ſo as almoſt entirely to exclude viſion; but this laſt caſe ſhould be diſtinguiſhed from the other, and may be eaſily remedied by the uſe of internal and topical medicines, ſuch as purges and diuretics given inwardly, and a compreſs dipped in warm ſpirit of wine and lime water. But in the paralytic or relaxed caſe, the uſe of cordial and nervous medicines muſt be propoſed internally; and outwardly, balſam of Peru and Hungary water are to be employed. If all theſe fail, the remaining method of cure is to extirpate a ſufficient quantity of the relaxed cutis; and then, after healing up the wound, the remainder will be ſufficiently ſhortened.

PHALANX, in Grecian antiquity, a ſquare battalion of ſoldiers, with their ſhields joined and pikes croſſing each other; ſo that it was next to impoſſible to break it. The *Macedonian* phalanx is ſuppoſed by ſome to have had the advantage, in valour and ſtrength, over the Roman legion. Its number was 8000 men. But the word *phalanx* is uſed for a party of 28, and ſeveral other numbers; and even ſometimes for the whole body of foot. See LEGION.

PHALANX is applied, by anatomiſts, to the three rows of ſmall bones which form the fingers. In natural hiſtory it is a term which Dr. Woodward and ſome other writers on foſſils have uſed to expreſs an arrangement of the columns of that ſort of foſſil coralloide body found frequently in Wales, and called *lithoſtrotion*. In the great variety of ſpecimens we find of this, ſome have the whole phalanx of columns cracked through, and others only a few of the external ones; but theſe cracks never remain empty, but are found filled up with a white ſpar, as the ſmaller cracks of ſtone uſually are. This is not wonderful, as there is much ſpar in the compoſition of this foſſil: and it is eaſily waſhed out of the general maſs to fill up theſe cracks, and is then always found pure, and therefore of its natural colour, white.

The lithoſtrotion, or general congeries of theſe phalanges of columns, is commonly found immerſed in a grey ſtone, and found on the tops of the rocky cliffs about Milford in Wales. It is uſually erect, though ſomewhat inclining in ſome ſpecimens, but never lies horizontal. It ſeems to have been all white at firſt, but to have been ſince gradually tinctured with the matter of the ſtone in which it lies. The ſingle columns, which form each phalanx, are uſually round or cylindric, though ſometimes flatted and bent; ſome of them are alſo naturally of an angular figure; theſe, however, are not regular in the number of their angles, ſome conſiſting of three ſides, ſome of five, and ſome of ſeven; ſome are hexangular alſo, but theſe are ſcarce. They are from five or ſix to ſixteen inches in length; and the largeſt are near half an inch over, the leaſt about a quarter of an inch; the greater number are very equal to one another in ſize; but the ſides of the columns being unequal, the ſame column meaſures of a different thickneſs when meaſured different ways; the phalanges or congeries of theſe are ſometimes of a foot or more in diameter.

The columns are often burſt, as if they had been affected by external injuries; and it is evident that they were not formed before ſeveral other of the extraneous foſſils; for there are found ſometimes ſhells of ſea-fiſhes and entrochi immerſed and bedded in the bodies of the columns. It appears plainly from hence, that when theſe bodies were waſhed out of the ſea, and toſſed about in the waters which then covered the tops of theſe cliffs, this elegant foſſil, together with the ſtony bed in which it is contained, were ſo ſoft, that thoſe other bodies found entrance into their very ſubſtance, and they were formed as it were upon them. This foſſil takes an elegant poliſh, and makes in that ſtate a very beautiful appearance, being of the hardneſs of the common white marble, and carrying the elegant ſtructure viſible in the ſmalleſt lineaments.

PHALARIS, a remarkable tyrant, born at Crete, where his ambitious deſigns occaſioned his baniſhment: he took refuge in Agrigentum, a free city of Sicily, and there obtained the ſupreme power by ſtratagem. The circumſtance which has chiefly contributed to preſerve his name in hiſtory is his cruelty; in one act of which he gave, however, an example of ſtrict juſtice. It is thus related: Perillus, a braſs-founder at Athens, knowing the cruel diſpoſition of Phalaris, contrived a new ſpecies of puniſhment for him to inflict on his ſubjects. He caſt a brazen bull, bigger than the life, with an opening in the ſide to admit the victims; who being ſhut up in the body, a fire was kindled under it to roaſt them to death; and the throat was ſo contrived, that their dying groans reſembled the roaring of a bull. The artiſt brought it to the tyrant, expecting a great reward. Phalaris admired the invention and workmanſhip, but ordered the inventor to be put into it to make the firſt trial. In alluſion to which, Ovid ſays,

Neque enim lex æquior ulla,
Quam necis artifices arte perire ſua.

The end of this deteſtable tyrant is differently related; but it is very generally believed, with Cicero, that he fell by the hands of the Agrigentines; and, as ſome ſuppoſe, at the inſtigation of Pythagoras. Ovid tells us, that his tongue was cut out; and that he was then put into the bull to periſh by the ſame ſlow fire by which means he had murdered ſo many before. Others ſay that he was ſtoned to death; and all agree that his end was violent. He reigned, Euſebius ſays, 28 years; others ſay 16. After all, there is great uncertainty both as to his life, death, and hiſtory. Many of the circumſtances related of him, as they are collected by Mr. Boyle, depend upon the authenticity of thoſe epiſtles which go under the name of the tyrant; and which have been juſtly queſtioned, and with great probability rejected, as the ſpurious production of ſome modern ſophiſt. See BENTLEY, p. 177. col. 2.

PHALARIS, or *Canary graſs*, in botany; a genus of the trigynia order, belonging to the triandria claſs of plants. The calyx is bivalved, carinated, and equal in length, containing the corolla. There are ten ſpecies, of which the moſt remarkable are the canarienſis, or manured Canary-graſs; and the arundinacea, or reed Canary-graſs. Theſe are both natives of Britain. The firſt grows by the road ſides; and is frequently cultivated for the ſake of the ſeeds, which are found to be the beſt food for the Canary and other ſmall birds. The ſecond grows on the banks of rivers. It is uſed for thatching ricks or cottages, and endures much longer than ſtraw. In Scandinavia they mow it twice a-year, and their cattle eat it. There is a variety of this cultivated in our gardens with beautifully ſtriped leaves. The ſtripes are generally green and white; but ſometimes they have a purpliſh caſt. This is commonly called *painted lady-graſs*, or *ladies treſſes*.

PHALERÆ, among the ancient Romans, were military rewards beſtowed for ſome ſignal act of bravery. Authors do not agree whether the phaleræ were a ſuit of rich trappings for a horſe, or golden chains ſomething like the torques, but ſo formed as to hang down to the breaſt, and diſplay a greater profuſion of ornament. The laſt opinion appears to have the greater prevalence, but perhaps both are true.

PHALEREUS (Nepos), a village and port of Athens; this laſt neither large nor commodious, for which reaſon Themiſtocles put the Athenians on building the Piræeus; both joined to Athens by long walls. The Phalereus lay nearer the city (Pauſanias). Demetrius Phalereus, the celebrated ſcholar of Theophraſtus, was of this place; to whom the Athenians erected above 300 ſtatues; which were afterwards deſtroyed by his enemies, on his flight to Ptolemy king of Egypt (Strabo). Here Demoſthenes was wont to declaim, to accuſtom his voice to ſurmount the noiſe and roaring of the ſea; a juſt and lively emblem of popular aſſemblies.

PHALEUCIAN VERSE, in ancient poetry, a kind of verſe conſiſting of five feet; the firſt of which is a ſpondee, the ſecond a dactyl, and the three laſt trochees.

PHALLUS, the MOREL, in botany; a genus of the order of fungi, belonging to the cryptogamia claſs of plants. The fungus is reticulated above and ſmooth below. There are two ſpecies.

1. The *eſculentus*, or eſculent morel, is a native of Britain, growing in woods, groves, meadows, paſtures, &c. The ſubſtance, when recent, is wax-like and friable; the colour a whitiſh yellow, turning browniſh in decay; the height of the whole fungus, about four or five inches. The ſtalk is thick and clumſy, ſomewhat tuberous at the baſe, and hollow in the middle. The pileus is either round or conical; at a medium about the ſize of an egg, often much larger; hollow within; its baſe united to the ſtalk; and its ſurface cellular, or latticed with irregular ſinuſes. The magnified ſeeds are oval. It is much eſteemed at table both recent and dried, being commonly uſed as an ingredient to heighten the flavour of ragouts. We are informed by Gleditſch, that morels are obſerved to grow in the woods of Germany in the greateſt plenty in thoſe places where charcoal has been made. Hence the good women who collect them to ſell, receiving a hint how to encourage their growth, have been accuſtomed to make fires in certain places of the woods, with heath, broom, vaccinium, and other materials, in order to obtain a more plentiful crop. This ſtrange method of cultivating morels being however ſometimes attended with dreadful conſequences, large woods having been ſet on fire and deſtroyed by it, the magiſtrate thought fit to interpoſe his authority, and the practice is now interdicted.

2. The *impudicus*, ſtinking morel, or ſtinkhorns, is alſo a native of Britain, and found in woods and on banks. It ariſes from the earth under a veil or volva, ſhaped exactly like a hen's egg, and of the ſame colour, having a long fibrous radicle at its baſe. This egg-like volva is compoſed of two coats or membranes, the ſpace between which is full of a thick, viſcid, tranſparent matter, which, when dry, glues the coats together, and ſhines like varniſh. In the next ſtage of growth, the volva ſuddenly burſts into ſeveral lacerated permanent ſegments, from the centre of which ariſes an erect, white, cellular, hollow ſtalk, about five or ſix inches high and one thick, of a wax-like friable ſubſtance, and moſt fetid cadaverous ſmell, conical at each end, the baſe inſerted in a white, concave, membranaceous, turbinated cup, and the ſummit capped with a hollow, conical pileus, an inch long, having a reticulated cellular ſurface, its baſe detached from the ſtalk, and its ſummit umbilicated, the umbilicus ſometimes perforated and ſometimes cloſed. The under ſide of this pileus is covered with a clear, viſcid, gelatinous matter, ſimilar to that found between the membranes of the volva: and under this viſcid matter, concealed in reticulated receptacles, are found the ſeeds, which when magnified appear ſpherical. As ſoon as the volva burſts, the plant begins to diffuſe its intolerable odours, which are ſo powerful and widely expanded, that the fungus may be readily diſcovered by the ſcent only, before it appears to the ſight. At this time, the viſcid matter between the coats of the volva grows turbid and fuſcous; and when the plant attains its full maturity, the clear viſcid ſubſtance in the pileus becomes gradually diſcoloured, putrid, and extremely fetid, and ſoon afterwards turns blackiſh, and, together with the ſeeds and internal part of the pileus itſelf, melts away. The fetid ſmell then begins to remit, the fungus fades, and continues for a ſhort time ſapleſs and coriaceous, and at laſt becomes the food of worms. The cadaverous ſcent of this fungus greatly allures the flies; which, lighting upon the pileus, are entrapped in the viſcid matter and periſh. We are informed by Gleditſch, that the vulgar people in Thuringia call the unopened volvæ by the ridiculous name of *ghoſts'* and *dæmons' eggs*; and that they collect and dry them either in the ſmoke or open air, and, when reduced to powder, uſe them in a glaſs of ſpirits as an aphrodiſiac.

PHALLUS, among the Egyptians, was the emblem of fecundity. It was very fervently worſhipped by women, eſpecially by thoſe who were barren. This cuſtom was introduced among the Greeks, and feſtivals in honour of it were called *phalluca*. See MYSTERIES. Among the HINDOOS a ſimilar emblem called *lingam* is uſed, and for ſimilar purpoſes.

PHALTI, or PHALTIEL, ſon of Laiſh. He married Michal, after Saul had taken her from David; but David afterwards took her away from Phalti (1 Sam. xxv. 44. 2 Sam. iii. 15.). Some interpreters are of opinion Phalti did not meddle with Michal all the time ſhe continued in his houſe, for fear that both of them ſhould incur the penalty of death, to be inflicted on adulterers (Levit. xx. 10.), becauſe Michal had not been legally divorced; but theſe reaſons are frivolous. Saul looked upon David as a rebel to his king, and an outlaw, whoſe goods and wives belonged to him, and which he could abſolutely diſpoſe of. He would not have given Michal to Phalti, nor would he have received her, if he had not thought he might uſe her as his wife. If Michal had no children by Phalti, by whom then were thoſe children that the ſcripture ſays ſhe had, ſince it is known ſhe had none by David? See 2 Sam. xxi. 8. and vi. 23.

PHANATIC, or FANATIC, a viſionary; one who fancies he ſees ſpectres, ſpirits, apparitions, or other imaginary objects, even when awake; and takes them to be real. See PHANTASY and FANATIC. Such are phrenetics, necromancers, hypochondriac perſons, lycanthropi, &c. See PHRENETIC, HYPOCHONDRIAC, LYCANTHROPI. Hence the word is alſo applied to enthuſiaſts, pretenders to revelation, new lights, prophecies, &c. See ENTHUSIAST, and SECOND *Sight*.

PHANTASIA was the daughter of Nicarchus of Memphis in Egypt. It has been ſuppoſed that ſhe wrote a poem on the Trojan war, and another on the return of Ulyſſes to Ithaca, from which compoſitions Homer copied the greateſt part of his Iliad and Odyſſey, when he viſited Memphis, where they were depoſited.

PHANTASM, a term ſometimes uſed in a ſynonymous ſenſe with idea, or notion retained in the mind, of an external object.

PHANTASY, or FANCY, the *Imagination*; the ſecond of the powers or faculties of ſoul, by which the ſpecies of objects received by the external organs of ſenſe are retained, recalled, further examined, and either compounded or divided. See the articles IMAGINATION and METAPHYSICS. Others define the phantaſy to be that internal ſenſe or power, whereby the ideas of abſent things are formed, and repreſented to the mind as if they were preſent. In melancholics and madmen this faculty is very ſtrong, repreſenting many extravagant and monſtrous things, and framing its images as lively as thoſe of ſenſation: whence the viſions and deceptions thoſe perſons are liable to.

PHANUEL, of the tribe of Aſher, the father of a holy

widow and propheteſs called Anna, who was in the temple when our Saviour was preſented there by his parents (Luke ii. 36, 37, 38.)

PHAON, a young man of Mytilene, in the iſland of Leſbos, received from Venus, as fable reports, an alabaſter vaſe filled with an eſſence which had the virtue of conferring beauty. He had no ſooner anointed his body with it than he became the moſt beautiful of men. The ladies of Mytilene fell deſperately in love with him; and the celebrated Sappho threw herſelf down a precipice becauſe he would not encourage her paſſion. He is ſaid to have been killed by a huſband who ſurpriſed him with his wife. We have in Ovid a letter from Sappho to Phaon, which Mr. Pope has tranſlated into Engliſh verſe.

PHARA (anc. geog.), a village between Egypt and Arabia Petræa; or, according to Ptolemy, at a promontory ſituated between the Sinus Heroopolites and Elaniticus of the Red Sea; where Iſmael is ſaid to have dwelt. In Hebrew it is *Paran*, and in moſt interpreters; *Pharan*, Septuagint and Vulgate. *Pharanitæ*, the people (Ptolemy). *Paran* or *Pharan*, the name of the wilderneſs in its neighbourhood, adjoining to Kadiſh.

PHARÆ (anc. geog.), a town of Achaia in Peloponneſus, on the river Pierus, 70 ſtadia from the ſea, and to the ſouth of Patræ 150 ſtadia. Another of Crete (Pliny); a colony from the *Pharæ* of Meſſenia (Stephanus). A third *Pharæ*, or *Pheræ* (Strabo, Ptolemy); *Phara, æ*, (Polybius); a town of Meſſenia, on the river Nedo (Strabo); on the north ſide of the Sinus Meſſenius, and to the north-weſt of Abca. Anciently read *Pharis* in Homer (Pauſanias, Statius), though now read *Phare*. *Pharitæ* is the name of the people.

PHARAMOND is the name which is given by the generality of hiſtorians to the firſt king of France. He is ſaid to have reigned at Treves, and over a part of France, about the year 420; and to have been ſucceeded by his ſon Clodion: but the account which is given of theſe two princes is very uncertain. It is probable Pharamond was properly no more than a general of an army, the head of a military ſociety of Franks, who were maſters of their perſons and their fortunes. Gregory of Tours ſeems to have been of this opinion. "It is not generally known (ſays he) who was the firſt king of the French. Sulpitius Severus, who mentions ſeveral things reſpecting that nation, takes no notice of its firſt monarch; he only ſays that it had generals." Be that as it may, the inſtitution of the famous Salique law (ſo named from the Salians, the moſt illuſtrious of the Franks) is generally attributed to Pharamond. "This law fixed the puniſhment of crimes, and various points of police. There is no juſt ground for believing that it expreſsly ſettled the right of ſucceſſion to the crown: it only ſays, that, with relation to the Salic land, women have no ſhare of heritage, without reſtricting it to the royal family in particular; for all thoſe were generally called *Salic lands* which were held by right of conqueſt; and it is eaſy to conceive that a nation of ſoldiers, whoſe general was their king, would not ſubmit to be governed by a woman. A long cuſtom, ſupported by the principles of the nation, came in time to be the eſtabliſhed law of the kingdom." (See *M. Abbé Millot, Elem. de l'Hiſtoire de France*, tom. i.)

PHARAOH, a common name of the kings of Egypt. Joſephus ſays, that all the kings of Egypt, from Minæus the founder of Memphis, who lived ſeveral ages before Abraham, have always had the name of Pharaoh, down to the times of Solomon, for more than 3300 years. He adds, that in the Egyptian language the word *Pharaoh* ſignifies a king; and that thoſe princes did not aſſume this name but when they aſcended the throne, at which time they quitted alſo their former name. From hence it comes to paſs, ſays Joſephus, that Herodotus names none of the kings of Egypt after Minæus the builder of Memphis, though he had 330 kings for his ſucceſſors, becauſe they had all the name of Pharaoh; but becauſe this name did not paſs to women alſo, he names an Egyptian queen Nicaule who ſucceeded them. Laſtly, I find, adds Joſephus, from the ancient records of our nation, that from the age of Solomon no king of Egypt had any longer the name of Pharaoh.

But Joſephus is not very accurate in this paſſage. True it is, Herodotus ſays, that Mines, or Minæus, was the firſt king of Egypt, and founder of Memphis; that there were 330 kings after him in Egypt; that after them there was a queen called Nicotris, and not Nicaule, as Joſephus writes it; but it is not true that theſe kings had no other name but Pharaoh. Herodotus ſays expreſsly, that in the books of the Egyptian prieſts were read the names and the catalogue of 330 kings; that in this number of 330 there were 18 Ethiopians, and a woman that was a foreigner called Nicotris, and that all the others were Egyptians. Theſe princes therefore had every one his proper name mentioned in the catalogue of the Egyptian kings. So likewiſe we ſee in the fragments of Manetho, that every king of Egypt had a name peculiar to him; and we find the name Pharaoh only in Scripture.

What Joſephus adds concerning queen Nicaule, or Nicotris, whom he pretends to be the ſame as the queen of Sheba, of whom mention is made in ſcripture (1 Kings x. 1, 2, &c.), is entirely fabulous; and as to what he ſays, that ſince the time of Solomon the kings of Egypt have no longer had the name of Pharaoh, it is manifeſtly falſe, ſince we ſtill find this name in the ſecond book of Kings, under Hezekiah (2 Kings xviii 21.); under Joſiah (xxiii. 29, 30. 33, &c.), where this name is joined to Necho, which was the proper name of this prince; under Jehoiakim (xxiii. 35.); and in the prophets Iſaiah, Jeremiah, and Ezekiel, who are much later than Solomon. It is very probable that the Egyptians gave the name of Pharaoh to their kings as long as the Egyptian language was in common uſe, and as long as their kings were of their own nation: but after the conqueſt of Egypt by Alexander the Great, and that the Grecians introduced their language with their government, the name of Pharaoh was known no longer among them. The firſt prince known to us by the name of Pharaoh was he in whoſe time Abraham went down to Egypt, when Sarah, who paſſed only for Abraham's ſiſter, was by the command of Pharaoh brought to his palace in order to become his wife. But the Lord ſmote Pharaoh and his family with great infirmities, and gave him to know that ſhe was Abraham's wife; whereupon Pharaoh ſent for Abraham, reſtored him his wife, and at the ſame time gave orders that he ſhould be conducted out of Egypt, with every thing that belonged to him. See SARAH.

The ſecond Pharaoh ſpoken of by the ſcripture is he that reigned when Joſeph arrived there. This prince or his ſucceſſor had the myſterious dream of the fat and lean kine, and the ſeven full and barren ears of corn, which Joſeph explained ſo well to his ſatisfaction, that he made him governor of his houſe and of all Egypt, reſerving only to himſelf the name of a king. This is the ſame Pharaoh that ſent for and entertained the patriarch Jacob and his family in Egypt, and gave them the land of Goſhen for their habitation. See JOSEPH and JACOB.

The third Pharaoh known in holy writ is he that perſecuted the Iſraelites. Moſes tells us that he was a new king, and had no knowledge of Joſeph (Exod. i. 8.). This prince, obſerving that the Iſraelites were become very numerous and powerful, reſolved to depreſs them by hardſhip and labour; and ſet cruel and pitileſs taſkmaſters over them. But the more he oppreſſed them, the faſter they multiplied; inſomuch that he gave orders to the Egyptian midwives, who aſſiſted the Hebrew women in their labour, to put all the male children to death, and to ſave

alive the females only. But this command was not ſtrictly executed. The midwives feared the Lord, and preſerved alive not only the female children, but the males alſo.

Pharaoh, ſeeing this project did not ſucceed to his wiſhes, publiſhed a decree (Exod. i. 22.) that all the male children born of Hebrew women ſhould be thrown into the Nile, and that only the females ſhould be ſpared. This order was rigorouſly executed; yet, by the providence of God, Moſes was preſerved, and even brought up in Pharaoh's own court, by his own daughter, who by chance had found the child as he was expoſed upon the Nile.

Moſes being grown up, and having killed an Egyptian who had abuſed an Hebrew, was obliged to fly from Egypt to avoid that death that Pharaoh had threatened him with.

Several years after, being about 80 years old, he returned again by an order from God, and performed mighty miracles before Pharaoh. See MOSES. There is a good deal of probability that this Pharaoh, before whom Moſes appeared, and in whoſe ſight he ſmote Egypt with ſo many plagues, was a different perſon from him who would have laid hands on him after he had ſlain the Egyptian. This ſame Pharaoh, having at laſt been compelled to ſend away the Hebrews, and to ſuffer them to go out of Egypt, ſoon repented of the leave he had given, and purſued them at the head of his army with his chariots. But he was drowned in the Red Sea, wherein he had raſhly entered in the eagerneſs of his purſuit. Some hiſtorians pretend to give us the name of this Pharaoh; ſome, as Appion, call him Amoſis or Amaſis; Euſebius calls him Chenchris; Uſher calls him Amenophis; but we may aſſure ourſelves that there can be nothing certain in all this.

The fifth Pharaoh known to us is he that gave protection to Hadad ſon of the king of Edom, who gave him to wife the ſiſter of his own queen, enriched him with lands, and brought up his ſon Genubah in his own court. Hadad returned to Idumea after the death of David.

The ſixth Pharaoh is he that gave his daughter in marriage to Solomon king of the Hebrews (1 Kings iii. 1.); and having taken Gezer, he ſet it on fire, drove the Canaanites out of it, and gave it for a preſent to Solomon in lieu of a dowry for his daughter, whom he had married to this prince (1 Kings ix. 16.).

The ſeventh is Shiſhak, who entertained Jeroboam in his dominions, a rebellious ſubject of Solomon, and offered him a refuge in oppoſition to the king his maſter. The ſame Skiſhak declared war againſt Rehoboam the ſon and ſucceſſor of Solomon, beſieged and took Jeruſalem, carried away all the king's treaſures, and thoſe of the houſe of God, and particularly the golden bucklers that Solomon had made. See SHISHAK.

The eighth is that Pharaoh with whom Hezekiah made a league againſt Sennacherib king of Aſſyria, in the year of the world 3290. See SENNACHERIB. This Pharaoh is probably the ſame whom Herodotus names Sethon, prieſt of Vulcan, who came to meet Sennacherib before Peluſium, and to whoſe aſſiſtance Vulcan ſent an army of rats, which gnawed the bow-ſtrings and the thongs of the bucklers of Sennacherib's ſoldiers.

The ninth is Pharaoh-Necho, or Nechos, ſon of Pſamnitiſcus, who made war with Joſiah, and ſubdued him. Herodotus alſo mentions this prince.

The tenth is Pharaoh Hophrah, who entered into an alliance with Zedekiah king of Judah, and attempted to come to his aſſiſtance againſt Nebuchadnezzar king of Chaldea. It was againſt this Pharaoh that Ezekiel pronounced ſeveral of his prophecies (See Ezek. xxix. xxx. xxxi. xxxii.). He is called Apries in Herodotus, l. ii. c. 161. He is alſo mentioned in Habakkuk ii. 15, 16. See alſo Iſaiah xix. xx. and Jeremiah xlvi. 16, &c.

PHARAON is the name of a game of chance, the principal rules of which are:—The banker holds a pack conſiſting of 52 cards; he draws all the cards one after the other, and lays them down alternately at his right and left hand; then the ponte may at his pleaſure ſet one or more ſtakes upon one or more cards, either before the banker has begun to draw the cards, or after he has drawn any number of couples. The banker wins the ſtake of the ponte when the card of the ponte comes out in an odd place on his right hand, but loſes as much to the ponte when it comes out in an even place on his left hand. The banker wins half the ponte's ſtake when it happens to be twice in one couple. When the card of the ponte, being but once in the ſtock, happens to be the laſt, the ponte neither wins nor loſes; and the card of the ponte being but twice in the ſtock, and the laſt couple containing his card twice, he then loſes his whole ſtake. De Moivre has ſhown how to find the gain of the banker in any circumſtance of cards remaining in the ſtock, and of the number of times that the ponte's card is contained in it. Of this problem he enumerates four caſes, viz. when the ponte's card is once, twice, three, or four times in the ſtock. In the firſt caſe, the gain of the banker is $\frac{1}{n}$, n being the number of cards in the ſtock.

In the ſecond caſe, his gain is $\frac{\overline{n-2} \times y}{n \times n-1} + \frac{2}{n \times n-1}$, or $\frac{\frac{1}{2}n+1}{n \times n-1}$, ſuppoſing $y = \frac{1}{2}$. In the third caſe, his gain is $\frac{3y}{2 \times n-1}$, or $\frac{3}{n \times n-1}$, ſuppoſing $y = \frac{1}{2}$. In the fourth caſe, the gain of the banker, or the loſs of the ponte, is $\frac{2n-5}{n-1 \times n-3} y$, or $\frac{2n-5}{2 \times n-1 \times n-3}$, ſuppoſing $y = \frac{1}{2}$. De Moivre has calculated a table, exhibiting this gain or loſs for any particular circumſtance of the play; and he obſerves, that at this play the leaſt diſadvantage of the ponte, under the ſame circumſtances of cards remaining in the ſtock, is when the card of the ponte is but twice in it; the next greater when three times, the next when once, and the greateſt when four times. He has alſo demonſtrated, that the whole gain *per cent.* of the banker upon all the money that is adventured at this game, is 2l. 19s. 10d. See De Moivre's Doctrine of Chances, p. 77, &c. p. 105, &c.

PHAREZ, ſon of Judah and Tamar (Gen. xxxviii. 27, 28, &c.) Tamar, being juſt ready to lie in, found herſelf with child of twins. One of them appeared firſt, and putting his arm out, he immediately drew it back again. The midwife tied a ſcarlet thread upon his arm, to diſtinguiſh him for the firſt-born; but having withdrawn his hand, his brother got before him into the world: whereupon he was called by his mother *Pharez*, i. e. *one breaking forth*; as the other with the thread on his hand was called *Zara*. The ſons of Pharez were Hezron and Hamul (Numb. xxvi. 20, 21.) F. Calmet, upon this article, explains the text as if Pharez, and not Zarah, had put out his hand, and drew it in again.

PHARISEES, a famous ſect of the Jews, who diſtinguiſhed themſelves by their zeal for the traditions of the elders, which they derived from the ſame fountain with the written word itſelf; pretending that both were delivered to Moſes from Mount Sinai, and were therefore both of equal authority. From their rigorous obſervance of theſe traditions, they looked upon themſelves as more holy than other men; and therefore ſeparated themſelves from thoſe whom they thought ſinners or profane, ſo as not to eat or drink with them; and hence, from the Hebrew word *pharis*, which ſignifies "to ſeparate," they had the name of *Phariſees* or *Separatiſts*.

This ſect was one of the moſt ancient and moſt conſiderable

among the Jews; but its original is not very well known*: however, it was in great repute in the time of our Saviour; and muſt have had its original at the ſame time with the traditions, and they grew up together, till at length they had gained ground ſo far that the traditional law ſwallowed up the written, and thoſe who were propagators of it the whole bulk of the Jewiſh nation.

The extraordinary pretences of the Phariſees to righteouſneſs drew after them the common people, who held them in the higheſt eſteem and veneration. Our Saviour frequently, however, charges them with hypocriſy, and making the law of God of no effect through their traditions (Matt. ix. 2. xv. 1—6. xxiii. 13—33. and Luke xi. 39—52.) Several of theſe traditions are particularly mentioned in the goſpel; but they had a vaſt number more, which may be ſeen in the Talmud, the whole ſubject whereof is to dictate and explain thoſe traditions which this ſect impoſed to be believed and obſerved.

The Phariſees, contrary to the opinion of the Sadducees, held a reſurrection from the dead, and the exiſtence of angels and ſpirits (Acts xxiii. 8.) But, according to Joſephus, this reſurrection of theirs was no more than a Pythagorean reſurrection, that is, of the ſoul only, by its tranſmigration into another body, and being born anew with it. From this reſurrection they excluded all that were notoriouſly wicked, being of opinion that the ſouls of ſuch perſons were tranſmitted into a ſtate of everlaſting woe. As to leſſer crimes, they held they were puniſhed in the bodies which the ſouls of thoſe who committed them were next ſent into.

Joſephus, however, either miſtook the faith of his countrymen, or, which is more probable, wilfully miſrepreſented it, to render their opinions more reſpected by the Roman philoſophers, whom he appears to have on every occaſion been deſirous to pleaſe. The Phariſees had many pagan notions reſpecting the ſoul; but Biſhop Bull, in his *Harmonia Apoſtolica*, has clearly proved, that they held a reſurrection of the body, and that they ſuppoſed a certain bone to remain uncorrupted, to furniſh the matter of which the reſurrection body was to be formed. They did not, however, believe that all mankind were to be raiſed from the dead. A reſurrection was the privilege of the children of Abraham alone, who were all to riſe on Mount Zion; their incorruptible bones, wherever they might be buried, being carried to that mountain below the ſurface of the earth. The ſtate of future felicity, in which the Phariſees believed, was very groſs: they imagined, that men in the next world, as well as in the preſent, were to eat and drink, and enjoy the pleaſures of love, each being reunited to his former wife. Hence the Sadducee, who believed in no reſurrection, and ſuppoſed our Saviour to teach it as a Phariſee, very ſhrewdly urged the difficulty of diſpoſing of the woman who had in this world been the wife of ſeven huſbands. Had the reſurrection of Chriſtianity been the Phariſaical reſurrection, this difficulty would have been inſurmountable; and accordingly we find the people, and even ſome of the Phariſees themſelves, ſtruck with the manner in which our Saviour removed it.

This ſect ſeems to have had ſome confuſed notions, probably derived from the Chaldeans and Perſians, reſpecting the preexiſtence of ſouls; and hence it was that Chriſt's diſciples aſked him concerning the blind man (John ix. 2.), 'Who did ſin, this man or his parents, that he was born blind?' And when the diſciples told Chriſt, that ſome ſaid he was Elias, Jeremias, or one of the prophets (Mat. xvi. 14.), the meaning can only be, that they thought he was come into the world with the ſoul of Elias, Jeremias, or ſome other of the old prophets, tranſmigrated into him. With the Eſſenes, they held abſolute predeſtination; and with the Sadducees free-will: but how they reconciled theſe ſeemingly incompatible doctrines is nowhere ſufficiently explained. The ſect of the Phariſees was not extinguiſhed by the ruin of the Jewiſh commonwealth. The greateſt part of the modern Jews are ſtill of this ſect; being as much devoted to traditions, or the oral law, as their anceſtors were. See the articles CABBALISTS, CARAITES, ESSENES, SADDUCEES, &c.

PHARMACA, among the ancients, meant medicated or enchanted compoſitions of herbs, minerals, &c. ſome of which, when taken inwardly, were ſuppoſed to cauſe blindneſs, madneſs, love, &c. others infected by touch; ſuch was the garment ſent by Medea to Creuſa, prepared *ſecundum artem*; and others operated upon perſons at a diſtance. *Pharmaca ſoteriæ* were employed as antidotes againſt theſe miſchievous compoſitions: thus the herb moly preſerved Ulyſſes from the magical influence of Circe. The laurel, the rhamnus, the fleabane, the jaſper-ſtone, were uſed for ſimilar purpoſes. See *Potter's Grec. Ant.*

PHARMACI, were two perſons who were employed in the luſtration or purification of cities. Some ſay they were both men; but others maintain, that a man to repreſent the males, and a woman to repreſent the females, performed this office. They performed ſacrifice, and wore figs about their necks called ολκαδες: thoſe of the man were blackiſh, and thoſe of the woman white. Figs were an emblem of fertility, which they doubtleſs prayed for on theſe ſolemn occaſions.

PHARMACOCHEMIA, means that part of the chemical art which treats of the preparation of medicines. It is ſo named by way of diſtinction from that chemiſtry which is wholly employed about the tranſmutation of metals by means of the philoſopher's ſtone; this being known by the name of *ſpagirico-chemia*.

PHARMACOLOGY, is a treatiſe of medicines, or the art of preparing them, judging of them, &c.

PHARMACOPŒIA, (from φαρμακον *remedy*, and ποιειν *to make*), means a diſpenſatory, or a treatiſe deſcribing the preparations of the ſeveral kinds of medicines, with their uſes, manner of application, &c.

We have various pharmacopœias, as thoſe of Bauderon, Quercetan, Zwelfer, Charas, Bates, Salmon, Lemery, Lewis, &c. The lateſt and moſt in eſteem are the London and Edinburgh diſpenſatories. See PHARMACY.

PHARMACOPOLA, or PHARMACOPOEIUS, an *apothecary*; or a perſon who prepares and ſells medicines. (See APOTHE-

* The Jeſuit Serrarius places their firſt riſe about the time of Eſdras; becauſe it was then that the Jews firſt began to have interpreters of their traditions. Maldonat, on the other hand, will not have this ſect to have ariſen among the Jews till a little before the time of Chriſt. Others, perhaps with more probability, refer the origin of the Phariſees to the time of the Maccabees.

Dr. Lightfoot thinks, that Phariſaiſm roſe up gradually, from a period which he does not aſſign, to the maturity of a ſect. It is certain, from the account given by Joſephus, that in the time of John Hyrcanus, the high prieſt and prince of the Aſmonean line, about 108 years before Chriſt, the ſect was not only formed, but made a conſiderable figure; and that it had advanced to a high degree of popularity and power about 80 years before Chriſt. Joſ. Ant. lib. xiii. cap. 10. § 5, 6. cap. 15. § 5. & cap. 16. § 1. According to Baſnage, Hiſt. of the Jews, book ii. cap. 9. § 2. one Ariſtobulus, an Alexandrian Jew, and a Peripatetic philoſopher, who flouriſhed about 125 years before Chriſt, and wrote ſome allegorical commentaries on the ſcripture, was the author of thoſe traditions by an adherence to which the Phariſees were principally diſtinguiſhed from other ſects.

CARY). The word is seldom used but by way of ridicule. It is formed from φαρμακον, and πωλειν *to sell*. See Horace, Sat. 2. lib. i. ver. 1.

PHARMACUM, φαρμακον, a medicament or medicine, whether of a salutary or poisonous quality.

PHARMACY.

THE art of preparing, preserving, and compounding, substances, for the purposes of medicine. This art has been commonly divided into two branches, *Galenical* and *Chemical* Pharmacy. But for this division there is no foundation in nature: and accordingly processes in one pharmacopœia referred to the head of Chemical, are in another referred to the head of Galenical. There can be no doubt, that even the most simple pharmaceutical preparations are to a certain extent chemical. Hence this division, founded on prejudice, and supported merely by a veneration for antiquity, is now banished from almost every modern pharmacopœia.

Pharmacy has also been divided into *Theoretical* and *Practical*; the first, consisting not merely of speculative opinions, but of a knowledge of facts and principles, tending to explain the *rationale* of processes; the latter, comprehending the mere manual labour employed in processes.

The former of these may therefore be justly styled *Scientific Pharmacy*. And there can be no doubt that an acquaintance with it is essentially necessary to the physician as well as the apothecary: for without it he must often err in the forms of preparations and compositions which he employs; and must be often deceived in the effects resulting from compositions, when he infers their properties from the known powers of the ingredients in their separate state.

The theory of pharmacy, therefore, is the same with that of chemistry; as are also the operations, which remain to be discussed here only in as far as they are made subservient to the medicinal art, distinct from that which is purely chemical. The objects of pharmacy, however, are much more limited than those of chemistry; the latter comprehending, in the utmost latitude of the word, almost every substance in nature; while pharmacy regards only such bodies in the vegetable, animal, and mineral kingdoms, as, by their effects on the human frame, tend to preserve health, or to restore it when lost.

PART I. ELEMENTS OF PHARMACY.

CHAP. I. *A general View of the Properties and Relations of Medicinal Substances.*

SECT. I. VEGETABLES.

VEGETABLES are organized bodies, furnished with a variety of vessels for reception, transmission, and perspiration of different fluids. Analogous to animals, they are produced from seeds and eggs, and are endowed with functions, by which the aliment they imbibe is changed into new forms, into solids and fluids, peculiar to particular plants, and to different parts of the same plant. The analogy between the vegetable and animal kingdoms will appear still more striking when we consider that the former exhibit, though in a less degree, all the phenomena of sensibility and motion.

The *pabulum* of vegetables, like that of most animals, is of a mixed nature; and is composed of the necessary union of water, heat, and light, and less necessarily of air and earth: the office of these two last elements seems to be that of filtres, or vehicles for conveying the other principles in proper form.

From varieties in the state and proportion of these several agents, a very multiplied diversity takes place in the external form, quantity, and quality, of one and the same vegetable: hence the difference of plants from the soil, climate, season, and other similar circumstances. The influence of heat and light, or, what is probably the same thing, the absorption of the inflammable principle, is perhaps the most important article in the aliment of vegetables. This principle, whether derived from the solar rays, from putrid matters employed in manure, or from the putrefaction of the wild growth, assisted by calcareous earths and other septics, is found at all times to modify, in a peculiar manner, the form, the quantity, and even the sensible and inherent properties, of vegetables. It is of importance however to remark, that the soundness and specific principles of vegetables are not invariably the more complete in proportion to the vigour of their growth; high health, which is always a dangerous state in the constitution of animals, is often the means of perverting or destroying the economy of vegetable life. Thus the finer aromatics, which naturally inhabit the dry and sandy soils, when transplanted into a moist and rich one, or, in other words, when placed in mould abounding with the *fomites* of inflammable principle, grow with rapidity and vigour, and have their bulk considerably increased; but lose very much of their fragrance, as if their active principles were exhausted by the luxuriance of their growth.

Plants are also found to differ considerably in the different periods of their growth. Thus, some herbs in their infancy abound most with odoriferous matter; others again yield little or none till they have attained to a more advanced age. Many fruits, in their immature state, contain an austere acid juice, which by maturation is changed into a sweet one: others, as the orange, are first warm and aromatic, and afterwards by degrees become filled with a strong acid. The common grain, and sundry other seeds, when beginning to vegetate, are in taste remarkably sweet: yet the kernels of certain fruits prove, at the same period, extremely acid. The roots of some of our indigenous plants, whose juice is, during the summer, thin and watery, if wounded early in the spring, yield rich balsamic juices, which, exposed to a gentle warmth, soon concrete into solid gummy-resins, superior to many of those brought from abroad. In open expositures, dry soils, and fair warm seasons, aromatic plants become stronger and more fragrant, while those of an opposite nature become weaker. To these particulars, therefore, due regard ought to be had in collecting plants for medicinal uses.

It may be proper to observe also, that the different parts of one plant are often very different in quality from each other. Thus the bitter herb wormwood rises from an aromatic root; and the narcotic poppy-head includes seeds which have no narcotic power. These differences, though very obvious in the common culinary plants, do not seem to have been sufficiently observed or attended to in those plants that have been admitted as articles of the materia medica.

Without any obvious dependence on the circumstances above mentioned, vegetables are, like animals, also obnoxious to dis-

eaſes and death; which, whether occaſioned by intenſe cold, by inſects, lightning, or other cauſes, always maintain a ſtriking analogy to the affections of animals. The principal difference between animals and vegetables is, that the ſeveral parts of vegetables do not conſtitute ſuch a mutually depending ſyſtem as thoſe of the more perfect animals: hence it is, that a very conſiderable part of a plant may be diſeaſed or dead, while the reſt enjoys perfect good life and health. Though the phyſiology of vegetables is hitherto inſufficient for forming any complete doctrines of the cauſes and cure of their ſeveral diſeaſes; yet, in many caſes, it might be uſeful to attend to the formation of a pathology of the vegetable kingdom: in the ſtate even of our preſent knowledge, it is of importance in the ſtudy of pharmacy to be aware that ſuch diſeaſes really exiſt, and are capable of changing or deſtroying the active principles of many of our moſt valuable herbs. In the plants more evidently ſenſitive, the diſeaſes exhibit a very cloſe analogy to many of thoſe of animals: ſeveral of the remote cauſes are ſuch as are known to obſtruct perſpiration, to induce general debility, or otherwiſe diſorder the animal economy. The diſeaſes alſo are evidently marked by a diminution of their ſenſitive and moving principle; and, perhaps in conſequence of this diminution, their ſolids, their ſap, and other fluids, ſhrivel and decay, and the whole plant aſſumes new forms, and is impregnated with inert, or fraught with noxious principles. Analogous alſo to animals, the plant, when deprived of the living principle, runs into all thoſe changes common to what is called *inanimate matter*. We ſhall now proceed to examine the changes to which vegetables are ſubject.

I. *Productions from Vegetables by* Fermentation.

Fermentation is a ſpontaneous motion excited in dead vegetables and animals, which is peculiar to thoſe organic ſubſtances in conſequence of the principle of vegetable or animal life. See Fermentation.

The circumſtances favouring fermentation are in general a certain degree of fluidity, a certain degree of heat, and the contact of the air.

There are, however, ſeveral ſubſtances, of themſelves not ſuſceptible of fermentation, which nevertheleſs may be brought into that ſtate by the admixture of thoſe that are; as by adding to them, along with a proper quantity of water, a portion of the yeſt or head thrown up to the ſurface of fermenting liquors. Without this expedient many vegetables would run immediately into the acetous, and ſome of them into the putrefactive fermentations. It is alſo found, that though acetous and putrefactive ferments are unable to ſtop the vinous fermentation, they are, however, capable of aſſimilating the liquor to their own nature in a more perfect form: and hence it is, that in the manufactures of wine, rum, and vinegar, it is found uſeful to keep the veſſels well ſeaſoned with the liquor intended to be prepared. Three different kinds or ſtages of fermentation have been generally diſtinguiſhed by chemiſts: The vinous, which furniſhes alcohol, or what is commonly called *ſpirit*; the acetous, which affords vinegar; and the putrefactive, which yields volatile alkali. Being generally conſtant in ſucceſſion to each other, the whole proceſs will be beſt underſtood by conſidering each of them apart. All vegetable ſubſtances are not capable of the vinous fermentation: the conditions neceſſary to its production are, a ſaccharo-mucilaginous matter; a fluidity ſomewhat viſcous, the proper degree of which is beſt learned from experience; a heat from 40 to 96 of Fahrenheit's thermometer; a conſiderable maſs of matter; and the acceſs of the external air.

The phenomena exhibited in the vinous fermentation are, a briſk tumultuary motion, the liquor loſes its tranſparency and homogeneous appearance, its bulk and heat are conſiderably increaſed, the ſolid parts are buoyed up to the top, and a great quantity of a permanently elaſtic fluid is diſengaged. This fluid or gas, being heavier than atmoſpheric air, floats in ſeparate maſſes near the ſurface of the liquor; and is eaſily diſtinguiſhable from common air by extinguiſhing flame and animal life, precipitating lime from limewater, cryſtalliſing and rendering mild the cauſtic alkali: is the gas ſylveſtre of Helmont, and the fixed air, aerial acid, or carbonic acid of modern chemiſts. After ſome time the tumultuary motion in the liquor is ſuddenly checked, perhaps from the generation of the alcohol; a fine ley is alſo precipitated; and the floating matter, if not purpoſely prevented, ſubſides to the bottom of the veſſel. In the wines produced from the grape, a large quantity of ſaline concrete is incruſted on the ſides and bottom of the caſks; and this is commonly known by the name of *tartar*, the properties of which we ſhall afterwards examine. At the termination of theſe phenomena, the vegetable matter has aſſumed new properties; and, from being a mild, ſweet, or gently acidulous infuſion, is now become the briſk, pungent, and inebriating liquor called *wine* or *vinous liquor*.

Fermented or vinous liquors are prepared from a great variety of ſubſtances: the ſaccharine ſubſtances, or thoſe rendered ſo by a beginning vegetation, are in general fitteſt for the purpoſe; a multitude of collateral circumſtances are alſo neceſſary for the proper management of the proceſs; and in vinous liquors great diverſities are obſervable. Theſe differences are not only obſervable in wines produced from different ſubſtances, but alſo in thoſe prepared from one and the ſame vegetable. Theſe diverſities may be referred to the different conditions of the ſubſtance to be fermented, to the ſtates of fluidity and heat, and to the degree of fermentation to which the ſubject has been carried. This laſt is principally modified by the preceding cauſes, and not unfrequently by very minute and apparently trifling circumſtances in the conduct of the operator. Hence the numerous varieties in the vinous liquors produced from the grape, which have been more peculiarly denominated *wines*. It is an important part of pharmacy to inquire into theſe differences with care and attention.

The diverſity in vinous liquors is ſtill more obvious in thoſe produced from different vegetables. Many of the native qualities of the ſubſtances, as colour, taſte, flavour, &c. often remain in the wine; not being totally ſubdued by that degree of fermentation neceſſary for rendering the liquor vinous. Hence the remarkable difference of wines produced from the grape and the graminous ſeeds: the wine produced from theſe laſt has been more ſtrictly called *beer*; and is well known to differ from wines produced from apples, pears, apricots, or any other fruit.

1. Of the Product of the Vinous Fermentation.

The product of all theſe fermented vegetables is, as we have juſt now mentioned, the pungent and intoxicating liquor called *wine*. It is proper, however, in pharmacy, to inquire into the different principles which enter its compoſition. As the wine furniſhed by grapes is the moſt valuable and generally known, we ſhall take it as an example: Grape-wine, then, is compoſed of a large quantity of water, of alcohol, of tartar, and of a colouring matter. It is proper, however, that we ſhould lay down the proofs of ſuch a combination in wine, and explain the methods by which it may be decompoſed and ſeparated into the conſtituent parts above mentioned.

For this purpoſe, recourſe is generally had to the aſſiſtance of the fire. The liquor is put into an alembic; and as ſoon as it boils, a white milky fluid, of a pungent ſmell and taſte, diſtils into the recipient. This fluid is called *aquavitæ*, or, in common language, *ſpirit*: it is compounded of water and certain matters capable of ſuſpenſion in water, of alcohol, and of a ſmall proportion of oil; which laſt communicates to it a milky colour: the yellow colour, afterwards aſſumed, is partly owing

to the ſame oil, and partly to a ſolution of the extractive matter of the wooden caſks in which the aquavitæ has been kept. This aquavitæ, like wine, always partakes more or leſs of the flavour of the vegetable from whence it has been prepared; but by farther diſtillation, and other proceſſes, it is freed of its water, and of the native principles of the vegetable matter which the watery parts had kept in ſolution: when thus prepared, it is a pure *alcohol* or *inflammable ſpirit*, which is always the ſame from whatever vegetable the wine was produced.

After all the aquavitæ has been drawn off, the reſiduum now ceaſes to be wine; it is of a chocolate colour, of an acid and auſtere taſte; it has now aſſumed a heterogeneous appearance, and a great quantity of ſaline cryſtals is obſerved in the liquor; theſe cryſtals are the *tartar*. By the above proceſſes, then, we have fully decompoſed *wine:* but it is to be obſerved, that by this analyſis we have not ſeparated the different parts of wine in their original and entire ſtate; nor are we hitherto acquainted with any method of regenerating the wine by recombining the aquavitæ with the reſiduum: ſome product of the fermentation is therefore changed or deſtroyed; and this product is probably ſome peculiar modification of fixed air or aerial acid. The reſiduum, when evaporated, aſſumes the form and conſiſtence of an extract; the colouring part may be abſtracted by rectified ſpirit of wine, but is not ſeparable from it by the addition of water: it ſeems therefore to be of a gummi-reſinous nature, and extracted from the grape by means of the alcohol generated during the fermentation.

From this analyſis, then, it is obvious, that wine is compoſed of water, colouring matter, alcohol, and a ſomething that is changed or loſt. We ſhall refer the particular examination of alcohol and tartar to the proper places aſſigned them in this work; and we hope that from this general ſurvey of the ſubject, the properties of wine, as a ſolvent of ſeveral medicinal ſubſtances to be afterwards examined, will be much more readily underſtood. Before we go farther, it is proper to add, that the *ley* precipitated from wine during fermentation is a compound of ſtones, pieces of grape, tartar, and vitriolated tartar: the two firſt are inert bodies; the two laſt we ſhall particularly examine in their proper order. We are now prepared to conſider the nature and product of the next kind or ſtage of fermentation, viz.

2. The Acetous Fermentation.

To underſtand the proceſs of the acetous fermentation, we muſt leave for the preſent our analyſis of the product of the vinous fermentation, and return to the wine in its moſt perfect and entire ſtate. It is proper to obſerve, that though, after the liquor has become vinous, a partial ceſſation of the more obvious phenomena takes place, yet the wine ſtill ſuffers a ſlow and imperceptible degree of fermentation. We are not then to conſider the liquor as being in a quieſcent ſtate, but as conſtantly approaching to the next ſtage, viz. the *acetous fermentation*, which we are now to conſider. This kind of inſenſible fermentation, or what we may call the intermediate change, ſeems to be neceſſary to the perfection of the wine. Its degree, however, is to be regulated under certain limitations: when too much checked, as by cold, thunder, or ſuch-like cauſes, the wine becomes vapid; when too much encouraged by heat, contact of air, &c. it approaches too far to the acetous change: but in order that the vinous ſhall proceed fully to the acetous fermentation, ſeveral circumſtances are required; and theſe are in general the ſame that were before neceſſary to the vinous ſtage. Theſe conditions are, a temperate degree of heat, a quantity of unfermented mucilage, and acid matter, ſuch as tartar, and the free acceſs of external air. When thus ſituated, the liquor ſoon paſſes into the acetous fermentation; but during this ſtage the phenomena are not ſo remarkable as in the vinous; the motion of air is now leſs conſiderable, a groſs unctuous matter ſeparates to the bottom, the liquor loſes its vinous taſte and flavour, becomes ſour, and on diſtillation affords no inflammable ſpirit. It is now the acetous acid or vinegar; and, when ſeparated by diſtillation from the unctuous ley, may be preſerved a conſiderable length of time without undergoing the putrid change: to this laſt, however, it always approaches in the ſame manner as the vinous conſtantly verges to the acetous fermentation; and this will much more readily happen if the acid be allowed to remain with the unctuous feculent matter above mentioned. When thus ſituated, the vinegar quickly loſes its tranſparency, aſſumes a blackiſh colour, loſes its ſourneſs and agreeable odour, has an offenſive taſte and ſmell, and, when diſtilled at a certain period of the proceſs, yields volatile alkali.

The liquor is now arrived to the laſt ſtage, viz.

3. The Putrefactive Fermentation.

From the preceding phenomena, it is obvious, that the ſame ſubſtance which is capable of the vinous and acetous, is alſo capable of the putrefactive fermentation. It is perhaps impoſſible to induce the firſt without a mixture of the ſecond; or the ſecond without a mixture of the third. Hence every wine is a little acid; and there are few vinegars without ſome diſpoſition towards putrefaction, or without volatile alkali, neutralized by the acid which predominates. Notwithſtanding this ſeeming continuation of one and the ſame proceſs, the putrefaction of vegetables has its particular phenomena. The vegetable matter, if in a fluid ſtate, becomes turbid, and depoſits a large quantity of feculent matter; a conſiderable number of air-bubbles are raiſed to the top; but their motion is not ſo briſk in the putrefactive as in the vinous, or even the acetous fermentation; neither the bulk nor heat of the liquor ſeems to be increaſed; but an acrid pungent vapour is perceived by the ſmell, and which, by chemical trials, is found to be the volatile alkali: by degrees this pungent odour is changed into one leſs pungent, but much more nauſeous. If the ſame train of phenomena have taken place in a vegetable conſiſting of parts ſomewhat ſolid, its coheſion is broke down into a ſoft pulpy maſs; this maſs, on drying, entirely loſes its odour, leaving a black-cherry-like reſiduum, containing nothing but earthy and ſaline ſubſtances.

It is proper to obſerve, that though the circumſtances favouring the putrefactive are the ſame with thoſe requiſite to the vinous and acetous fermentations, yet theſe ſeveral conditions are not ſo indiſpenſable to the former as to the two latter ſtages. All vegetables have more or leſs tendency to putrefaction, and a great number of them are capable of the acetous fermentation: but the proportion of thoſe capable of the vinous is not conſiderable; and theſe laſt will run into the putrid in circumſtances in which they cannot undergo the vinous or even the acetous fermentations. Thus, flour made into a ſoft paſte will become ſour: but it muſt be perfectly diſſolved in water to make it fit for the vinous ſtage; whereas mere dampneſs is ſufficient to make it paſs to the putrid fermentation: beſides the condition of fluidity, a leſs degree of heat, and a more limited acceſs of air, are ſufficient for producing the putrefactive fermentation.

It is therefore probable, that all vegetables, in whatever ſtate they may be, are liable to a kind of putrefaction: in ſome the change is ſlow and gradual, but never fails at length to break down the texture and coheſion of the moſt ſolid.

We formerly obſerved, that the vapours ſeparated during the vinous fermentation were fixed air or aerial acid; and it is indeed true, that in the incipient ſtate of this fermentation a quantity of gas is ſtill evolved, and along with it a quantity of alkaline air: in the advanced ſtate, however, we find theſe vapours of a different nature; they now tarniſh ſilver, and render

combinations of lead with the vegetable acids black. When produced in large quantity, and much confined, as happens in ſtacks of hay put up wet, they burſt into actual flame, conſuming the hay to aſhes: on other occaſions, the eſcape of theſe vapours diſcovers itſelf by an emiſſion of light, as in the luminous appearance of rotten wood when placed in the dark. From the above phenomena it is evident, that theſe vapours abound with the principle of inflammability; and their odour probably depends on this principle looſely combined with the water, or ſome other parts of the volatiliſed matter. This gas is therefore different from that ſeparated during the vinous fermentation; it is the phlogiſticated, and ſometimes the inflammable air of Dr. Prieſtley, or the *hydrogen* of Lavoiſier. See table of chemical nomenclature, &c. CHEMISTRY.

We have thus, for the ſake of clearneſs, and in order to comprehend the whole of the ſubject, traced the phenomena of fermentation through its different ſtages: it is proper, however, to obſerve, that, though every vegetable that has ſuffered the vinous will proceed to the acetous and putrefactive fermentations, yet the ſecond ſtage is not neceſſarily preceded by the firſt, nor the third by the ſecond; or, in other words, the acetous fermentation is not neceſſarily confined to thoſe ſubſtances which have undergone the vinous, nor the putrefactive to thoſe which have undergone the acetous fermentation. Thus it is, that gums diſſolved in water paſs to the acetous without undergoing the vinous fermentation; and glutinous matter ſeems to run into putrefaction without ſhowing any previous aceſcence: and farther, theſe changes frequently happen although the matter be under thoſe conditions which are favourable to the preceding ſtages.

From the foregoing ſketch, the importance of this ſubject in the ſtudy of Pharmacy will be obvious at firſt ſight: it cannot, however, afford us any uſeful information on the native principles of vegetables; but it preſents to us new products, the importance of which is well known in chemiſtry, in medicine, and in arts. The neceſſity of being well acquainted with the ſeveral facts (for of theory we know none ſatisfactory) will appear in the pharmaceutical hiſtory and preparation of many of our moſt valuable drugs. We are next to conſider a ſet of no leſs complicated operations, *viz.*

II. *Productions from Vegetables by* FIRE.

IN order to analyſe, or rather to decompoſe, vegetables by the naked fire, any given quantity of dry vegetable matter is put into a retort of glaſs or earth. Having filled the veſſel about one half or two thirds, we place it in a reverberatory furnace, adapting it to a proper receiver. To collect the elaſtic fluids, which, if confined, would burſt the veſſels (and which, too, it is proper to preſerve, as being real products of the analyſis), we uſe a perforated receiver with a crooked tube, the extremity of which is received into a veſſel full of water or of mercury, and inverted in a baſon containing the ſame fluid: by this contrivance, the liquid matters are collected in the receiver, and the aeriform fluids paſs into the inverted veſſel. If the vegetable is capable of yielding any ſaline matter in a concrete ſtate, we interpoſe between the retort and the receiver another veſſel, upon whoſe ſides the ſalt ſublimes. Theſe things being properly adjuſted, we apply at firſt a gentle heat, and increaſe it gradually, that we may obſerve the different products in proper order. At firſt an inſipid watery liquor paſſes over, which is chiefly compoſed of the water of vegetation; on the heat being a little farther increaſed, this watery liquor, or phlegm, becomes charged with an oily matter, having the odour of the vegetable, if it poſſeſſed any in its entire ſtate; along with this oil we alſo obtain an acid reſembling vinegar, and which communicates to the oil ſomewhat of a ſaponaceous nature; on the heat being carried ſtill farther, we procure more acid, with an oil of a dark colour, and the colour gradually deepens as the diſtillation advances. The oil now ceaſes to retain the peculiar odour of the vegetable, and, being ſcorched by the heat, ſends forth a ſtrong diſagreeable ſmell like tar: it is then called *empyreumatic oil*. About this time alſo ſome elaſtic vapours ruſh into the inverted veſſel; theſe generally conſiſt of inflammable or fixed airs, and very often of a mixture of both; the volatile ſalt now alſo ſublimes, if the vegetable was of a nature to furniſh it. By the time the matter in the retort has acquired a dull red heat, nothing further will ariſe: we then ſtop; and allowing the veſſel to cool, we find a maſs of charcoal, retaining more or leſs the form and appearance of the vegetable before its decompoſition.

We have thus deſcribed, in the order of their ſucceſſion, the ſeveral products obtained from the generality of vegetables when analyſed in cloſe veſſels and in a naked fire.

It is, however, to be underſtood, that the proportion of theſe principles turns out very various; the more ſucculent yield more water, and the more ſolid afford a greater quantity of the other principles. Independently alſo of this difference, the nature of the products themſelves is found to differ in different vegetables: thus, in the cruciform plants, and in the emulſive and farinaceous ſeeds, the ſaline matter which comes over with the water and oil is found to be alkaline; ſometimes it is ammoniacal, from the combination of the acid with the volatile alkali paſſing over at the end of the proceſs; it is alſo probable that the acids of vegetables are not all of the ſame nature, though they exhibit the ſame external marks. When volatile alkali is obtained, it is always found in the mild effervеſcing ſtate; it is procured, however, from a few vegetables only; it is ſeldom in a concrete form, being generally diſſolved in the phlegm; and as it ordinarily makes its appearance about the end of the proceſs, it is probable that its formation is owing to ſome peculiar combination of the oil and fixed alkali. The plants containing much oily combuſtible matter ſeem to be thoſe which more peculiarly yield inflammable air, while the mucilages appear to be as peculiarly fitted for affording the fixed air or aerial acid. The chemical properties of charcoal ſeem to be always the ſame, from whatever vegetable it has been produced: on a minute examination (which, however, is not the buſineſs of pharmacy), it is found to conſiſt of fixed air, the principle of inflammability, a ſmall quantity of earth, ſaline matter, and a little water. The whole of the analyſis then amounts to air, water, earth, and the principle of inflammability; for by repeated diſtillations the oil is reſolved into water, the principle of inflammability, and a little earth; the ſaline matter alſo is a product ariſing from a combination of the earthy matter with water or the principle of inflammability, in ſome ſhape or other, or perhaps with both. That theſe combinations take place, has at leaſt been the opinion of the chemiſts.

We formerly ſaid that charcoal was partly compoſed of ſaline matter; it therefore remains that we ſhould next decompoſe the charcoal, in order to obtain or ſeparate the articles next to be mentioned.

The fixed Salts of Vegetables.

When vegetable charcoal has been burnt, there remains a quantity of aſhes or cinders of a blackiſh grey or white colour: theſe, when boiled or infuſed in water, communicate to it a pungent ſaline taſte; the ſalt thus held in ſolution may, by evaporation, be reduced to a concrete ſtate: this ſaline matter, however, is generally found to be mixed with ferruginous, earthy and other impurities, and likewiſe with a number of neutral ſalts of different kinds. In this mixed condition it is the

Potaſhes uſed in Commerce.

This ſalt, or rather compound of different ſalts, is procured by burning large quantities of wood of any kind; and this pro-

ceſs is called *incineration*: the predominating ſalt, however, is alkaline; and as the neutral ſalts are obtained to better advantage by other means, they are generally neglected in the purification of potaſhes. Potaſhes, then, freed from its impurities, and ſeparated from the other ſalts by proceſſes to be hereafter mentioned, is now

The fixed vegetable Alkali.

Alkalis in general are diſtinguiſhed by a pungent taſte, the very reverſe of that of ſourneſs; by their deſtroying the acidity of every ſour liquor; and by their changing the blue and red colours of vegetables to a green: they attract more or leſs the moiſture of the air, and ſome of them deliquate. The fixed alkalis, which we ſhall at preſent conſider more particularly, are fuſible by a gentle heat: by a greater degree of heat they are diſſipated; their fixity, therefore, is only relative to the other kind of alkalis, *viz.* the volatile: they diſſolve and form glaſs with earths: and, laſtly, when joined with acids to the point of ſaturation, they form what are called *neutral ſalts*.

Theſe characters will afford ſome neceſſary and preliminary knowledge of theſe ſubſtances in general; and we ſhall afterwards find that they are ſufficient to diſtinguiſh them from all other ſaline bodies: it is neceſſary, however, to examine them more minutely, for our analyſis has not yet reached ſo far as to preſent them in their ſimpleſt ſtate. Previous to the diſcoveries of Dr. Black, the vegetable fixed alkali (which we at preſent ſpeak of particularly), when ſeparated from the foreign matters with which it is mixed in the aſhes, was conſidered to be in its pureſt ſtate: we ſhall afterwards find that it is ſtill a compound body, and is really a neutral ſalt, compounded of pure alkali, and fixed air or the aerial acid. We preſume, then, that the particular hiſtory of its chemical and medicinal properties will be better underſtood when we come to thoſe proceſſes by which it is brought to its moſt pure and ſimple ſtate: See CHEMISTRY. We ſhall only therefore obſerve for the preſent, that fixed vegetable alkali, not only in its pure ſtate, but alſo when neutraliſed by aerial acid, ſeems always to be one and the ſame thing, from whatever vegetable it has been produced. Thoſe of ſome ſea-plants muſt, however, be excepted: the ſaline matter obtained from theſe laſt is, like the former, in a mixed and impure ſtate; it differs, however, from potaſhes, in containing an alkali of ſomewhat different properties. The cinder of ſea-plants containing this alkali is called

Soda.

Soda, then, as we have juſt now hinted, is produced by the incineration of the kali and other ſea-plants: and from this impure and mixed maſs of cinder is obtained the marine, mineral, or muriatic alkali, or natron, as it is now denominated by the London College. This alkali has acquired theſe names, becauſe it is the baſe of the common marine or ſea-ſalt: it differs from the vegetable alkali in being more eaſily cryſtallizable; when dried, it does not like the former attract humidity ſufficient to form a liquid; it is ſomewhat leſs pungent to the taſte, and, according to Bergman, has leſs attraction for acids than the vegetable alkali.

It is, however, to be obſerved, that this alkali, when deprived of fixed air, that is to ſay, when brought to its pureſt ſtate, can ſcarcely, if at all, be diſtinguiſhed from the vegetable alkali; and indeed the true diſtinction can only be formed from their combinations, each of them affording with the ſame acid very different neutral ſalts. It belonged to this place to mention ſome of the characters of alkalis in general, and alſo ſome of thoſe marks by which the vegetable and mineral alkalis are diſtinguiſhed from each other: but for a more particular hiſtory of their chemical and medicinal properties, we refer to an account of the pharmaceutical preparations. As the volatile alkali is rarely produced from vegetables, but is generally obtained from animal matter, we ſhall conſider that kind of alkali when we come to analyſe the animal kingdom.

Of Vegetable Earth.

After all the ſaline matter contained in the aſhes of vegetables has been waſted off by the proceſſes before mentioned, there yet remains one inſipid earthy-like powder, generally of a whitiſh colour, inſoluble in water, and from which ſome iron may be attracted by the magnet. It is ſaid to have formed alum with the vitriolic acid; a kind of ſelenite has alſo been obtained, but ſomewhat different from that produced by the union of the ſame acid with calcareous earth; this reſiduum of burnt vegetables differs alſo from calcareous earth, in not being ſuſceptible of becoming quicklime by calcination. It has been found that this reſiduum, inſtead of an earth, is a calcareous phoſphoric ſalt, ſimilar to that obtained from bones of animals.

We have thus finiſhed our analyſis of vegetables by the naked fire; and have only to obſerve, that, like the analyſis by fermentation, it can afford us no uſeful information on the native principles of the vegetable itſelf.

When chemiſtry began firſt to be formed into a rational ſcience, and to examine the component parts and internal conſtitution of bodies, it was imagined, that this reſolution of vegetables by fire, diſcovering us all their active principles, unclogged and unmixed with each other, would afford the ſureſt means of judging of their medicinal powers. But, on proſecuting theſe experiments, it was ſoon found that they were inſufficient for that end: that the analyſes of poiſonous and eſculent plants agreed often as nearly as the analyſes of one plant: that by the action of a burning heat, two principles of vegetables are not barely ſeparated, but altered, tranſpoſed, and combined into new forms; inſomuch that it was impoſſible to know in what form they exiſted, and with what qualities they were endowed, before theſe changes and tranſpoſitions happened. If, for example, 32 ounces of a certain vegetable ſubſtance are found to yield ten ounces and a half of acid liquor, above one ounce and five drams of oil, and three drams and a half of fixed alkaline ſalt; what idea can this analyſis give of the medicinal qualities of *gum arabic?*

III. SUBSTANCES *naturally contained in Vegetables, and ſeparable by Art without Alteration of their native Qualities.*

It has been ſuppoſed, that there is one general fluid or blood which is common to all vegetables, and from which the fluids peculiar to particular plants and their parts are prepared by a kind of ſecretion: to this ſuppoſed general fluid botaniſts have given the name of *ſap*. This opinion is rendered plauſible from the analogy in many other reſpects between vegetable and animal ſubſtances: and indeed if we conſider the water of vegetation as this general fluid, the opinion is perhaps not very far from the truth; but the notion has been carried much farther than ſuppoſing it to be mere water; and the opinion of naturaliſts on this ſubject does not ſeem to be well ſupported by experience. It is difficult to extract this ſap without any mixture of their conſtituent parts. But in a few vegetables from which it diſtils by wounding their bark, we find this ſuppoſed general blood poſſeſſing properties not a little various: Thus, the juice effuſed from a wounded birch is conſiderably different from that poured out from an inciſion in the vine.

1. Groſs Oils.

Vegetables, like animals, contain an oil in two different ſtates. That is, in ſeveral vegetables a certain quantity of oil is ſuperabundant to their conſtitution, is often lodged in diſtinct reſervoirs, and does not enter into the compoſition of their

other principles: in moſt vegetables, again, another quantity of oil is combined, and makes a conſtituent part of their principles. Of this laſt we formerly ſpoke in our analyſis of vegetables by fire; and it is the former we mean to conſider, under the three following heads.

Groſs oils abound chiefly in the kernels of fruits, and in certain ſeeds; from which they are commonly extracted by expreſſion, and are hence diſtinguiſhed by the name of *expreſſed oils*. They are contained alſo in all the parts of all vegetables that have been examined, and may be forced out by vehemence of fire; but here their qualities are much altered in the proceſs by which they are extracted or diſcovered, as we have ſeen under the foregoing head.

Theſe oils, in their common ſtate, are not diſſoluble either in vinous ſpirits or in water, though by means of certain intermedia they may be united both with the one and the other. Thus, a ſkilful interpoſition of ſugar renders them miſcible with water into what are called *lohochs* and *oily draughts*; by the intervention of gum or mucilage they unite with water into a milky fluid; by alkaline ſalts they are changed into a ſoap, which is miſcible both with water and ſpiritous liquors, and is perfectly diſſolved by the latter into an uniform tranſparent fluid. The addition of any acid to the ſoapy ſolution abſorbs the alkaline ſalt; and the oil, which of courſe ſeparates, is found to have undergone this remarkable change, that it now diſſolves without any intermedium in pure ſpirit of wine.

Expreſſed oils expoſed to the cold loſe their fluidity greatly: ſome of them, in a ſmall degree of cold, congeal into a conſiſtent maſs. Kept for ſome time in a warm air, they become thin and highly rancid: their ſoft, lubricating, and relaxing quality is changed into a ſharp acrimonious one: and in this ſtate, inſtead of allaying, they occaſion irritation; inſtead of obtunding corroſive humours, they corrode and inflame. Theſe oils are liable to the ſame noxious alteration while contained in the original ſubject: hence ariſes the rancidity which the oily ſeeds and kernels, as almonds and thoſe called the *cold ſeeds*, are ſo liable to contract in keeping. Nevertheleſs, on triturating theſe ſeeds or kernels with water, the oil, by the intervention of the other matter of the ſubject, unites with the water into an emulſion or milky liquor, which, inſtead of growing rancid, turns ſour on ſtanding.

It appears then that ſome kind of fermentation goes on in the progreſs of oils in the rancid ſtate; and it would ſeem from ſome experiments by Mr. Macquer, that an acid is evolved, which renders them more ſoluble in ſpirit of wine than before.

In the heat of boiling water, and even in a degree of heat as much exceeding this as the heat of boiling water does that of the human body, theſe oils ſuffer little diſſipation of their parts. In a greater heat they emit a pungent vapour, ſeemingly of the acid kind; and when ſuffered to grow cold again, they are found to have acquired a greater degree of conſiſtence than they had before, together with an acrid taſte. In a heat approaching to ignition, in cloſe veſſels, the greateſt part of the oil ariſes in an empyreumatic ſtate, a black coal remaining behind.

2. Groſs ſebaceous matter.

From the kernels of ſome fruits, as that of the chocolate nut, we obtain, inſtead of a fluid oil, a ſubſtance of a butyraceous conſiſtence; and from others, as the nutmeg, a ſolid matter as firm as tallow. Theſe concretes are moſt commodiouſly extracted by boiling the ſubſtance in water: the ſebaceous matter, liquefied by the heat, ſeparates, and riſes to the ſurface, and reſumes its proper conſiſtence as the liquor cools.

The ſubſtances of this claſs have the ſame general properties with expreſſed oils, but are leſs diſpoſed to become rancid in keeping than moſt of the common fluid oils. It is ſuppoſed by the chemiſts, that their thick conſiſtence is owing to a larger admixture of an acid principle: for, in their reſolution by fire, they yield a vapour more ſenſibly acid than the fluid oils; and fluid oils, by the admixture of concentrated acids, are reduced to a thick or ſolid maſs.

3. Eſſential Oils.

Eſſential oils are obtained only from thoſe vegetables, or parts of vegetables, that are conſiderably odorous. They are the direct principle in which the odour, and oftentimes the warmth, pungency, and other active powers of the ſubject, reſide; whence their name of *eſſences* or *eſſential oils*.

Eſſential oils are ſecreted fluids; and are often lodged in one part of the plant, while the reſt are entirely void of them. Sometimes they are found in ſeparate ſpaces or receptacles, and are there viſible by the naked eye: thus, in the rind of lemons, oranges, citrons, and many others, there are placed everywhere ſmall pellucid veſicles, which, by preſſing the peel near to the flame of a candle, ſquirt out a quantity of eſſential oil, forming a ſtream of lambent flame: hence, too, an oleoſaccharum may be made, by rubbing the exterior ſurface of theſe peels with a piece of lump ſugar, which at once tears open theſe veſicles, and abſorbs their contained oil.

Eſſential oils unite with rectified ſpirit of wine, and compoſe with it one homogeneous tranſparent fluid; though ſome of them require for this purpoſe a much larger proportion of the ſpirit than others. The difference of their ſolubility perhaps depends on the quantity of diſengaged acid; that being found by Mr. Macquer not only to promote the ſolution of eſſential oils, but even of thoſe of the unctuous kind. Water alſo, though it does not diſſolve their whole ſubſtance, may be made to imbibe ſome portion of their more ſubtile matter, ſo as to become conſiderably impregnated with their flavour; by the admixture of ſugar, gum, the yolk of an egg, or alkaline ſalts, they are made totally diſſoluble in water. Digeſted with volatile alkali, they undergo various changes of colour, and ſome of the leſs odorous acquire conſiderable degrees of fragrance; while fixed alkali univerſally impairs their odour.

The ſpecific gravity of moſt of theſe oils is leſs than that of water: ſome of them, however, are ſo heavy as to ſink in water; but theſe varieties ſhall be noticed when we come to their preparation.

In the heat of boiling water, theſe oils totally exhale; and on this principle they are commonly extracted from ſubjects that contain them; for no other fluid, which naturally exiſts in vegetables, is exhalable by that degree of heat, excepting the aqueous moiſture, from which the greateſt part of the oil is eaſily ſeparated. Some of theſe oils ariſe with a much leſs heat, a heat little greater than that in which water begins viſibly to evaporate. In their reſolution by a burning heat, they differ little from expreſſed oils.

Eſſential oils, expoſed for ſome time to a warm air, ſuffer an alteration very different from that which the expreſſed undergo. Inſtead of growing thin, rancid, and acrimonious, they gradually become thick, and at length harden into a ſolid brittle concrete; with a remarkable diminution of their volatility, fragrancy, pungency, and warm ſtimulating quality. In this ſtate, they are found to conſiſt of two kinds of matter; a fluid oil, volatile in the heat of boiling water, and nearly of the ſame quality with the original oil; and of a groſſer ſubſtance which remains behind, not exhalable without a burning heat, or ſuch as changes its nature, and reſolves it into an acid, an empyreumatic oil, and a black coal.

The admixture of a concentrated acid inſtantly produces, in eſſential oils, a change nearly ſimilar to that which time effects. In making theſe kinds of mixtures, the operator ought to be on his guard; for, when a ſtrong acid, particularly that of nitre, is poured haſtily into an eſſential oil, a great heat

and ebullition enſue, and often an exploſion happens, or the mixture burſts into flame. The union of expreſſed oils with acids is accompanied with much leſs conflict.

4. Concrete eſſential oil.

Some vegetables, as roſes and elecampane root, inſtead of a fluid eſſential oil, yield a ſubſtance poſſeſſing the ſame general properties, but of a thick or ſebaceous conſiſtence. This ſubſtance appears to be of as great volatility and ſubtility of parts as the fluid oils: it equally exhales in the heat of boiling water, and concretes upon the ſurface of the collected vapour. The total exhalation of this matter, and its concreting again into its original conſiſtent ſtate, without any ſeparation of it into a fluid and a ſolid part, diſtinguiſhes it from eſſential oils that have been thickened or indurated by age or by acids.

5. Camphor.

Camphor is a ſolid concrete, obtained chiefly from the woody parts of certain Indian trees. See CAMPHORA *. It is volatile like eſſential oils, and ſoluble both in oils and inflammable ſpirits; it unites freely with water by the intervention of gum, but very ſparingly and imperfectly by the other intermedia that render oils miſcible with watery liquors. It differs from the ſebaceous as well as fluid eſſential oils, in ſuffering no ſenſible alteration from long keeping; in being totally exhalable, not only by the heat of boiling water, but in a warm air, without any change or ſeparation of its parts, the laſt particle that remains unexhaled appearing to be of the ſame nature with the original camphor; in its receiving no empyreumatic impreſſion, and ſuffering no reſolution, from any degree of fire to which it can be expoſed in cloſe veſſels, though readily combuſtible in the open air; in being diſſolved by concentrated acids into a liquid form; and in ſeveral other properties which it is needleſs to ſpecify in this place.

6. Aroma,

Or ſpiritus rector, is the name given to the odorous principle of vegetables. Theſe bodies differ greatly from one another in the quantity, ſtrength, and volatility of the odorous principle which they contain. It is generally found united with volatile oils; but it is ſoluble in alcohol and water as well as in theſe. The ſlighteſt degree of heat is ſufficient to diſengage the aroma of plants. To obtain it, the plant muſt be diſtilled in a balneum mariæ, and its vapours received into a cold capital, which may condenſe and afterwards conduct them in a fluid ſtate into the receiver. The product is pure odoriferous water, and is known by the name of eſſential or diſtilled water. This liquor is to be conſidered as a ſolution of the aroma or odorous principle in water. When aromatic water is heated, it loſes its ſmell, in conſequence of the odorous principle being more volatile than the fluid in which it was diſſolved. This principle is alſo diſſipated by expoſure to the air. Many facts would induce us to believe, that the principle of ſmell is one of the elementary principles of volatile oils; but we are as yet almoſt completely ignorant of its chemical nature, properties, and combinations.

7. Reſin.

Eſſential oils, indurated by age or acids, are called *reſins*. When the indurated maſs has been expoſed to the heat of boiling water, till its more ſubtile part, or the pure eſſential oil that remained in it, has exhaled, the groſs matter left behind is likewiſe called *reſin*. We find, in many vegetables, reſins analogous both to one and the other of theſe concretes; ſome containing a ſubtile oil, ſeparable by the heat of boiling water; others containing nothing that is capable of exhaling in that heat.

Reſins in general diſſolve in rectified ſpirit of wine, though ſome of them much leſs eaſily than others: it is chiefly by means of this diſſolvent that they are extracted from the ſubjects in which they are contained. They diſſolve alſo in oils both expreſſed and eſſential; and may be united with watery liquors by means of the ſame intermedia which render the fluid oils miſcible with water. In a heat leſs than that of boiling water, they melt into an oily fluid; and in this ſtate they may be incorporated one with another. In their reſolution by fire, in cloſe veſſels, they yield a manifeſt acid, and a large quantity of empyreumatic oil.

8. Gum.

Gum differs from the foregoing ſubſtances in being uninflammable; for, though it may be burnt to a coal, and thence to aſhes, it never yields any flame. It differs remarkably alſo in the proportion of the principles into which it is reſolved by fire; the quantity of empyreumatic oil being far leſs, and that of an acid far greater. In the heat of boiling water, it ſuffers no diſſipation: nor does it liquefy like reſins; but continues unchanged, till the heat be ſo far increaſed as to ſcorch or turn it to a coal.

By a little quantity of water, it is ſoftened into a viſcous adheſive maſs, called *mucilage*: by a larger quantity it is diſſolved into a fluid, which proves more or leſs glutinous according to the proportion of gum. It does not diſſolve in vinous ſpirits, or in any kind of oil: nevertheleſs, when ſoftened with water into a mucilage, it is eaſily miſcible both with the fluid oils and with reſins; which by this means become ſoluble in watery liquors along with the gum, and are thus excellently fitted for medicinal purpoſes.

This elegant method of uniting oils with aqueous liquors, which has been kept a ſecret in few hands, appears to have been known to Dr. Grew. "I took (ſays he) oil of aniſeeds, and, pouring it upon *another body*, I ſo ordered it, that it was thereby turned into a perfect milk-white balſam or butter; by which means the oil became mingleable with any vinous or watery liquor, eaſily and inſtantaneouſly diſſolving therein in the form of a milk. And note, this is done without the leaſt alteration of the ſmell, taſte, nature, or operation of the ſaid oil. By ſomewhat the ſame means any other ſtillatitious oil may be transformed into a milk-white butter, and in like manner be mingled with water or any other liquor: which is of various uſe in medicine, and what I find oftentimes very convenient and advantageous to be done." (*Grew of Mixture, chap.* v. *inſt.* i. § 7.) This inquiry has lately been further proſecuted in the firſt volume of the Medical Obſervations publiſhed by a ſociety of phyſicians in London; where various experiments are related, for rendering oils, both eſſential and expreſſed, and different unctuous and reſinous bodies, ſoluble in water by the mediation of gum. Mucilages have alſo been uſed for ſuſpending crude mercury, and ſome other ponderous and inſoluble ſubſtances: the mercury is by this means not a little divided; but it is found that the particles are very apt to run together or ſubſide, if a pretty conſtant agitation be not kept up.

As oily and reſinous ſubſtances are thus united to water by the means of gum, ſo gums may in like manner be united to ſpirit of wine by the intervention of reſins and eſſential oils; though the ſpirit does not take up near ſo much of the gum as water does of the oil or reſin.

Acid liquors, though they thicken pure oils, or render them

* It may likewiſe be procured from moſt of the volatile oils, by volatilizing the oil in a temperature a few degrees below that which is ſufficient to elevate the camphor.

conſiſtent, do not impede the diſſolution of gum, or of oils blended with gum. Alkaline ſalts, on the contrary, both fixed and volatile, though they render pure oils ſoluble in water, prevent the ſolution of gum, and of mixtures of gum and oil. If any pure gum be diſſolved in water, the addition of any alkali will occaſion the gum to ſeparate, and fall to the bottom in a conſiſtent form; if any oily or reſinous body was previouſly blended with the gum, this alſo ſeparates, and either ſinks to the bottom, or riſes to the top, according to its gravity.

9. Gum-reſin.

By gum-reſin is underſtood a mixture of gum and reſin. Many vegetables contain mixtures of this kind, in which the component parts are ſo intimately united, with the interpoſition perhaps of ſome other matter, that the compound, in a pharmaceutical view, may be conſidered as a diſtinct kind of principle; the whole maſs diſſolving almoſt equally in aqueous and in ſpirituous liquors; and the ſolutions being not turbid or milky, like thoſe of the groſſer mixtures of gum and reſin, but perfectly tranſparent. Such is the aſtringent matter of biſtort-root, and the bitter matter of gentian. It were to be wiſhed that we had ſome particular name for this kind of matter; as the term *gum-reſin* is appropriated to the groſſeſt mixtures, in which the gummy and reſinous parts are but looſely joined, and eaſily ſeparable from each other.

We ſhall afterwards find that it will be convenient to imitate this natural combination by art. As the effects of medicines very generally depend on their ſolubility in the ſtomach, it is often neceſſary to bring their more inſoluble parts, ſuch as reſinous and oily matters, into the ſtate of gum-reſin: this is done, as we have mentioned in the former article, by the mediation of mucilage. By this management theſe matters become much more ſoluble in the ſtomach; and the liquor thus prepared is called an emulſion, from its whitiſh colour, reſembling that of milk.

10. Saline matter.

Of the ſaline juices of vegetables there are different kinds, which have hitherto been but little examined: the ſweet and the acid ones are the moſt plentiful and the beſt known.

There have lately, however, been diſcovered a conſiderable variety of ſalts in different vegetables. The mild fixed alkali, which was formerly conſidered as a product of the fire, has been obtained from almoſt all plants by macerating them in acids; the vegetable alkali is the moſt common; but the mineral is alſo found in the marine plants. Beſides the fixed alkali, ſeveral other ſalts have been detected in different vegetables; ſuch as vitriolated tartar, common ſalt, Glauber's ſalt, nitre, febrifuge ſalt, and ſelenite. From ſome experiments, too, the volatile alkali has been ſuppoſed to exiſt ready formed in many plants of the cruciform or tetradynamian tribe.

It is, however, to be underſtood, that though ſome of theſe ſalts are really products of vegetation, others of them are not unfrequently adventitious, being imbibed from the ſoil without any change produced by the functions of the vegetable.

The juices of vegetables, expoſed to a heat equal to that of boiling water, ſuffer generally no other change than the evaporation of their watery parts; the ſaline matter remaining behind, with ſuch of the other fixed parts as were blended with it in the juice. From many plants, after the exhalation of great part of the water, the ſaline matter gradually ſeparates in keeping, and concretes into little ſolid maſſes, leaving the other ſubſtances diſſolved, or in a moiſt ſtate; from others, no means have yet been found of obtaining a pure concrete ſalt.

The ſalts more peculiarly native and eſſential to vegetables are the ſweet and the ſour; theſe two are frequently blended together in the ſame vegetable, and ſometimes paſs into each other at different ages of the plant. Of the ſour ſalts ſeveral kinds are known in pharmacy and in the arts; ſuch as thoſe of ſorrel, of lemons, oranges, citrons, &c. The ſaccharine ſalts are alſo obtained from a great number of vegetables; they may in general be eaſily diſcovered by their ſweet taſte: the ſugar-cane is the vegetable from which this ſaline matter is procured in greateſt quantity, and with moſt profit in commerce. For its medicinal and chemical properties, ſee MATERIA MEDICA.

The ſweet and ſour ſalts above mentioned diſſolve not only in water, like other ſaline bodies; but many of them, particularly the ſweet, in rectified ſpirit alſo. The groſs oily and gummy matter, with which they are almoſt always accompanied in the ſubject, diſſolves freely along with them in water, but is by ſpirit in great meaſure left behind. Such heterogeneous matters as the ſpirit takes up are almoſt completely retained by it, while the ſalt concretes; but of thoſe which water takes up, a conſiderable part always adheres to the ſalt. Hence eſſential ſalts, as they are called, prepared in the common manner from the watery juices of vegetables, are always found to partake largely of the other ſoluble principles of the ſubject; while thoſe extracted by ſpirit of wine are more pure. By means of rectified ſpirit ſome productions of this kind may be freed from their impurities: perfect ſaccharine concretions obtained from many of our indigenous ſweets may be thus purified.

There is another kind of ſaline matter obtained from ſome reſinous bodies, particularly from benzoin, which is of a different nature from the foregoing, and ſuppoſed by ſome of the chemiſts to be a part of the eſſential oil of the reſin, coagulated by an acid, with the acid more predominant or more diſengaged than in the other kinds of coagulated or indurated oils. Theſe concretes diſſolve both in water and in vinous ſpirits, though difficultly and ſparingly in both: they ſhow ſeveral evident marks of acidity, have a ſmell like that of the reſin from which they are obtained, exhale in a heat equal to that of boiling water, or a little greater, and are inflammable in the fire.

11. Farina or flour.

This ſubſtance partakes of the nature of gum, but has more taſte, is more fermentable, and much more nutritive. It abounds in very many vegetables, and is generally depoſited in certain parts, ſeemingly for the purpoſe of its being more advantageouſly accommodated to their nouriſhment and growth. Several of the bulbous and other roots, ſuch as thoſe of potatoes, briony, thoſe from which caſſava is extracted, ſalep, and many others, contain a great quantity of white *fæculæ* reſembling and really poſſeſſing the properties of farina. The plants of the leguminous tribe, ſuch as peas and beans, are found alſo to abound with this matter. But the largeſt quantity of farina reſides in grains, which are therefore called *farinaceous*. Of this kind are wheat, rye, barley, oats, rice, and other ſimilar plants.

At firſt ſight farina appears to be one homogeneous ſubſtance; it is, however, found to be a compound of three different and ſeparable parts. To illuſtrate this, we ſhall take as an example the farina of wheat, being the vegetable which affords it in greateſt quantity, and in its moſt perfect ſtate. To ſeparate theſe different parts, we form a paſte with any quantity of flour and cold water; we ſuſpend this paſte in a bag of muſlin, or ſuch-like cloth; we next let fall on it a ſtream of cold water from ſome height, and the bag may now and then be very gently ſqueezed: the water in its deſcent carries down with it a very fine white powder, which is received along with the water in a veſſel placed below the bag. The proceſs muſt be continued till no more of this white powder comes off, which is known by the water that paſſes through the bag ceaſing to be of a milky colour. The proceſs being now finiſhed,

the farina is found to be ſeparated into three different ſubſtances: the glutinous or vegeto-animal part remains in the bag; the amylum or ſtarch is depoſited from the water which has been received in the veſſel placed below the bag; and, laſtly, a mucous matter is held diſſolved in the ſame water from which the ſtarch has been depoſited: this mucous part may be brought to the conſiſtence of honey, by evaporating the water in which it is kept in ſolution.

Theſe ſeveral parts are found alſo to differ remarkably in their ſenſible and chemical properties. The vegeto-animal part is of a whitiſh grey colour, is a tenacious, ductile, and elaſtic matter, partly poſſeſſing the texture of animal membranes. Diſtilled in a retort, it yields, like all animal matters, a true volatile alkali; and its coal affords no fixed alkali. It is not only inſoluble, but even indiffuſible, in water; both which appear from its remaining in the bag after long-continued lotions. Like gums, it is inſoluble in alcohol, in oils, or ether; but it is alſo inſoluble in water, and yields on diſtillation products very different from thoſe afforded by gums: it is therefore of an animal nature, and approaches perhaps nearer to the coagulable lymph of animals than to any other ſubſtance.

The fixed alkali, by means of heat, diſſolves the gluten vegeto-animale; but when it is precipitated from this ſolution by means of acids, it is found to have loſt its elaſticity. The mineral acids, and eſpecially the nitrous, are alſo capable of diſſolving the vegeto-animal part of the farina.

The ſtarch, amylum, or the amylaceous matter, makes the principal part of the farina. As we before noticed, it is that fine powder depoſited from the water which has pervaded the entire farina: it is of a greyiſh white colour, but can be rendered much whiter by making it undergo a certain degree of fermentation. Starch is inſoluble in cold water: but in hot water it forms a tranſparent glue: hence the neceſſity of employing cold water in ſeparating it from the vegeto-animal part. Diſtilled in a retort, it yields an acid phlegm; and its coal affords, like other vegetables, a fixed alkaline ſalt. As ſtarch forms the greateſt part of the farina, it is probably the principal nutritive conſtituent in bread.

The mucous, or rather the mucoſo-ſaccharine, matter is only in a very ſmall quantity in bread. This ſubſtance on diſtillation is found to exhibit the phenomena of ſugar. The uſe of this matter ſeems to be that of producing the vinous fermentation: and we may obſerve once for all, that the preparation of good bread probably depends on a proper proportion of the three different parts above deſcribed; viz. that the vinous fermentation is promoted by the mucoſo-ſaccharine part, the acetous by the ſtarch, and the putrid by the gluten vegeto-animale. From different ſtates or degrees of theſe ſeveral ſtages of fermentation the qualities of good bread are probably derived.

12. Of the colouring matter of vegetables.

The colouring matter of vegetables ſeems to be of an intermediate nature between the gummy and reſinous parts. It is in many plants equally well extracted by water, and by rectified ſpirit: it is alſo, however, procurable in the form of a lake, not at all ſoluble in either of theſe menſtrua. It would ſeem that the colouring matter, ſtrictly ſo called, has hitherto eluded the retearches of chemiſts. It is only the *baſe* or *nidus*, in which the real colouring matter is embodied, that chemiſtry has as yet reached: and on the chemical properties of this *baſe*, colours are capable of being extracted by different menſtrua, and of being variouſly accommodated to the purpoſes of dyeing. The ſubſtance from which the colours of vegetables are immediately derived is without doubt a very ſubtile body. Since plants are known to loſe their colour when excluded from the light of the ſun, there is reaſon to think that the immediately colouring ſubſtance is primarily derived from the matter of the ſun, ſomewhat elaborated by vegetable life.

Many of theſe dyes are evolved or variouſly modified by chemical operations. Thus, a colouring matter is ſomewhat depoſited in the form of a *fæcula* during the putrefaction of the vegetable; in others it is evolved or changed by alum, by acids, or by alkali. We may alſo obſerve, that any part of the vegetable may be the baſe of the colouring matter. This appears from the ſolubility of the different dyes in their proper menſtrua: and in theſe ſolutions we have not been able to ſeparate the real colouring matter from the baſe in which it is inviſcated. After all, then, we muſt conclude, that a full inveſtigation of this ſubject more properly belongs to the ſublimer parts of CHEMISTRY than to the buſineſs in which we are at preſent engaged.

The colouring drugs are conſidered in their proper places.

In finiſhing our hiſtory of the vegetable kingdom, it only remains that we ſhould offer ſome

General Obſervations on the foregoing Principles.

1. ESSENTIAL oils, as already obſerved, are obtainable only from a few vegetables: but groſs oil, reſin, gum, and ſaline matter, appear to be common, in greater or leſs proportion, to all; ſome abounding more with one, and others with another.

2. The ſeveral principles are in many caſes intimately combined, ſo as to be extracted together from the ſubject, by thoſe diſſolvents, in which ſome of them ſeparately could not be diſſolved. Hence watery infuſions and ſpirituous tinctures of a plant contain reſpectively more ſubſtances than thoſe of which water or ſpirit is the proper diſſolvent.

3. After a plant has been ſufficiently infuſed in water, all that ſpirit extracts from the reſiduum may be conſidered as conſiſting wholly of ſuch matter as directly belongs to the action of ſpirit. And, on the contrary, when ſpirit is applied firſt, all that water extracts afterwards may be conſidered as conſiſting only of that matter of which water is the direct diſſolvent.

4. If a vegetable ſubſtance, containing all the principles we have enumerated, be boiled in water, the eſſential oil, whether fluid or concrete, and the camphor, and volatile eſſential ſalt, will gradually exhale with the ſteam of the water, and may be collected by receiving the ſteam in proper veſſels placed beyond the action of the heat. The other principles, not being volatile in this degree of heat, remain behind: the groſs oil and ſebaceous matter float on the top: the gummy and ſaline ſubſtance, and a part of the reſin, are diſſolved by the water, and may be obtained in a ſolid form by ſtraining the liquor, and expoſing it to a gentle heat till the water has exhaled. The reſt of the reſin, ſtill retained by the ſubject, may be extracted by ſpirit of wine, and ſeparated in its proper form by exhaling the ſpirit. On theſe foundations moſt of the ſubſtances contained in vegetables may be extracted, and obtained in a pure ſtate, however they may be compounded together in the ſubject.

5. Sometimes one or more of the principles is found naturally diſengaged from the others, lying in diſtinct receptacles within the ſubject, or extravaſated and accumulated on the ſurface Thus, in the dried roots of angelica, cut longitudinally, the microſcope diſcovers veins of reſin. In the flower-cups of hypericum, and the leaves of the orange-tree, tranſparent points are diſtinguiſhed by the naked eye; which, at firſt view, ſeem to be holes, but on a cloſer examination are found to be little veſicles filled with eſſential oil. In the bark of the fir, pine, larch, and ſome other trees, the oily receptacles are extremely numerous, and ſo copiouſly ſupplied with the oily and reſinous fluid, that they frequently burſt, eſpecially in the warm climates, and diſcharge their contents in great quantities. The acacia.

tree in Egypt, and the plum and cherry among ourſelves, yield almoſt pure gummy exudations. From a ſpecies of aſh is ſecreted the ſaline ſweet ſubſtance manna; and the only kind of ſugar with which the ancients were acquainted, appears to have been a natural exudation from the cane.

6. The foregoing principles are, as far as is known, all that naturally exiſt in vegetables; and all that art can extract from them, without ſuch operations as change their nature, and deſtroy their original qualities. In one or more of theſe principles, the colour, ſmell, taſte, and medicinal virtues of the ſubject are almoſt always found concentrated.

7. In ſome vegetables the whole medicinal activity reſides in one principle. Thus, in ſweet almonds, the only medicinal principle is a groſs oil; in horſe-radiſh root, an eſſential oil; in jalap root, a reſin; in marſh mallow root, a gum; in the leaves of ſorrel, a ſaline acid ſubſtance.

8. Others have one kind of virtue reſiding in one principle, and another in another. Thus, Peruvian bark has an aſtringent reſin and a bitter gum; wormwood, a ſtrong flavoured eſſential oil and a bitter gum-reſin.

9. The groſs inſipid oils and ſebaceous matters, the ſimple inſipid gums, and the ſweet and acid ſaline ſubſtances, ſeem to agree both in their medicinal qualities and in their pharmaceutic properties.

10. But eſſential oils, reſins, and gum-reſins differ much in different ſubjects. As eſſential oils are univerſally the principle of odour in vegetables, it is obvious that they muſt differ in this reſpect as much as the ſubjects from which they are obtained. Reſins frequently partake of the oil, and conſequently of the differences depending on it; with this further diverſity, that the groſs reſinous part often contains other powers than thoſe which reſide in oils. Thus, from wormwood a reſin may be prepared, containing not only the ſtrong ſmell and flavour but likewiſe the whole bitterneſs of the herb; from which laſt quality the oil is entirely free. The bitter, aſtringent, purgative, and emetic virtues of vegetables reſide generally in different ſorts of reſinous matter, either pure or blended with gummy and ſaline parts; of which kind of combinations there are many ſo intimate, that the component parts can ſcarcely be ſeparated from each other, the whole compound diſſolving almoſt equally in aqueous and ſpirituous menſtrua.

11. There are ſome ſubſtances alſo, which, from their being totally ſoluble in water, and not in ſpirit, may be eſteemed to be mere gums; but which, nevertheleſs, poſſeſs virtues never to be found in the ſimple gums. Such are the aſtringent gum called *acacia*, and the purgative gum extracted from aloes.

12. It is ſuppoſed that vegetables contain certain ſubtile principles different in different plants, of too great tenuity to be collected in their pure ſtate, and of which oils, gums, and reſins are only the matrices or vehicles. This inquiry is foreign to the purpoſes of pharmacy, which is concerned only about groſſer and more ſenſible objects. When we obtain from an odoriferous plant an eſſential oil, containing in a ſmall compaſs the whole fragrance of a large quantity of the ſubject, our intentions are equally anſwered, whether the ſubſtance of the oil be the direct odorous matter, or whether it has diffuſed through it a fragrant principle more ſubtile than itſelf. And when this oil in long keeping loſes its odour, and becomes a reſin, it is equal, in regard to the preſent conſiderations, whether the effect happens from the avolation of a ſubtile principle, or from a change produced in the ſubſtance of the oil itſelf.

Sect. II. Animals.

From the hiſtory we have already given of the vegetable kingdom, our details on animal ſubſtances may in many particulars be conſiderably abridged. All animals are fed on vegetables, either directly or by the intervention of other animals. No part of their ſubſtance is derived from any other ſource except water. The ſmall quantity of ſalt uſed by man and ſome other animals, is only neceſſary as a ſeaſoning or ſtimulus to the ſtomach. As the animal then is derived from the vegetable matter, we accordingly find that the former is capable of being reſolved into the ſame principles as thoſe of the latter. Thus, by repeated diſtillations, we obtain from animal ſubſtances, water, oil, air, an eaſily deſtructible ſalt, and charcoal. Theſe ſecondary principles are by farther proceſſes at length reſoluble into the ſame proximate principles which we found in vegetables, *viz.* water, air, earth, and the principle of inflammability. But though the principles of vegetable and animal ſubſtances are fundamentally the ſame, yet theſe principles are combined in a very different manner. It is exceedingly rare that animal ſubſtances are capable of the vinous or acetous fermentations; and the putrefactive, into which they run remarkably faſt, is alſo different in ſome particulars from the putrefaction of vegetables; the eſcape of the phlogiſton in the form of light is more evident, and the ſmell is much more offenſive, in the putrefaction of animal than of vegetable ſubſtances. The putrefaction of urine is indeed accompanied with a peculiar fetor, by no means ſo intolerable as that of other animal matters: this we ſuppoſe to be owing to the pungency derived from the volatile alkali, and alſo to the urine containing leſs inflammable matter than the blood and many other fluids. When analyſed by a deſtructive heat, animals afford products very different from thoſe of vegetables: the empyreumatic oil has a particular and much more fetid odour; and the volatile ſalt, inſtead of being an acid, as it is in moſt vegetables, is found in animals to be a volatile alkali. Chemiſts have ſpoken of an acid procurable from animal ſubſtances; and indeed certain parts of animal bodies are found to yield a ſalt of this kind; but it by no means holds with animal ſubſtances in general; and though the proofs to the contrary were even concluſive, it is confeſſedly in ſo ſmall a quantity as not to deſerve any particular regard. In ſome animals, however, an acid exiſts, uncombined and ready formed in their bodies. This is particularly manifeſt in ſome inſects, eſpecially ants, from which an acid reſembling the acetous has been procured by boiling them in water. The ſolid parts of animal bodies, as the muſcles, teguments, tendons, cartilages, and even the bones, when boiled with water, give a gelatinous matter or glue reſembling the vegetable gums, but much more adheſive. We muſt, however, except the horny parts and the hair, which ſeem to be little ſoluble either in water or in the liquors of the ſtomach. The acids, the alkalis, and quicklime, are alſo found to be powerful ſolvents of animal matters. It is from the ſolid parts that the greateſt quantity of volatile alkali is obtained; it ariſes along with a very fetid empyreumatic oil, from which it is in ſome meaſure ſeparated by repeated rectifications. This ſalt is partly in a fluid, and partly in a concrete ſtate; and from its having been anciently prepared in the greateſt quantity from the horns of the hart, it has been called *ſalt* or *ſpirit of hartſhorn*. Volatile alkali is, however, procurable from all animals, and from almoſt every part of animal bodies except fat. Though we are ſometimes able to procure fixed alkali from an animal cinder, yet it is probable that this ſalt did not make any part of the living animal, but rather proceeded from the introduction of ſome ſaline matter, incapable of being aſſimilated by the functions of the living creature.

In ſpeaking of the fluid parts of animals, we ſhould firſt examine the general fluid, or blood, from whence the reſt are ſecreted. The blood, which at firſt ſight appears to be an homogeneous fluid, is compoſed of ſeveral parts, eaſily ſeparable from each other, and which the microſcope can even perceive in its uncoagulated ſtate. On allowing it to ſtand at reſt, and to be expoſed to the air, it ſeparates into what are called the *craſſamentum* and the *ſerum*. The craſſamentum, or cruor, chiefly conſiſts

of the red globules, joined together by another ſubſtance, called the *coagulable lymph*: the chemical properties of theſe globules are not as yet underſtood; but they ſeem to contain the greateſt quantity of the iron found in the blood. The ſerum is a yellowiſh ſubviſcid liquor, having little ſenſible taſte or ſmell: at a heat of 160 of Fahrenheit it is converted into a jelly. This coagulation of the ſerum is alſo owing to its containing a matter of the ſame nature with that in the craſſamentum, viz. the coagulable lymph: whatever then coagulates animal blood, produces that effect on this concreſcible part. Several cauſes, and many different ſubſtances, are capable of effecting this coagulation; ſuch as contact of air, heat, alcohol, mineral acids, and their combinations with earths, as alum, and ſome of the metallic ſalts. The more perfect neutral ſalts are found to prevent the coagulation, ſuch as common ſalt and nitre.

Of the fluids ſecreted from the blood, there are a great variety in men and other animals. The excrementitious and redundant fluids are thoſe which afford in general the greateſt quantity of volatile alkali and empyreumatic oil: there are alſo ſome of the ſecreted fluids, which, on a chemical analyſis, yield products in ſome degree peculiar to themſelves. Of this kind is the urine, which is found to contain in the greateſt abundance the noted ſalt formed from the phoſphoric acid and volatile alkali. The fat, too, has been ſaid to differ from the other animal matters, in yielding by diſtillation a ſtrong acid, but no volatile alkali. There is alſo much variety in the quantity and ſtate of the combination of the ſaline and other matters in different ſecreted fluids. But for a fuller inveſtigation of this and other parts of the ſubject, we refer to ANATOMY, CHEMISTRY, and PHYSIOLOGY; with which it is more immediately connected than with the elements of pharmacy.

Animal oils and fats, like the groſs oils of vegetables, are not of themſelves ſoluble either in water or vinous ſpirits: but they may be united with water by the intervention of gum or mucilage. Moſt of them may be changed into ſoap by fixed alkaline ſalts, and be thus rendered miſcible with ſpirit as well as water.

The odorous matter of ſome odoriferous animal ſubſtances, as muſk, civet, caſtor, is, like eſſential oil, ſoluble in ſpirit of wine, and volatile in the heat of boiling water. Carthuſer relates, that from caſtor an actual eſſential oil has been obtained in a very ſmall quantity, but of an exceedingly ſtrong diffuſive ſmell.

The veſicating matter of cantharides, and thoſe parts of ſundry animal ſubſtances in which their peculiar taſte reſides, are diſſolved by rectified ſpirit, and ſeem to have ſome analogy with reſins and gummy reſins.

The gelatinous principle of animals, like the gum of vegetables, diſſolves in water, but not in ſpirit or in oils: like gums, alſo, it renders oils and fats miſcible with water into a milky liquor.

Some inſects, particularly the ant, are found to contain an acid juice, which approaches nearly to the nature of vegetable acids.

There are, however, ſundry animal juices, which differ greatly, even in theſe general kinds of properties, from the correſponding ones of vegetables. Thus, animal ſerum, which appears analogous to vegetable gummy juices, has this remarkable difference, that though it mingles uniformly with cold or warm water, yet, on conſiderably heating the mixture, the animal matter ſeparates from the watery fluid, and concretes into a ſolid maſs. Some phyſicians have been apprehenſive, that the heat of the body, in certain diſeaſes, might riſe to ſuch a degree as to produce this dangerous or mortal concretion of the ſerous humours: but the heat requiſite for this effect is greater than the human body appears capable of ſuſtaining, being nearly about the middle point between the greateſt human heat commonly obſerved and that of boiling water.

The ſoft and fluid parts of animals are ſtrongly diſpoſed to run into putrefaction; they putrefy much ſooner than vegetable matters, and, when corrupted, prove more offenſive.

This proceſs takes place, in ſome degree, in the bodies of living animals, as often as the juices ſtagnate long, or are prevented, by an obſtruction of the natural emunctories, from throwing off their more volatile and corruptible parts.

During putrefaction, a quantity of air is generated; all the humours become gradually thinner, and the fibrous parts more lax and tender. Hence the tympany, which ſucceeds the corruption of any of the viſcera, or the imprudent ſuppreſſion of dyſenteries by aſtringents; and the weakneſs and laxity of the veſſels obſervable in ſcurvies, &c.

The craſſamentum of human blood changes by putrefaction into a dark livid-coloured liquor; a few drops of which tinge the ſerum with a tawny hue, like the ichor of ſores and dyſenteric fluxes, as alſo the white of the eye, the ſaliva, the ſerum of blood drawn from a vein, and the liquor that oozes from a bliſter in deep ſcurvies and the advanced ſtate of malignant fevers.

The putrid craſſamentum changes a large quantity of recent urine to a flame-coloured water, ſo common in fevers and in the ſcurvy. This mixture, after ſtanding an hour or two, gathers a cloud reſembling what is ſeen in the crude water of acute diſtempers, with ſome oily matter on the ſurface like the ſcum which floats on ſcorbutic urine.

The ſerum of the blood depoſits, in putrefaction, a ſediment reſembling well-digeſted pus, and changes to a faint olive-green. A ſerum ſo far putrefied as to become green, is perhaps never to be ſeen in the veſſels of living animals; but in dead bodies this ſerum is to be diſtinguiſhed by the green colour which the fleſh acquires in corrupting. In ſalted meats, this is commonly aſcribed to the brine, but erroneouſly; for that has no power of giving this colour, but only of qualifying the taſte, and in ſome degree the ill effects, of corrupted aliments. In foul ulcers and other ſores, where the ſerum is left to ſtagnate long, the matter is likewiſe found of this colour, and is then always acrimonious.

The putrefaction of animal ſubſtances is prevented or retarded by moſt ſaline matters, even by the fixed and volatile alkaline ſalts, which have generally been ſuppoſed to produce a contrary effect. Of all the ſalts that have been made trial of, ſea-ſalt ſeems to reſiſt putrefaction the leaſt; in ſmall quantities it even accelerates the proceſs. The vegetable bitters, as chamomile flowers, are much ſtronger antiſeptics, not only preſerving fleſh long uncorrupted, but likewiſe ſomewhat correcting it when putrid: the mineral acids have this laſt effect in a more remarkable degree. Vinous ſpirits, aromatic and warm ſubſtances, and the acrid plants, falſely called *alkaleſcent*, as ſcurvy-graſs and horſe-radiſh, are found alſo to reſiſt putrefaction. Sugar and camphor are found to be powerfully antiſeptic. Fixed air, or the aerial acid, is likewiſe thought to reſiſt putrefaction; but above all the vapour of nitrous acid, in the form of air (the nitrous air of Dr. Prieſtley), is found to be the moſt effectual in preſerving animal bodies from corruption. The liſt of the ſeptics, or of thoſe ſubſtances that promote putrefaction, is very ſhort; and ſuch a property has only been diſcovered in calcareous earths and magneſia, and a very few ſalts whoſe baſes are of theſe earths.

It is obſervable, that notwithſtanding the ſtrong tendency of animal matters to putrefaction, yet broths made from them, with the admixture of vegetables, inſtead of putrefying turn ſour. Sir John Pringle has found, that when animal fleſh in ſubſtance is beaten up with bread or other farinaceous vegeta-

bles, and a proper quantity of water, into the conſiſtence of a pap, this mixture likewiſe, kept in a heat equal to that of the human body, grows in a little time ſour; while the vegetable matters, without the fleſh, ſuffer no ſuch change.

It was obſerved in the preceding ſection, that ſome few vegetables, in the reſolution of them by fire, diſcover ſome agreement in the matter with bodies of the animal kingdom; yielding a volatile alkaline ſalt in conſiderable quantity, with little or nothing of the acid or fixed alkali, which the generality of vegetables afford. In animal ſubſtances, alſo, there are ſome exceptions to the general analyſis: from animal fats, as we before obſerved, inſtead of a volatile alkali, an acid liquor is obtained; and their empyreumatic oil wants the peculiar offenſiveneſs of the other animal oils.

Sect. III. Minerals.

I. Oils *and* Bitumens.

In the mineral kingdom is found a fluid oil, called *naphtha* or *petroleum*, floating on the ſurface of waters, or iſſuing from cleſts of rocks, particularly in the eaſtern countries, of a ſtrong ſmell, very different from that of vegetable or animal oils, limpid almoſt as water, highly inflammable, not ſoluble in ſpirit of wine, and more averſe to union with water than any other oils.

There are different ſorts of theſe mineral oils, more or leſs tinged, of a more or leſs agreeable, and a ſtronger or weaker ſmell. By the admixture of concentrated acids, which raiſe no great heat or conflict with them, they become thick, and at length conſiſtent; and in theſe ſtates are called *bitumens*.

Theſe thickened or concreted oils, like the correſponding products of the vegetable kingdom, are generally ſoluble in ſpirit of wine, but much more difficultly, more ſparingly, and for the moſt part only partially; they liquefy by heat, but require the heat to be conſiderably ſtronger than vegetable products. Their ſmells are various; but all of them, either in the natural ſtate, when melted or ſet on fire, yield a peculiar kind of ſtrong ſcent, called from them *bituminous*.

The ſolid bitumens are, amber, jet, aſphaltum, or bitumen of Judea, and foſſil or pit coal. All theſe bitumens, when diſtilled, give out an odorous phlegm, or water, more or leſs coloured and ſaline; an acid, frequently in a concrete ſtate; an oil, at firſt reſembling the native petrolea, but ſoon becoming heavier and thicker; and, laſtly, a quantity of volatile alkali is obtained: the reſiduum is a charry matter, differing in its appearances according to the nature of the bitumen which had been analyſed.

From the obſervations of ſeveral naturaliſts, it is probable that all bitumens are of vegetable and animal origin; that the circumſtances by which they differ from the reſinous and other oily matters of vegetables and animals are the natural effects of time, or of an alteration produced on them by mineral acids; or perhaps they are the effect of both theſe cauſes combined. This opinion is the more probable, ſince bitumens, on a chemical analyſis, yield oil and volatile alkali; neither of which are found in any other minerals.

II. Earths.

The little impropriety of joining the vegetable and animal earths to the mineral, muſt be overlooked for the ſake of bringing both under one ſynoptical view. Under the mineral earths are included ſtones; theſe being no other than earths in an indurated ſtate. The different kinds of theſe bodies hitherto taken notice of are the following:

1ſt, Earths ſoluble in the nitrous, marine, and vegetable acids, but not at all, or exceeding ſparingly, in the vitriolic acid. When previouſly diſſolved in other acids, they are precipitated by the addition of this laſt, which thus unites with them into inſipid, or nearly inſipid concretes, not diſſoluble in any liquor.

Of this kind are,

1. The mineral calcareous earth: *diſtinguiſhed by its being convertible in a ſtrong fire, without addition, into an acrimonious calx called quicklime.* This earth occurs in a variety of forms in the mineral kingdom: the fine ſoft chalk, the coarſer limeſtones, the hard marbles, the tranſparent ſpars, the earthy matter contained in waters, and which ſeparating from them incruſtates the ſides of the caverns, or hangs in icicles from the top, receiving from its different appearances different appellations. How ſtrongly ſoever ſome of theſe bodies have been recommended for particular medicinal purpoſes, they are fundamentally no other than different forms of this calcareous earth; ſimple pulverization depriving them of the ſuperficial characters by which they were diſtinguiſhed in the mais. Moſt of them generally contain a greater or leſs admixture of ſome of the indiſſoluble kinds of earth; which, however, affects their medicinal qualities no otherwiſe than by the addition which it makes to their bulk. Chalk appears to be one of the pureſt, and is therefore in general preferred. They all burn into a ſtrong quicklime: in this ſtate a part of them diſſolves in water, which thus becomes impregnated with the aſtringent and lithontriptic powers that have been erroneouſly aſcribed to ſome of the earths in their natural ſtate.

During the calcination of calcareous earths, a large quantity of elaſtic vapour is diſcharged: the abſence of this fluid is the cauſe of the cauſticity of quicklime, and of its ſolubility in water in the form of lime-water. For a more full inquiry into this ſubject, ſee Fixed Air, &c.

2. The animal calcareous earth: *burning into quicklime like the mineral.* Of this kind are oyſter-ſhells and all the marine ſhells that have been examined; though with ſome variation in the ſtrength of the quicklime produced from them.

3. The earth of bones and horns: *not at all burning into quicklime.* This kind of earth is more difficult of ſolution in acids than either of the preceding. It is accompanied in the ſubjects with a quantity of gelatinous matter, which may be ſeparated by long boiling in water, and more perfectly by burning in the open air. The earth may be extracted alſo from the bone or horn, though difficultly, by means of acids; whereas vegetables and the ſoft parts of animals yield their pure earth by burning only.

2d, Earths ſoluble with caſe in the vitriolic as well as other acids, and yielding, in all other combinations therewith, ſaline concretes ſoluble in water.

1. Magneſia alba: *compoſing with the vitriolic acid a bitter purgative ſalt.* This earth has not yet been found naturally in a pure ſtate. It is obtained from the purging mineral waters and their ſalts; from the bitter liquor which remains after the cryſtallization of ſea-ſalt from ſea-water; and from the fluid which remains uncryſtallized in the putrefaction of ſome ſorts of rough nitre. The aſhes of vegetables appear to be nearly the ſame kind of earth.

2. Aluminous earth: *compoſing with the vitriolic acid a very aſtringent ſalt.* This earth alſo has not been found naturally pure. It is obtained from alum; which is no other than a combination of it with the vitriolic acid; it may likewiſe be extracted, by ſtrong boiling in that acid, from clays and boles.

3d, Earths which by digeſting in acids, either in the cold or in a moderate warmth, are not at all diſſolved.

1. Argillaceous earth: *becoming hard, or acquiring an addi-*

tional hardneſs, in the fire. Of this kind of earth there are ſeveral varieties, differing in ſome particular properties: as the purer *clays*, which when moiſtened with water form a very viſcous maſs, difficultly diffuſible through a larger quantity of the fluid, and ſlowly ſubſiding from it; *boles*, leſs viſcous, more readily miſcible with water, and more readily ſubſiding; and *ochres*, which have little or nothing of the viſcoſity of the two foregoing, and are commonly impregnated with a yellow or red ferruginous calx.

2. Cryſtalline earth: *naturally hard, ſo as to ſtrike ſparks with ſteel; becoming friable in a ſtrong fire.* Of this kind are flints, cryſtals, &c. which appear to conſiſt of one and the ſame earth, differing in the purity, hardneſs, and tranſparency of the maſs.

3. Gypſeous earth: *reducible by a gentle heat into a ſoft powder, which unites with water into a maſs, ſomewhat viſcous and tenacious while moiſt, but quickly drying and becoming hard. A greater heat deprives the powder of this property, without occaſioning any other alteration.* Such are the tranſparent *ſelenites*; the fibrous ſtony maſſes improperly called *Engliſh talc*; and the granulated *gypſa* or *plaſter of Paris* ſtones. Though theſe bodies, however, have been commonly thought to be mere earths, of a diſtinct kind from the reſt, they appear, both from analytical and ſynthetical experiments, to be no other than combinations of the mineral calcareous earth with vitriolic acid.

4. Talky earth: *ſcarcely alterable by a vehement fire.* The maſſes of this earth are generally of a fibrous or leafy texture; more or leſs pellucid, bright or glittering, ſmooth and unctuous to the touch; too flexible and elaſtic to be eaſily pulveriſed; ſoft, ſo as to be cut with a knife. In theſe reſpects ſome of the gypſeous earths nearly reſemble them, but the difference is readily diſcovered by fire; a weak heat reducing the gypſeous to powder; while the ſtrongeſt makes no other alteration in the talky, than ſomewhat diminiſhing their flexibility, brightneſs, and unctuoſity.

III. Metals.

Of metals, the next diviſion of mineral bodies, the moſt obvious characters are, their peculiar bright aſpect, perfect opacity, and great weight; the lighteſt of them is ſix, and the heavieſt upwards of 19 times heavier than an equal bulk of water.

To underſtand the writers in chemiſtry, it is proper to be informed, that metals are ſubdivided into the *perfect*, the *imperfect*, and the *ſemimetals*.

Thoſe poſſeſſed of ductility and malleability, and which are not ſenſibly altered by very violent degrees of heat, are called *perfect metals*: Of theſe there are three; gold, ſilver, and platina. It is, however, probable, that the mark of their indeſtructibility by fire is only relative: and indeed modern chemiſts have been able, by a very intenſe degree of heat, to bring gold into the ſtate of a calx, or ſomething very nearly reſembling it.

Thoſe metallic ſubſtances which poſſeſs the diſtinctive properties of the perfect metals, but in a leſs degree, are called the *imperfect metals*: theſe are, copper, iron, tin, lead.

Laſtly, thoſe bodies having the metallic characters in the moſt imperfect ſtate, that is to ſay, thoſe which have no ductility and the leaſt fixity in the fire, are diſtinguiſhed by the name of *ſemi-metals*: theſe are, regulus of antimony, biſmuth, zinc, regulus of cobalt, nickel, and regulus of arſenic; which laſt might be rather conſidered as the boundary between the metallic and the ſaline bodies.

Mercury has generally been ranked in a claſs by itſelf.

All metallic bodies, when heated in cloſe veſſels, melt or *fuſe*. This *fuſion* takes place at different degrees of heat in different metals; and it does not appear that this proceſs produces any change in the metals, provided it be conducted in cloſe veſſels. Metals, expoſed to the combined action of air and fire, are converted into an earth-like ſubſtance called *calx*: by this proceſs, which we call *calcination*, the metal ſuffers remarkable changes. From the diſtinctive marks we have before given of the metallic bodies, it will be obvious, that the perfect metals are moſt ſlowly, the imperfect more quickly, and the ſemi-metals moſt eaſily and ſooneſt, affected in this operation. This earth-like powder, or *calx*, is found to poſſeſs no metallic aſpect, but is conſiderably heavier than the metal before its calcination: it has no longer any affinity with metallic bodies, nor even with the metal from which it has been produced.

Beſides this method of calcining metals by air and fire, they may likewiſe be brought into the ſtate of a calx by diſſolving them in acids; from which they may be afterwards freed by evaporating the acid, or by adding to the ſolution an alkaline ſalt. Metals are alſo ſometimes dephlogiſticated by detonation with nitre. This change in their obvious properties is generally accompanied with a remarkable alteration in their medicinal virtues: thus, quickſilver, which, taken into the body in its crude ſtate and undivided, ſeems inactive, proves, when calcined by fire, even in ſmall doſes, a ſtrong emetic and cathartic, and, in ſmaller ones, a powerful alterative in chronical diſorders; while regulus of antimony, on the contrary, is changed, by the ſame treatment, from a high degree of virulence to a ſtate of inactivity.

Calces of mercury and arſenic exhale in a heat below ignition: thoſe of lead and biſmuth, in a red or low white heat, run into a tranſparent glaſs; the others are not at all vitreſcible, or not without extreme vehemence of fire. Both the calces and glaſſes recover their metallic form and qualities again by the ſkilful addition of any kind of inflammable ſubſtance that does not contain a mineral acid. This recovery of the metallic calces into the metallic form is called *reduction*. During this proceſs an elaſtic aerial fluid eſcapes, which is found to be *pure air*.

Is the converſion of metals into calces owing to the diſcharge of phlogiſton, or to the abſorption of pure air? And is the reduction to be aſcribed to the abſorption of phlogiſton, or to the eſcape of pure air? And again, Is the calcination to be explained by the diſcharge of phlogiſton and conſequent precipitation of pure air? And is the reduction effected by the abſorption of phlogiſton, either furniſhed by inflammable bodies or precipitated in conſequence of the diſcharge of pure air? On theſe queſtions there is much diſpute among modern chemiſts: we thought it only neceſſary to ſtate them here, as a full inquiry into the ſubject is by no means the province of pharmacy. We, however, think it prudent to retain the doctrine of Stahl: and we do this the more readily, becauſe it has been followed in our article Chemistry, and becauſe it is abundantly clear in its illuſtration of the pharmaceutical proceſſes. We do not mean, however, to reject any modern diſcovery which may ſerve to illuſtrate our ſubjects.

All metallic bodies diſſolve in acids; ſome only in particular acids, as ſilver and lead in the nitrous: ſome only in compoſitions of acids, as gold in a mixture of the nitrous and marine: and others, as iron and zinc, in all acids. Some likewiſe diſſolve in alkaline liquors, as copper: and others, as lead, in expreſſed oils. Fuſed with a compoſition of ſulphur and fixed alkaline ſalt, they are all, except zinc, made ſoluble in water.

All metallic ſubſtances, diſſolved in ſaline liquors, have powerful effects in the human body, though many of them appear in their pure ſtate to be inactive. Their activity is generally in proportion to the quantity of acid combined with them: thus, lead, which in its crude form has no ſenſible effect, when united

with a ſmall portion of vegetable acid into ceruſs, diſcovers a low degree of the ſtyptic and malignant quality, which it ſo ſtrongly exerts when blended with a larger quantity of the ſame acid into what was called *ſaccharum ſaturni*, but now more properly *ſal plumbi*, or *plumbum acetatum*: and thus mercury, with a certain quantity of the marine acid, forms the violent corroſive ſublimate, which by diminiſhing the proportion of acid becomes the mild medicine called *mercurius dulcis*.

IV. Acids.

The ſalts of this order are very numerous; but as we are at preſent treating of *Minerals*, it is only therefore the *mineral* or *foſſil* acids we mean to ſpeak of in this place.

Theſe are diſtinguiſhed by the names of the concretes from which they have been principally extracted; the *vitriolic* from vitriol, the *nitrous* from nitre or ſaltpetre; and the *marine* or *muriatic* from common ſea-ſalt. The form they are generally in, is that of a watery fluid: they have all a remarkable attraction for water: they imbibe the humidity of the air with rapidity, and the generation of heat. Although heat be produced by their union with water, yet, when mixed with ice in a certain manner, they generate a prodigious degree of cold. Acids change the purple and blue colours of vegetables to a red: they reſiſt fermentation; and, laſtly, they impreſs that peculiar ſenſation on the tongue called *ſourneſs*, and which their name imports. But it is to be obſerved, that they are all highly corroſive, inſomuch as not to be ſafely touched, unleſs largely diluted with water, or united with ſuch ſubſtances as obtund or ſuppreſs their acidity. Mixed haſtily with vinous ſpirits, they raiſe a violent ebullition and heat, accompanied with a copious diſcharge of noxious fumes: a part of the acid unites intimately with the vinous ſpirit into a new compound, void of acidity, called *dulciſied ſpirit*. It is obſervable, that the marine acid is much leſs diſpoſed to this union with ſpirit of wine than either of the other two; nevertheleſs, many of the compound ſalts reſulting from the combination of earthy and metallic bodies with this acid, are ſoluble in that ſpirit, while thoſe with the other acids are not. All theſe acids effervesce ſtrongly with alkaline ſalts both fixed and volatile, and form with them neutral ſalts; that is, ſuch as diſcover no marks either of an acid or alkaline quality.

The nitrous and marine acids are obtained in the form of a thin liquor; the acid part being blended with a large proportion of water, without which it would be diffuſed into an incoercible vapour: the vitriolic ſtands in need of ſo much leſs water for its condenſation as to aſſume commonly an oily conſiſtence (whence it is called *oil of vitriol*), and in ſome circumſtances even a ſolid one. Alkaline ſalts, and the ſoluble earths and metals, abſorb from the acid liquors only the pure acid part: ſo that the water may now be evaporated by heat, and the compound ſalt left in a dry form.

From the coalition of the different acids with the three different alkalis, and with the ſeveral ſoluble earths and metallic bodies, reſult a variety of ſaline compounds; the principal of which ſhall be particulariſed in the ſequel of this article.

The vitriolic acid, in its concentrated liquid ſtate, is much more ponderous than the other two; it emits no viſible vapour in the heat of the atmoſphere, but imbibes moiſture which increaſes its weight: the nitrous and marine emit copious corroſive fumes, the nitrous yelloviſh red, and the marine white ones. If bottles containing the three acids be ſtopt with cork, the cork is found in a little time tinged black with the vitriolic, corroded into a yellow ſubſtance by the nitrous, and into a whitiſh one by the marine.

It is above laid down as a character of one of the claſſes of earths, that the vitriolic acid precipitates them when they are previouſly diſſolved in any other acid: it is obvious, that on the ſame principle this particular acid may be diſtinguiſhed from all others. This character ſerves not only for the acid in its pure ſtate, but likewiſe for all its combinations that are ſoluble in water. If a ſolution of any compound ſalt, whoſe acid is the vitriolic, be added to a ſolution of chalk in any other acid, the vitriolic acid will part from the ſubſtance with which it was before combined, and join itſelf to the chalk, forming therewith a compound; which, being no longer ſoluble in the liquor, renders the whole milky for a time, and then gradually ſubſides.

This acid may be diſtinguiſhed alſo, in compound ſalts, by another criterion not leſs ſtrongly marked: If any ſalt containing it be mixed with powdered charcoal, and the mixture expoſed in a cloſe veſſel to a moderately ſtrong fire, the acid will unite with the directly inflammable part of the charcoal, and compoſe therewith a genuine ſulphur. Common brimſtone is no other than a combination of the vitriolic acid with a ſmall proportion of inflammable matter. With any kind of inflammable matter which is not volatile in cloſe veſſels, as the coal of vegetables, of animals, or of bitumens, this acid compoſes always the ſame identical ſulphur.

The nitrous acid alſo, with whatever kind of body it be combined, is both diſtinguiſhed and extricated by means of any inflammable ſubſtance being brought to a ſtate of ignition with it. If the ſubject be mixed with a little powdered charcoal and made red hot, a deflagration or fulmination enſues, that is, a bright flame with a hiſſing noiſe; and the inflammable matter and the acid being thus conſumed or diſſipated together, there remains only the ſubſtance which was before combined with the acid, and the ſmall quantity of aſhes afforded by the coal.

Theſe properties of the nitrous acid deflagrating with inflammable ſubſtances, and of the vitriolic forming ſulphur with them, ſerve not only as criteria of the reſpective acids in the various forms and diſguiſes, but likewiſe for diſcovering inflammable matter in bodies, when its quantity is too ſmall to be ſenſible on other trials.

All theſe acids will be more particularly examined when we come to treat of each of them apart. There are, however, a few other mineral acids which are of importance to be known: theſe are, *aqua regia*; *acid of borax*; *ſparry acid*; and, laſtly, *fixed air*, which has of late been called *aërial acid*, or *acid of chalk*.

Aqua regia has been generally prepared by a mixture of certain proportions of the nitrous and muriatic acids. It is of little avail in pharmacy whether we conſider it as a diſtinct acid, or only as a modification of the muriatic. It has been found, that the muriatic acid when diſtilled with *manganeſe* (a peculiar foſſile ſubſtance, ſhowing a remarkable attraction to phlogiſton) ſuffers a change which renders it capable of diſſolving gold and platina. Whether this change be produced by the acid acquiring a redundance of pure air, or by its being deprived of phlogiſton, it is not our buſineſs to decide. This experiment, however, renders it probable, that the nitrous acid in the common aqua regia is only ſubſervient to accompliſhing the ſame change in the muriatic acid which is produced by diſtilling that acid with manganeſe.

As aqua regia has been only uſed in the nicer operations in chemiſtry, and in the art of aſſaying, we think it unneceſſary to ſay more of it in this place.

The *acid of borax*, or *ſedative ſalt of Homberg*, may be extracted from borax, a neutral ſalt whoſe baſe is mineral alkali. It has alſo been found native in the waters of ſeveral lakes in Tuſcany. It is a light, cryſtallized, concrete ſalt; its taſte is ſenſibly acid; it is difficultly ſoluble in water; but the ſolution changes blue vegetable colours to a red. With vitreſcent earths it fuſes into a white glaſs: it unites with the other al-

kalis, with magnesia, and with quicklime. The salts resulting from these combinations are very imperfectly known. The salt has been called *sedative*, from its supposed virtues as an anodyne and refrigerant remedy; but modern physicians have very little faith in this once celebrated drug.

The *sparry acid* is so called from its being extracted from a fossil called *sparry fluor*, or *vitreous spar*. It is not yet determined whether it be a distinct acid; and as it has not yet been employed for any purpose in pharmacy, we think it would be improper to attempt any farther account of it here.

Besides the acids above mentioned, there have also been discovered acids seemingly of a particular nature, in amber, in arsenic, and in black-lead: but as these have not hitherto been applied to any use in pharmacy, they cannot properly have a place in this article.

We now come to the last, but perhaps the most generally diffused, acid in nature: this is the aerial acid, or

Fixed Air.

In our pharmaceutical history of this body, we shall only make use of the two names *fixed air* and *aerial acid*, being those most generally used, and which in our opinion are most applicable to our own subject. Fixed air is a permanently elastic fluid, being only *fixed* when in a state of combination with calcareous earth or other substances from which it may be extricated. It has received many different names, according to the substances from which it is disengaged, and to the different opinions concerning its nature: it is the *gas silvestre* of Helmont, the *fixed air* of Dr. Black, the *acid of chalk*, *calcareous gas*, *mephitic gas*, *mephitic acid*, *aerial acid*, and *carbonic acid*, of many modern chemists. In accommodating our account of it to the purposes of pharmacy, it is most convenient to consider it as an acid. The aerial acid may be extricated by heat, or by other acids, from all calcareous earths; that is, from all those earths which by calcination are converted into quicklime; such as chalk, marble, limestone, sea-shells, &c. It is likewise extricated from mild, fixed, and volatile alkalis, and from magnesia alba. Thus, if the vitriolic, or almost any other acid, be added to a quantity of calcareous earth or mild alkali, a brisk effervescence immediately ensues; the fixed air, or aerial acid, is discharged in bubbles; and the other acid takes its place. If this process be conducted with an apparatus to be afterwards described, the aerial acid, now separated from the calcareous earth, may be received and preserved in close vessels. When thus disengaged, it assumes its real character, viz. that of a *permanently elastic fluid*. Fixed air is also separated in great quantity during the vinous fermentation of vegetable matters. When a calcareous earth is deprived of this acid by heat, it is converted into the caustic substance *quicklime*. When alkalis, fixed or volatile, are deprived by any means of their aerial acid, they are rendered much more caustic, incapable of crystallization, or of effervescing with other acids. They are also in this *deaerated* state much more powerful in dissolving other bodies. By recombining this acid with quicklime, calcined magnesia, or alkali, any of which had been deprived of it, these substances again assume their former weight and properties. These bodies, then, when combined with aerial acid, are called *mild*; as *mild calcareous earth*, *mild alkali*, &c.: and when deprived of this acid they are called *caustic*; as *caustic calcareous earths*, *caustic alkali*, &c.: but as magnesia is not rendered caustic by calcination, there would perhaps be less danger in calling them *aerated* and *deaerated*. The aerial acid is more disposed to unite with caustic calcareous earth (quicklime) than with any other substance; next to that, its attraction is for fixed alkali, then for magnesia, and lastly for volatile alkali. We shall afterwards find that these relative powers of the different substances to unite with this acid, lay the foundation of many important processes in pharmacy.

When we pour a small quantity of the aerial acid into lime-water, the liquor instantly assumes a white colour, and the lime gradually precipitates, leaving the water clear and tasteless: the lime in this experiment has absorbed the acid, and has therefore become *mild* or *aerated* earth. The aerial acid is capable of being absorbed by water, and the water thus impregnated precipitates lime in lime-water; but if a certain larger quantity of this impregnated water be added, the lime is redissolved, and the liquor recovers its transparency. Water impregnated with aerial acid is capable of dissolving iron; and in this way are formed native and artificial chalybeate waters. Zinc is also soluble in the same liquor. This acid is easily expelled from the water by removing the pressure of the atmosphere, by boiling, and even by time alone, if the vessel be not kept close shut. Fixed air extinguishes flame, vegetable and animal life, and ought therefore to be cautiously managed: like other acids it changes the blue colours of vegetables to a red, and communicates an acidulous taste to the water impregnated with it. The attraction of the aerial acid, even to quicklime, is but feeble; as we know of no other acids whatever that are not able to disengage it.

From these several facts it will appear obvious, that *mild* or *effervescing alkalis*, whether fixed or volatile, are really neutral salts, compounded of the aerial acid and pure alkali: like other acids, it unites with these bodies, diminishes their causticity, and effects their crystallization. In speaking, therefore, of *pure alkali*, we ought to confine ourselves to those in the *caustic* or *deaerated* state; or, in other words, to those which are deprived of their fixed air or aerial acid, with which they formed a compound salt. Many other properties of this acid might be mentioned, but we have now noticed all those which we thought were concerned in the business of pharmacy. We shall have occasion to recur to the subject when we come to the preparation of several compound drugs.

Let us next take a view of what passes in the combinations of acids with different substances.

If a fixed alkaline salt be united with a vegetable acid, as vinegar, and formed into a neutral salt, on adding to this compound some marine acid, the acetous acid will be disengaged, so as to exhale totally in a moderate heat, leaving the marine in possession of the alkali: the addition of the nitrous will in like manner dispossess the marine, which now arises in its proper white fumes, though without such an addition it could not be extricated from the alkali by any degree of heat: on the addition of the vitriolic acid, the nitrous gives way in its turn, exhaling in red fumes, and leaving only the vitriolic acid and the alkali united together.

Again, if any metallic body be dissolved in an acid, the addition of any earthy body that is dissoluble in that acid will precipitate the metal; a volatile alkaline salt will in like manner precipitate the earth; and a fixed alkali will dislodge the volatile; which last being readily exhaled by heat, the remaining salt will be the same as if the acid and fixed alkali had been joined together at first, without the intervention of any of the other bodies.

The power in bodies on which these various transpositions and combinations depend, is called by the chemists *affinity* or *elective attraction*; a term, like the Newtonian *attraction*, designed to express not the cause, but the effect. When an acid spontaneously quits a metal to unite with an alkali, they say *it has a greater affinity* or *attraction* to the alkali than to the metal: and when, on the contrary, they say it has a greater affinity to fixed alkali than to the volatile, they mean only that it will unite with the fixed in preference to the volatile; and

that, if previouſly united with a volatile alkali, it will forſake this for a fixed one.

The doctrine of the *affinities of bodies* is of a very extenſive uſe in chemical pharmacy: many of the officinal proceſſes, as we ſhall ſee hereafter, are founded on it: ſeveral of the preparations turn out very different from what would be expected by a perſon unacquainted with theſe properties of bodies; and ſeveral of them, if, from an error in the proceſs, or other cauſes, they prove unfit for the uſe intended, may be rendered applicable to other purpoſes, by ſuch tranſpoſitions of their component parts as are pointed out by the knowledge of their affinities.

We ſhall therefore ſubjoin a Table of the principal affinities obſerved in pharmaceutical operations, formed from that of the famous Bergman. See other tables for more general purpoſes in the article ELECTIVE *Attraction*.

The table is to be thus underſtood. The ſubſtance printed in capitals, on the top of each ſeries, has the greateſt affinity with that immediately under it, a leſs affinity with the next, and ſo on to the end of the ſeries: that is, if any of the remote bodies has been combined with the top one, the addition of any of the intermediate bodies will diſunite them; the intermediate body uniting with the uppermoſt body of the ſeries, and throwing out the remote one. Thus, in the firſt ſeries of the affinities of the vitriolic acid, a fixed alkali being placed between the acid and iron, it is to be concluded, that wherever vitriolic acid and iron are mixed together, the addition of any fixed alkaline ſalt will unite with the acid, and occaſion the iron to be ſeparated. Where ſeveral ſubſtances are expreſſed in one ſeries, it is to be underſtood, that any of thoſe bodies which are nearer to the uppermoſt, will in like manner diſengage from it any of thoſe which are more remote.

TABLE OF SINGLE ATTRACTIONS.

By WATER.

Vitriolic acid.	Nitrous acid.	Marine acid.	Aqua regia.	Acid of borax.	Acid of sugar.	Acid of tartar.	Acid of sorrel.	Acid of lemon.
Terra ponderosa,	Vegetable alkali,	Vegetable alkali,	Vegetable alkali,	Lime,	Lime,	Lime,	Lime,	Lime,
Vegetable alkali,	Fossil alkali,	Fossil alkali,	Fossil alkali,	Terra ponderosa,	Terra ponderosa,	Terra ponderosa,	Terra ponderosa,	Terra ponderosa,
Fossil alkali,	Terra ponderosa,	Terra ponderosa,	Terra ponderosa,	Magnesia,	Magnesia,	Magnesia,	Magnesia,	Magnesia,
Lime,	Lime,	Lime,	Lime,	Vegetable alkali,	Vegetable alkali,	Vegetable alkali,	Vegetable alkali,	Vegetable alkali,
Magnesia,	Magnesia,	Magnesia,	Magnesia,	Fossil alkali,	Fossil alkali,	Fossil alkali,	Fossil alkali,	Fossil alkali.
Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,
Clay,	Clay,	Clay,	Clay,	Clay,	Clay,	Clay,	Clay,	Clay,
Zinc,	Zinc,	Zinc,	Zinc,	Zinc,	Zinc,	Zinc,	Zinc,	Zinc,
Iron,	Iron,	Iron,	Iron,	Iron,	Iron,	Iron,	Iron,	Iron,
Lead,	Lead,	Lead,	Lead,	Lead,	Lead,	Lead,	Lead,	Lead,
Tin,	Tin,	Tin,	Tin,	Tin,	Tin,	Tin,	Tin,	Tin,
Copper,	Copper,	Copper,	Copper,	Copper,	Copper,	Copper,	Copper,	Copper,
Antimony,	Antimony,	Antimony,	Antimony,	Antimony,	Antimony,	Antimony,	Antimony,	Antimony,
Arsenic,	Arsenic,	Arsenic,	Arsenic,	Arsenic,	Arsenic,	Arsenic,	Arsenic,	Arsenic,
Mercury,	Mercury,	Mercury,	Mercury,	Mercury,	Mercury,	Mercury,	Mercury,	Mercury,
Silver,	Silver,	Silver,	Silver,	Silver,	Silver,	Silver,	Silver,	Silver,
Gold,	Gold,	Gold,	Gold,	Gold,	Gold,	Gold,	Gold,	Gold,
Water,	Water,	Water,	Water,	Water,	Water,	Water,	Water,	Water,
Alcohol.	Alcohol.	Alcohol.	Alcohol.	Alcohol.	Alcohol.	Alcohol.	Alcohol.	Alcohol.

By FIRE.

Vegetable alkali,	Terra ponderosa,	Terra ponderosa,	Terra ponderosa,	Lime,				
Fossil alkali,	Vegetable alkali,	Vegetable alkali,	Vegetable alkali,	Terra ponderosa,				
Terra ponderosa,	Fossil alkali,	Fossil alkali,	Fossil alkali,	Magnesia,				
Lime,	Lime,	Lime,	Lime,	Vegetable alkali,				
Magnesia,	Magnesia,	Magnesia,	Magnesia,	Fossil alkali,				
Metals,	Metals,	Metals,	Metals,	Metals,				
Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,	Volatile alkali,				
Clay.	Clay.	Clay.	Clay.	Clay.				

TABLE *of* SINGLE ATTRACTIONS *continued.*

BY WATER.

ACETOUS ACID.	ACID OF PHOSPHORUS.	AERIAL ACID.	VEGETABLE ALKALI.	FOSSIL ALKALI.	VOLATILE ALKALI.	TERRA PONDEROSA.	LIME.	MAGNESIA.
Terra ponderosa, Vegetable alkali, Fossil alkali, Volatile alkali, Lime, Magnesia, Clay, Zinc, Iron, Lead, Tin, Copper, Antimony, Arsenic, Mercury, Silver, Gold, Water, Alcohol.	Lime, Terra ponderosa, Magnesia, Vegetable alkali, Fossil alkali, Volatile alkali, Clay, Zinc, Iron, Lead, Tin, Copper, Antimony, Arsenic, Mercury, Silver, Gold, Water.	Terra ponderosa, Lime, Vegetable alkali, Fossil alkali, Magnesia, Volatile alkali, Clay, Zinc, Iron, Lead, Tin, Copper, Antimony, Arsenic, Mercury, Silver, Gold, Water.	Vitriolic acid, Nitrous acid, Marine acid, Phosphoric acid, Acid of sugar, Acid of tartar, Acid of sorrel, Acid of lemon, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid, Water, Unctuous oils, Sulphur, Metals.	Vitriolic acid, Nitrous acid, Marine acid, Phosphoric acid, Acid of sugar, Acid of tartar, Acid of sorrel, Acid of lemon, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid, Water, Unctuous oils, Sulphur, Metals.	Vitriolic acid, Nitrous acid, Marine acid, Phosphoric acid, Acid of sugar, Acid of tartar, Acid of sorrel, Acid of lemon, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid, Water, Unctuous oils, Sulphur, Metals.	Vitriolic acid, Acid of sugar, Acid of sorrel, Phosphoric acid, Nitrous acid, Marine acid, Acid of lemon, Acid of tartar, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid, Water, Unctuous oils, Sulphur.	Acid of sugar, Acid of sorrel, Vitriolic acid, Acid of tartar, Phosphoric acid, Nitrous acid, Marine acid, Acid of lemon, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid, Water, Unctuous oils, Sulphur.	Acid of sugar, Phosphoric acid, Vitriolic acid, Nitrous acid, Marine acid, Acid of sorrel, Acid of tartar, Acid of lemon, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid, Sulphur.

BY FIRE.

Terra ponderosa, Vegetable alkali, Fossil alkali, Lime, Magnesia, Metals, Volatile alkali, Clay.	Lime, Terra ponderosa, Magnesia, Vegetable alkali, Fossil alkali, Metals, Volatile alkali, Clay.		Phosphoric acid, Acid of borax, Vitriolic acid, Nitrous acid, Marine acid, Acetous acid, Terra ponderosa, Lime, Magnesia, Clay, Sulphur.	Phosphoric acid, Acid of borax, Vitriolic acid, Nitrous acid, Marine acid, Acetous acid, Terra ponderosa, Lime, Magnesia, Clay, Sulphur.	Vitriolic acid, Nitrous acid, Marine acid, Acetous acid, Terra ponderosa, Lime, Magnesia, Clay, Sulphur.	Phosphoric acid, Acid of borax, Vitriolic acid, Nitrous acid, Marine acid, Acid of benzoin, Acetous acid, Fixed alkali, Sulphur, Lead.	Phosphoric acid, Acid of borax, Vitriolic acid, Nitrous acid, Marine acid, Fixed alkali, Sulphur, Lead.	Phosphoric acid, Acid of borax, Vitriolic acid, Nitrous acid, Marine acid, Fixed alkali, Sulphur, Lead.

TABLE *of* SINGLE ATTRACTIONS *continued.*

BY WATER.

CLAY.	WATER.	SULPHUR.	HEPAR SULPHURIS.	ALCOHOL.	ÆTHER.	ESSENTIAL OILS.	EXPRESSED OILS.	GOLD.
Vitriolic acid, Nitrous acid, Marine acid, Acid of ſugar, Acid of ſorrel, Acid of tartar, Acid of lemon, Acid of phoſphorus, Acid of benzoin, Acetous acid, Acid of borax, Aerial acid.	Vegetable alkali, Foſſil alkali, Volatile alkali, Alcohol, Æther, Vitriolic acid, Vitriolated tartar, Alum, Green vitriol, Corroſive ſublimate.	Lead, Tin, Silver, Mercury, Arſenic, Antimony, Iron, Vegetable alkali, Volatile alkali. Terra ponderoſa, Lime, Magneſia, Unctuous oils, Eſſential oils, Æther, Alcohol.	Gold, Silver, Mercury, Arſenic, Antimony, Copper, Tin, Lead, Iron, Alcohol, Water.	Water, Æther, Eſſential oils, Volatile alkali, Fixed alkali, Hepar ſulphuris, Sulphur.	Alcohol, Eſſential oils, Expreſſed oils, Water, Sulphur.	Æther, Alcohol, Expreſſed oils, Fixed alkali, Sulphur.	Æther, Eſſential oils, Fixed alkali, Volatile alkali, Sulphur.	Æther, Marine acid, Aqua-regia, Nitrous acid, Vitriolic acid, Acid of tartar, Phoſphoric acid, Fixed alkali, Volatile alkali.

BY FIRE.

Phoſphoric acid, Acid of borax, Vitriolic acid, Nitrous acid, Marine acid, Fixed alkali, Sulphur, Lead.		Fixed alkali, Iron, Copper, Tin, Lead, Silver, Antimony, Mercury, Arſenic.	Iron, Copper, Tin, Lead, Silver, Antimony, Mercury, Arſenic.					Mercury, Copper, Silver, Lead, Tin, Antimony, Iron, Zinc, Arſenic, Hepar ſulphuris.

TABLE *of* SINGLE ATTRACTIONS *continued.*

BY WATER.

SILVER.	MERCURY.	LEAD.	IRON.	COPPER.	TIN.	ARSENIC.	ZINC.	ANTIMONY.
Marine acid, Acid of ſugar, Vitiolic acid, Phoſphoric acid, Nitrous acid, Acid of tartar, Acid of ſorrel, Acid of lemon, Acetous acid, Aerial acid, Volatile acid.	Marine acid, Acid of ſugar, Phoſphoric acid, Vitriolic acid, Acid of tartar, Acid of lemon, Nitrous acid, Acetous acid, Acid of borax, Aerial acid.	Vitriolic acid, Acid of ſugar, Acid of tartar, Phoſphoric acid, Acid of ſorrel, Marine acid, Nitrous acid, Acid of lemon, Acetous acid, Acid of borax, Aerial acid, Fixed alkali.	Acid of ſugar, Acid of tartar, Vitriolic acid, Marine acid, Nitrous acid, Phoſphoric acid, Acid of ſorrel, Acid of lemon, Acetous acid, Acid of borax, Aerial acid.	Acid of ſugar, Acid of tartar, Marine acid, Vitriolic acid, Nitrous acid, Phoſphoric acid, Acid of ſorrel, Acid of lemon, Acetous acid, Acid of borax, Aerial acid, Fixed alkali, Volatile alkali, Expreſſed oils.	Acid of tartar, Marine acid, Vitriolic acid, Acid of ſugar, Phoſphoric acid, Nitrous acid, Acid of ſorrel, Acid of lemon, Acetous acid, Acid of borax, Fixed alkali, Volatile alkali.	Marine acid, Acid of ſugar, Vitriolic acid, Nitrous acid, Acid of tartar, Phoſphoric acid, Acid of ſorrel, Acid of lemon, Acetous acid, Volatile alkali, Unctuous oils.	Acid of ſugar, Vitriolic acid, Marine acid, Nitrous acid, Acid of ſorrel, Acid of tartar, Phoſphoric acid, Acid of lemon, Acetous acid, Acid of borax, Aerial acid, Volatile alkali.	Marine acid, Acid of ſugar, Vitriolic acid, Nitrous acid, Acid of tartar, Acid of ſorrel, Phoſphoric acid, Acid of lemon, Acetous acid, Acid of borax, Aerial acid.

BY FIRE.

Lead, Copper, Mercury, Tin, Gold, Antimony, Iron, Zinc, Arſenic, Hepar ſulphuris, Sulphur.	Gold, Silver, Lead, Tin, Zinc, Copper, Antimony, Arſenic, Iron, Hepar ſulphuris, Sulphur.	Gold, Silver, Copper, Mercury, Tin, Antimony, Arſenic, Zinc, Iron, Hepar ſulphuris, Sulphur.	Arſenic, Copper, Gold, Silver, Tin, Antimony, Lead, Mercury, Hepar ſulphuris, Sulphur.	Gold, Silver, Arſenic, Iron, Zinc, Antimony, Tin, Lead, Mercury, Hepar ſulphuris, Sulphur.	Zinc, Mercury, Copper, Antimony, Gold, Silver, Lead, Iron, Arſenic, Hepar ſulphuris, Sulphur.	Copper, Iron, Silver, Tin, Lead, Gold, Zinc, Antimony, Hepar ſulphuris, Sulphur.	Copper, Antimony, Tin, Mercury, Silver, Gold, Arſenic, Lead, Iron.	Iron, Copper, Tin, Lead, Silver, Zinc, Gold, Mercury, Arſenic, Hepar ſulphuris, Sulphur.

CASES of DOUBLE ELECTIVE ATTRACTIONS.

BY WATER.

1. Epſom ſalt with Mild vegetable alkali,	Give	1. Vitriolated tartar and Common magneſia.
2. Vitriolic ammoniac with Mild mineral alkali,		2. Glauber's ſalt and Mild volatile alkali.
3. Vitriolated tartar, with Nitrous ſelenite,		3. Vitriolic ſelenite and Saltpetre.
4. Vitriolated tartar with Mercurial nitre,		4. Vitriol of mercury and Saltpetre.
5. Saltpetre with Luna cornea,		5. Lunar cauſtic and Cubic nitre.
6. Vitriolated tartar with Luna cornea,		6. Vitriol of ſilver and Febrifugal ſalt.
7. Regenerated tartar with Mercurial nitre,		7. Acetous mercurial ſalt and Saltpetre.

BY HEAT.

1. Vitriolic ammoniac with Common ſalt,	Give	1. Common ſal ammoniac and Glauber's ſalt.
2. Vitriolic ammoniac with Regenerated tartar,		2. Acetous ammoniacal ſalt and Vitriolated tartar.
3. Vitriol of mercury with Common ſalt,		3. Glauber's ſalt and Muriated quickſilver.
4. Crude antimony with Muriated quickſilver,		4. Butter of antimony and Factitious cinnabar.

CHAP. II.

Of the Pharmaceutical Apparatus.

ONE of the principal parts of the pharmaceutical apparatus conſiſts in contrivances for containing and applying fire, and for directing and regulating its power. Of theſe contrivances, called *furnaces*, there are different kinds, according to the conveniency of the place, and the particular purpoſes they are intended to anſwer. We ſhall here endeavour to give a general idea of their ſtructure, and of the principles on which they are built; and for particulars refer the reader to FURNACE; and CHEMISTRY.

FURNACES.

The moſt ſimple furnace is the common ſtove, otherwiſe called the *furnace for open fire*. This is uſually made of an iron hoop, five or ſix inches deep; with a grate or ſome iron bars acroſs the bottom, for ſupporting the fuel. It either ſtands upon feet, ſo as to be moveable from place to place; or is fixed in brick-work. In this laſt caſe, a cavity is left under the grate, for receiving the aſhes that drop through it; and an aperture or door, in the forepart of this aſh-pit, ſerves both for allowing the aſhes to be occaſionally raked out, and for admitting air to paſs up through the fuel. This furnace is deſigned for effecting ſuch operations as thoſe for which only a moderate heat is required: as infuſion, decoction, and the evaporation of liquids.

A deeper hoop or body, cylindrical, parallelopipedal, widening upwards, elliptical, or of other figures; formed of, or lined with, ſuch materials as are capable of ſuſtaining a ſtrong fire; with a grate and aſh-pit beneath, as in the preceding; and communicating at the top with a perpendicular pipe, or chimney, makes a *wind furnace*.

The greater the perpendicular height of the chimney, the greater will be the draught of air through the furnace, and the more intenſely will the fire burn; provided the width of the chimney is ſufficient to allow a free paſſage to all the air that the furnace can receive through the grate; for which purpoſe, the area of the aperture of the chimney ſhould be nearly equal to the area of the interſtices of the grate.

Hence, where the chimney conſiſts of moveable pipes, made to fit upon each other at the ends, ſo that the length can be occaſionally increaſed or diminiſhed, the vehemence of the fire will by ſuch contrivance be increaſed or diminiſhed in the ſame proportion.

In furnaces whoſe chimney is fixed, the ſame advantage may be procured on another principle. As the intenſity of the fire depends wholly upon the quantity of air ſucceſſively paſſing through and animating the burning fuel, it is obvious, that the moſt vehement fire may be ſuppreſſed or reſtrained at pleaſure, by cloſing more or leſs either the aſh-pit door by which the air is admitted, or the chimney by which it paſſes off; and that the fire may be more or leſs raiſed again, by more or leſs opening thoſe paſſages. A moveable plate, or regiſter, in any convenient part of the chimney, affords commodious means of varying the width of the paſſage, and conſequently of regulating the heat. This is moſt conveniently accompliſhed by keeping the aſh-pit door entirely ſhut, and regulating the heat by a range of holes in a damping plate; each hole is provided with a proper pin, whereby we may ſhut it at pleaſure. Theſe holes may be made to bear a certain proportion to each other; the ſmalleſt being conſidered as one, the next to it in ſize muſt have twice the opening, the next to that double of the ſecond, &c.; and ſo on to the number of ſeven or eight; and by combining theſe holes variouſly together, we can admit any quantity of air from 1 to 128: as 1. 2. 4. 8. 16. 32. 64. 128. See the article FURNACE.

There are two general kinds of theſe wind-furnaces; one, with the chimney on the top, over the middle of the furnace; the other with the chimney on one ſide, and the mouth clear.

In the firſt, either the upper part of the furnace is contracted to ſuch an aperture, that the chimney may fit upon it; or it is covered with an arched dome, or with a flat plate, having a like aperture in the middle. As, in this diſpoſition of the chimney, the inſide of the furnace cannot be come at from above, a door is made in the inſide, a little above the grate, for ſupplying the fuel, inſpecting the matter in the fire, &c.

For performing fuſions in this furnace, the crucible, or

melting veſſel, is placed immediately among the fuel, with a ſlip of brick, or ſome other like ſupport, between it and the grate, to keep the cold air, which enters underneath, from ſtriking on its bottom.

When deſigned as a reverberatory, that is, for diſtillation in long-necked coated glaſs retorts, two iron bars are placed acroſs, above the fire, for ſupporting the veſſel, whoſe neck comes out at an aperture made for that purpoſe, in the ſide. This aperture ſhould be made in the ſide oppoſite to the door above mentioned; or at leaſt ſo remote from it, that the receiver, fitted on the neck of the diſtilling veſſel without the furnace, may not lie in the operator's way when he wants to ſtir the fire or throw in freſh fuel.

The other kind of wind-furnace communicates, by an aperture in its back part near the top, either with an upright pipe of its own, or with the chimney of the room; in which laſt caſe, all other paſſages into the chimney muſt be cloſed. Here the mouth of the furnace ſerves for a door, which may be occaſionally covered with a plate or tile. Of this kind is the furnace moſt commonly uſed for fuſion in a crucible.

This laſt conſtruction, by leaving the mouth of the furnace clear, affords the conveniency of letting into it a boiling or evaporating pan, a copper ſtill, an iron pot, for diſtilling hartſhorn, an iron ſand-pot, or other like veſſels, of ſuch a ſize that they may be ſupported on the furnace by their rims. The mouth being thus occupied by the veſſels, a door muſt be made in the ſide for ſupplying and ſtirring the fuel.

When a furnace of this kind is deſigned only for a ſand-bath, it is moſt commodious to have the ſand placed on a long iron plate, furniſhed with a ledge of freeſtone or brick-work at each ſide. The mouth of the furnace is to be cloſely covered by one end of this plate; and the canal by which the furnace communicates with its chimney, is to be lengthened and carried along under the plate, the plate forming the upper ſide of the canal. In this kind of ſand-bath, digeſtions, &c. requiring different degrees of heat may be carried on at once; for the heat decreaſes gradually from the end over the furnace to the other.

When large veſſels, as ſtills and iron pots for diſtilling hartſhorn and aquafortis, are fixed in furnaces, a conſiderable part of the bottom of the veſſel is commonly made to reſt upon ſolid brick-work.

The large ſtill, whoſe bottom is narrow in proportion to its height, and whoſe weight, when charged with liquor, requires great part of it to be thus ſupported, expoſes but a ſmall ſurface to the action of the fire underneath. To make up for this diſadvantage, the heat, which riſes at the further end of a long narrow grate, is conveyed all round the ſides of the veſſel by a ſpiral canal, which communicates at top with a common chimney.

The pots for diſtilling hartſhorn and aquafortis in the larger way, have part of their great weight borne up by three ſtrong pins or trunnions at equal diſtances round the pot towards the middle reaching into a brick-work; ſo that, leſs ſupport being neceſſary underneath, a greater ſurface of the wide bottom lies expoſed to the immediate action of the fire.

If a furnace, communicating with its chimney by a lateral canal, as in the ſand furnace above mentioned, be carried to a conſiderable height above the part where this canal enters it, and if it be filled with fuel to the top, and cloſely covered, the fuel will burn no higher than up to the upper ſide of the canal through which the air paſſes off; and in proportion as this lower part of the fuel conſumes, it will be ſupplied by that above, which falls down in its place. Hence in this furnace, called an *athanor*, a conſtant heat may be kept up for a conſiderable length of time without attendance.

The tower of the athanor, or that part which receives the fuel, is commonly made to widen a little downwards, that the coals may fall the more freely: but not ſo much as that the part on fire at bottom may be too ſtrongly preſſed. A ſmall aperture is made oppoſite to the canal or flue, or a number of openings according to the ſize of the furnace and the degree of heat required, for ſupplying the air, which is more conveniently admitted in this manner than through the grate, as the interſtices of the grate are in time choaked up by the aſhes.

This furnace is deſigned only for heating bodies exterior to it. Its canal or flue, as in the ſand-furnace already deſcribed, paſſes under a ſand-bath or water-bath; at the farther end of which it riſes perpendicularly to ſuch a height, as may occaſion a ſufficient draught of air through the fire.

The flue may be ſo wide as to correſpond to the whole height of the fire-place. A regiſter or ſliding plate, placed between the flue and the furnace, enables us to increaſe or diminiſh this height, and conſequently the quantity of fire at pleaſure. If the ſpace beneath the flue be incloſed to the ground, the heat in this cavity will be conſiderable enough to be applicable to ſome uſeful purpoſes.

With regard to the materials of furnaces, the fixed ones are built of bricks, cemented together by ſome good loam or clay. Any kind of loam or clayey compoſition that is of a proper degree of tenacity, which, when made into a paſte with water and well worked, does not ſtick to the fingers, and which, when thoroughly dried, neither cracks nor melts in a vehement fire, is fit for uſe. The purer and more tenacious clays require to have their tenacity leſſened by an admixture of ſand, or rather of the ſame kind of clay burnt and groſsly powdered.

Smaller portable furnaces are made of ſtrong iron or copper plates, lined, to the thickneſs of an inch or more, with the ſame kind of clayey compoſition; which for this uſe may be beaten with ſome horſe-dung, chopped ſtraw, or cut hair or tow.

Very commodious portable furnaces, for a buſineſs of moderate extent, may be formed of the larger kind of common black lead melting-pots, by cutting a door at the bottom of the pot for the aſh-pit, another above this for the fire-place, and introducing a circular iron grate of ſuch a ſize as may reſt between the two doors. For a more particular account of the method of preparing furnaces, ſee FURNACE.

BATHS.

Where a ſtrong degree of heat is requiſite, as in the fuſion of metals, &c. the veſſel containing the ſubject matter is placed among the burning fuel, or immediately over it: this is called *operating in a naked fire*. Where a ſmaller heat is ſufficient, and the veſſel employed is either of glaſs, or of the more tender kinds of earthen ware, the ſand-bath or water-bath is uſed to defend the veſſel from the immediate action of the fire, and to render the heat leſs fluctuating.

Both theſe baths have their peculiar advantages and inconveniences. In water, the heat is equal through every part of the fluid: whereas in ſand it varies in different parts of one perpendicular line, decreaſing from the bottom to the top. Water cannot be made to receive, or to tranſmit to veſſels immerſed in it, above a certain degree of heat, viz. that which is ſufficient to make it boil; and hence it ſecures effectually againſt any danger of an exceſs of heat in thoſe operations wherein the product would be injured by a heat greater than that of boiling water: but this advantage renders it uſeleſs for proceſſes which require a greater heat, and for which ſand or other ſolid intermedia are neceſſarily employed. There is this convenience alſo in the ſand-bath, that the heat may be readily diminiſhed or increaſed about any particular veſſel, by raiſing it higher out of the ſand or ſinking it deeper; that different ſubjects may be expoſed to

different degrees of heat from one fire; and that it keeps the veſſels ſteady. The ſand made choice of ſhould be a large coarſe-grained kind, ſeparated from the finer parts by waſhing, and from little ſtones by the ſieve.

Coating of Glasses, Lutes.

Some proceſſes require to be performed with glaſs veſſels in a naked fire. For theſe purpoſes, veſſels made of the thinneſt glaſs ſhould be choſen; for theſe bear the fire without cracking, much better than thoſe which are thicker, and in appearance ſtronger.

All glaſſes, or other veſſels that are apt to crack in the fire, muſt be cautiouſly nealed, that is, heated by ſlow degrees: and when the proceſs is finiſhed, they ſhould be as ſlowly cooled, unleſs where the veſſel is to be broken to get out the preparation, as in ſome ſublimations: in this caſe it is more adviſeable to expoſe the hot glaſs ſuddenly to the cold air, which will ſoon occaſion it to crack, than to endanger throwing down the ſublimated matter among the fæces by a blow.

As a defence from the violence of the fire, and to prevent the contact of cold air on ſupplying freſh fuel, &c. the glaſs is to be coated over, to the thickneſs of about half-a-crown, with Windſor loam, ſoftened with water into a proper conſiſtence, and beaten up with ſome horſe-dung, or with the other clayey compoſitions above mentioned.

Theſe compoſitions ſerve alſo as a lute, for ſecuring the junctures of the veſſels in the diſtillation of the volatile ſalts and ſpirits of animals: for the diſtillation of acid ſpirits, the matter may be moiſtened with a ſolution of fixed alkaline ſalt inſtead of water. For moſt other purpoſes, a piece of wet bladder, or paſte of flour and water, or of linſeed meal (that is, the cake left after the expreſſion of oil of linſeed), are ſufficient lutes.

Sometimes clay and chalk are mixed up into a paſte, and ſpread upon ſlips of paper; and ſometimes gum-arabic is uſed inſtead of the clay, and mixed up in the ſame manner.

Wet bladders contract ſo ſtrongly by drying, that they not unfrequently break the veſſels: and the fat lute of Mr. Macquer, which is a compoſition of clay and chalk with oil, is too cloſe for moſt operations. Where very elaſtic ſteams are to be condenſed, we are often obliged, even where the common lutes are employed, to leave or make an opening which may be occaſionally ſtopped by a plug: by this means we give paſſage to a part of theſe vapours, which prevents the burſting of the veſſels, and facilitates the condenſation of the reſt. If we wiſh to collect incondenſible vapours, we receive them into a jar inverted under a baſon of water or quickſilver, as is uſually done in the analyſis of vegetables by fire.

Beſides theſe, there are alſo required ſome other kinds of lutes for joining veſſels together in operations requiring a ſtrong heat, and for lining furnaces; for which ſee Chemistry.

Vessels.

In this place, we ſhall only give the operator a few general cautions with regard to the *matter* of the veſſels deſigned for containing the ſubject; and refer their deſcription to the account of the operations in which they are employed. See likewiſe Chemistry.

Metalline veſſels poſſeſs the advantage of being able to bear ſudden alterations of heat and cold, and of being very ſtrong, ſo as to be capable of confining elaſtic ſteams; but, except thoſe made of gold or ſilver, they are readily corroded by acids, even by the mild ones of the vegetable kingdom. Copper veſſels are corroded alſo by alkaline liquors, and by ſome neutral ones, as ſolutions of ſal ammoniac. It is obſervable, that vegetable acids do not act upon this metal by boiling, ſo much as by ſtanding in the cold; for even lemon juice may be boiled in a clean copper veſſel, without receiving from it any taſte or ill quality; whereas, in the cold, it ſoon diſſolves ſo much as to contract a pernicious taint. The tin, with which copper-veſſels are uſually lined, gives likewiſe a ſenſible impregnation to acid juices; and this impregnation alſo is probably not innocent, more eſpecially as a quantity of lead is commonly mixed with the tin. From the want of tranſparency in theſe veſſels, we are alſo deprived of the advantage of ſeeing the different changes during the operation.

The earthen veſſels poſſeſs none of the deſirable qualities for chemical operations, except that of ſuſtaining very violent degrees of heat, without being melted or otherwiſe changed. Theſe veſſels are leſs liable to external cracks from ſudden applications of heat and cold, when they are made with a certain proportion of ſand, than with pure clay. Black lead, too, mixed with the clay, makes the veſſels ſuſtain violent degrees and ſudden alterations of heat ſurpriſingly well: crude clay reduced to a kind of ſand by violent heat, and then mixed with raw clay, is alſo found to furniſh veſſels excellently fitted for thoſe operations where ſand might be corroded: but of all kinds of earthen ware, the moſt perfect is porcelain, compoſed of the fineſt clay mixed with a ſtony matter capable of melting in a violent heat. This, however, is too coſtly an article for general uſe. Reaumur diſcovered a method of imitating porcelain, by melting the coarſer kinds of glaſs with a mixture of ſand and clay: this has been found to be nearly of the colour of porcelain, to be much ſtronger than glaſs, and to bear the moſt ſudden changes of heat and cold that we have occaſion to apply. There has not hitherto been any manufacture of this ware, and of courſe it has not come into general uſe.

The common earthen veſſels are of a looſe porous texture; and hence are apt to imbibe a conſiderable quantity of certain liquids, particularly of thoſe of the ſaline kind; which ſoon diſcover that they have penetrated the veſſel, by ſhooting into ſaline efflorеſcences on the outſide. Thoſe which are *glazed* have their glazing corroded by acids; by vinegar, and the acid juices of fruits, as well as by the ſtronger acids of the mineral kingdom. And as this glazing conſiſts chiefly of vitrified lead, the impregnation which it communicates to theſe liquors is of a very dangerous kind. If vinegar be boiled for ſome time in a glazed earthen veſſel, it will yield, on being inſpiſſated, a pure ſal plumbi, that is, a ſalt compoſed of lead and the acetous acid.

The veſſels called, from their hardneſs and compactneſs, *ſtone ware*, are in a good meaſure free from the inconveniences of the coarſer earthen ones. Their glazing being a part of the clay itſelf, ſuperficially vitrified by means of the fumes of common ſalt, appears to be proof againſt acids.

Glaſs veſſels ſuffer no corroſion, and give no taint, in any of the pharmaceutic operations. When, therefore, they are made of a proper thinneſs, when they are well annealed, and when blown into a ſpherical form ſo that the heat may be equally applied, they are preferable to all others, where great and ſudden changes of heat and cold are not to take place, and where ſtrength is not required: what is called the *flint-glaſs*, which contains a quantity of lead in its compoſition, is the beſt for chemical purpoſes.

Weights.

Two different kinds of weights are made uſe of in this country; one in the merchandiſe of gold and ſilver; the other for almoſt all other goods. The firſt we call Troy, the latter Avoirdupois weight.

The goldſmiths divide the Troy pound into twelve ounces; the ounce into 20 pennyweights; and the pennyweight into

24 grains. The Avoirdupois pound is divided into 16 ounces; and the ounce into 16 parts, called *drams*.

The pound of the London and Edinburgh diſpenſatories is that of the goldſmiths, divided in the following manner:

The pound	contains	twelve ounces.
The ounce		eight drams.
The dram		three ſcruples.
The ſcruple		twenty grains.

The grain is equal to the goldſmith's grain.

The medical or Troy pound is leſs than the Avoirdupois, but the ounce and the dram greater. The Troy pound contains 5760 grains; the Avoirdupois 7000 grains. The Troy ounce contains 480 grains; the Avoirdupois only 437½. The Troy dram 60; the Avoirdupois dram ſomewhat more than 27. Eleven drams Avoirdupois are nearly equal to five drams Troy; 12 ounces Avoirdupois to nearly 11 ounces Troy; and 19 pounds Avoirdupois are equal to ſomewhat more than 23 pounds Troy.

Theſe differences in our weights have occaſioned great confuſion in the practice of pharmacy. As the druggiſts and grocers ſell by the Avoirdupois weight, the apothecaries have not in general kept any weights adjuſted to the Troy pound greater than two drams, uſing Avoirdupois ounces. By this means it is apparent, that in all compoſitions, where the ingredients are preſcribed ſome by pounds and others by ounces, they are taken in a wrong proportion to each other; and the ſame happens where any are directed in leſſer denominations than the ounce, as theſe ſubdiviſions uſed by the apothecaries are made to a different ounce.

Measures.

The meaſures employed in pharmacy are the common wine meaſures.

A gallon	contains	eight pints (*libræ.*)
The pint		ſixteen ounces.
The ounce		eight drams.

Though the pint is called by Latin writers *libra* or pound, there is not any known liquor of which a pint meaſure anſwers to that weight. A pint of the higheſt rectified ſpirit of wine exceeds a pound by above half an ounce; a pint of water exceeds it by upwards of three ounces; and a pint of oil of vitriol weighs more than two pounds and a quarter.

The Edinburgh College, ſenſible of the many errors from the promiſcuous uſe of weights and meaſures, and of their different kinds, have in the laſt edition of their Pharmacopœia entirely rejected meaſures, and employ the Troy weight in directing the quantity either of ſolid or fluid ſubſtances. They have, however, taken all poſſible care that the proportion of the ſimples and ſtrength of the compounds ſhould neither be increaſed nor diminiſhed by this alteration. This change in the Edinburgh Pharmacopœia muſt be very particularly adverted to. And it is, we think, to be regretted, that the London College have not in the laſt edition of their Pharmacopœia followed the ſame plan.

A table of the weights of certain meaſures of different fluids may on many occaſions be uſeful, both for aſſiſting the operator in regulating their proportions in certain caſes, and ſhowing the comparative gravities of the fluids themſelves. We here inſert ſuch a table for a pint, an ounce, and a dram meaſure of thoſe liquids whoſe gravity has been determined by experiments that can be relied on. The wine gallon contains 231 cubic inches; whence the pint contains $28\frac{7}{8}$, the ounce $1\frac{10}{12}\frac{3}{2}$, and the dram $\frac{231}{7424}$ of a cubic inch.

	Pint weighs			Ounce meaſure weighs	Dram meaſure weighs
	ounces	drams	grains	grains	grains
Inflammable Spirits.					
Æthereal ſpirit of wine	11	1	36	336	42
Highly rectified ſpirit of wine	12	5	20	380	47½
Common-rectified ſpirit of wine	13	2	40	400	50
Proof ſpirit	14	1	36	426	53¼
Dulcified ſpirit of ſalt	14	4	48	438	55¾
Dulcified ſpirit of nitre	15	2	40	460	57½
Wines.					
Burgundy	14	1	36	426	53¼
Red port	15	1	36	456	57
Canary	15	6	40	475	59½
Expressed Oils.					
Oil olive	14	0	0	420	52½
Linſeed oil	14	2	8	428	53½
Essential Oils.					
Oil of turpentine	12	1	4	364	45½
of orange-peel				408	51
of juniper-berries				419	52⅜
of roſemary				430	53¾
of origanum				432	54
of caraway ſeeds				432	54
of nutmegs				436	54½
of ſavin				443	55⅜
of hyſſop				443	55⅜
of cummin-ſeed				448	56
of mint				448	56
of pennyroyal				450	56¼
of dill-ſeed				457	57⅛
of fennel-ſeed				458	57¼
of cloves				476	59½
of cinnamon				576	49½
of ſaſſafras				503	62⅞
Alkaline Liquors.					
Aqua kali puri, *Pharm. Lond.*	16	0	0	480	90
Spirit of ſal ammoniac	17	1	10	514¾	64 11/32
Strong ſoap-boilers ley	17	6	24	534	66¾
Lixivium tartari	24	0	0	720	90
Acid Liquors.					
Wine-vinegar	15	3	44	464	58
Beer-vinegar	15	6	56	476	59½
Glauber's ſpirit of ſalt	17	4	0	525	65⅝
Glauber's ſpirit of nitre	20	2	40	610	76¼
Strong oil of vitriol	28	5	20	860	107½
Animal Fluids.					
Urine	15	5	20	470	58⅞
Cows milk	15	6	40	475	59⅜
Aſſes milk	16	0	0	480	60
Blood	16	1	4	484	60½
Waters.					
Diſtilled water	15	1	50	456⅞	57
Rain-water	15	2	40	460	57½
Spring-water	15	3	12	462	57¾
Sea-water	15	5	20	470	58⅞
Quicksilver.	214	5	20	6440	805

Chap. III. *Of the Pharmaceutical Operations.*

Sect. I. Solution.

Solution is an intimate commixture of ſolid bodies with fluids into one ſeemingly homogeneous liquor. The diſſolving fluid is called a *menſtruum* or *ſolvent*; and the body diſſolved is called the *ſolvend*.

Objections have been made, and perhaps with propriety, to theſe terms; as it is ſuppoſed that the two bodies uniting in ſolution act reciprocally on each other: there is, however, no danger from the words themſelves, if we do not derive them from a miſtaken theory. Solution cannot take place, unleſs one of the bodies, at leaſt, be in a fluid ſtate; and this fluidity is effected either by water or fire: hence ſolution is ſaid to be performed in the *humid* or in the *dry way*. Thus, for inſtance, if any quantity of brimſtone be diſſolved in a ſolution of fixed alkali, the brimſtone is ſaid to be diſſolved in the *humid way*: but if the brimſtone be diſſolved by melting it in a pan with the dry alkali, the ſolution is ſaid to be done in the *dry way*. The hepar ſulphuris is the ſame in both. Another kind of ſolution reſembling that by the dry way, is, however, to be carefully diſtinguiſhed from it: if, for example, a piece of Glauber's ſalt is put into a pan over the fire, the ſalt very ſoon aſſumes a liquid ſtate; but on continuing the heat, it loſes its fluidity, and becomes a white powder: this powder is the ſalt freed from its water, and it is found to be very refractory. This liquidity depended on the water of cryſtallization being enabled by the heat to keep the ſalt in ſolution, and the ſalt ceaſed to be fluid as ſoon as its cryſtallizing water was evaporated. This kind of ſolution, then, differs not from the firſt, or humid way.

If one of the two bodies to be united is tranſparent, the ſolution, if complete, is a tranſparent compound: this is the caſe in ſolutions of alkalis and calcareous earths in acids. But if the ſolution be opaque and milky, as is the caſe with ſoap and water, it is then conſidered as incomplete.

The principal menſtrua uſed in pharmacy are, *water*, *vinous ſpirits*, *oils*, *acid* and *alkaline liquors*.

Water is the menſtruum of all ſalts, of vegetable gums, and of animal gellies. Of ſalts, it diſſolves only a determinate quantity, though of one kind of ſalt more than another; and, being thus *ſaturated*, leaves any additional quantity of the ſame ſalt untouched.

Experiments have been made for determining the quantities of water which different ſalts require for the diſſolution. Mr. Eller has given a large ſet in the Memoirs of the Royal Academy of Sciences of Berlin for the year 1750, from which the following table is extracted.

Eight ounces by weight of diſtilled water diſſolved,

	oz.	dr.	gr.
Of refined ſugar	24	0	0
Green vitriol	9	4	0
Blue vitriol	9	0	0
White vitriol	4	4	0
Epſom ſalt	4	0	0
Purified nitre	4	0	0
Soluble tartar	4	0	0
Common ſalt	3	4	0
Sal gemmæ	3	4	0
Sal catharticus Glauberi	3	4	0
Seignette's ſalt	3	0	0
Alum	2	4	0
Sal ammoniac	2	4	0
Vitriolated tartar	1	4	0
Salt of hartſhorn	1	4	0
Sugar of lead	1	2	0
Cream of tartar	1	0	0
Borax	0	4	20

Though great care appears to have been taken in making theſe experiments, it is not to be expected that the proportions of the ſeveral ſalts ſoluble in a certain quantity of water will always be found exactly the ſame with thoſe above ſet down. Salts differ in their ſolubility according to the degree of their purity, perfection, and dryneſs: the vitriols, and the artificial compound ſalts in general, differ remarkably in this reſpect, according as they are more or leſs impregnated with the acid ingredient. Thus, vitriolated tartar perfectly neutralized is extremely difficult of ſolution: the matter which remains in making Glauber's ſpirit of nitre is no other than a vitriolated tartar; and it diſſolves ſo difficultly, that the operator is obliged to break the retort in order to get it out; but, on adding more of the vitriolic acid, it diſſolves with eaſe. Hence many have been tempted to uſe an over-proportion of acid in this preparation; and we frequently find in the ſhops, under the name of vitriolated tartar, this acid ſoluble ſalt. The degree of heat occaſions alſo a remarkable difference in the quantity of ſalt taken up: in very cold weather, eight ounces of water will diſſolve only about one ounce of nitre; whereas in warm weather, the ſame quantity will take up three ounces or more. To theſe circumſtances are probably owing, in part, the remarkable differences in the proportionable ſolubilities of ſalts, as determined by different authors. It is obſervable that common ſalt is leſs affected in its ſolubility by a variation of heat than any other; water in a temperate ſtate diſſolving nearly as much of it as very hot water: and accordingly this is the ſalt in which the different experiments agree the beſt. In the experiments of Hoffmann, Neumann, and Petit, the proportion of this ſalt, on a reduction of the numbers, comes on exactly the ſame, viz. three ounces of the ſalt to eight of water; Dr. Brownrigg makes the quantity of ſalt a little more; Dr. Grew, a dram and a ſcruple more; and Eller, as appears in the above table, four drams more: ſo that in the trials of ſix different perſons, made probably in different circumſtances, the greateſt difference is only one ſixth of the whole quantity of ſalt; whereas in ſome other ſalts there are differences of twice or thrice the quantity of the ſalt. In the experiments from which the table is drawn, the water was of the temperature of between 40 and 42 degrees of Fahrenheit's thermometer, or above freezing by about one-ſeventh of the interval between freezing and the human heat.

Some ſalts omitted by Eller are here ſubjoined; the firſt is taken from Dr. Grew, and the other four from Neumann.

Eight ounces of water diſſolved,

	oz.	dr.	gr.
Of fixed alkaline ſalt	above 8	0	0
Sal diureticus	8	0	0
Sugar candy, both brown and white	9	0	0
Sugar of milk	0	2	40
Eſſential ſalt of ſorrel	0	1	20

Though water takes up only a certain quantity of one kind of ſalt, yet, when ſaturated with one, it will ſtill diſſolve ſome portion of another; and when it can bear no more of either of theſe, it will ſtill take up a third, without letting go any of the former. The principal experiments of this kind which have been made relative to pharmaceutic ſubjects, are exhibited in the following table; of which the two firſt articles are from Grew, and the others from Eller.

Water, 32 parts by weight,

Fully ſaturated with	diſſolved afterwards			
Nitre	Sal ammoniac	10		
Common ſalt	Nitre	10	Sal ammoniac	2
Nitre	Fixed alkali	7	Common ſalt	2
Common ſalt	Nitre, near	2	Fixed alkali	2½
Volatile alkali	Nitre	4	Sugar	2
Sal ammoniac	Common ſalt	2½		
Soluble tartar	Nitre	2		
Vitriolated tartar	Fixed alkali	2		
Glauber's ſalt	Nitre	1	Sugar	1
Epſom ſalt	Sugar	6		
Borax	Fixed alkali	2		

In regard to the other claſs of bodies for which water is a menſtruum, viz. thoſe of the gummy gelatinous kind, there is no determinate point of ſaturation: the water unites readily with any proportions of them, forming with different quantities liquors of different conſiſtence. This fluid takes up likewiſe, when aſſiſted by trituration, the vegetable gummy reſins, as ammoniacum and myrrh; the ſolutions of which, though *imperfect*, that is, not tranſparent, but turbid and of a milky hue, are nevertheleſs applicable to valuable purpoſes in medicine. It mingles with vinous ſpirits, with acid and alkaline liquors, not with oils, but imbibes ſome of the more ſubtile parts of eſſential oils, ſo as to become impregnated with their ſmell and taſte.

Rectified *ſpirit of wine*, or rather *alcohol*, is the menſtruum of the eſſential oils and reſins of vegetables; of the pure diſtilled oils, and ſeveral of the colouring and medicinal parts of animals; of ſome mineral bituminous ſubſtances, as of ambergris; and of ſoaps, though it does not act upon the expreſſed oil and fixed alkaline ſalt, of which ſoap is compoſed: whence, if ſoap contains any ſuperfluous quantity of either the oil or ſalt, it may by means of this menſtruum be excellently purified. It diſſolves, by the aſſiſtance of heat, volatile alkaline ſalts; and more readily the neutral ones, compoſed either of fixed alkali and the acetous acid, as the ſal diureticus, or of the volatile alkali and the nitrous acid, as alſo the ſalt of amber, &c. It mingles with water and with acids; not with alkaline lixivia.

Oils diſſolve vegetable reſins and balſams, wax, animal-fats, mineral bitumens, ſulphur, and certain metallic ſubſtances, particularly lead. The expreſſed oils are, for moſt of theſe bodies, more powerful menſtrua than thoſe obtained by diſtillation; as the former are more capable of ſuſtaining, without injury, a ſtrong heat, which is in moſt caſes neceſſary to enable them to act. It is ſaid, that one ounce of ſulphur will diſſolve in three ounces of expreſſed oil, particularly linſeed oil; but requires ſix ounces of eſſential oil, as turpentine.

All acids diſſolve alkaline ſalts, alkaline earths, and metallic ſubſtances. The different acids differ greatly in their action upon theſe laſt; one diſſolving only ſome particular metals, and another, others.

The *vegetable* acids diſſolve a conſiderable quantity of zinc, iron, copper, lead, and tin; and extract ſo much from the metallic part of antimony, as to become powerfully emetic: they diſſolve lead more readily, if the metal be previouſly calcined by fire, than in its metallic ſtate.

The *marine* acid diſſolves zinc, iron, and copper; and though it ſcarcely acts on any other metallic ſubſtance in the common way of making ſolutions, it may nevertheleſs be artfully combined with them all except gold. The corroſive ſublimate, and antimonial cauſtic of the ſhops, are combinations of it with mercury and the metallic part of antimony, effected by applying the acid, in the form of fume, to the ſubjects, at the ſame time alſo ſtrongly heated.

The *nitrous* acid is the common menſtruum of all metallic ſubſtances, except gold and the metallic part of antimony; of which two, the proper ſolvent is a mixture of the nitrous and marine acids, called *aqua regia*.

The *vitriolic* acid, diluted with water, eaſily diſſolves zinc and iron. In its concentrated ſtate, and aſſiſted by a boiling heat, it may be made to corrode, or imperfectly diſſolve, moſt of the other metals.

The *aerial* acid diſſolves iron, zinc, and calcareous earth; and thoſe ſolutions muſt be conducted without heat.

Alkaline *lixivia* diſſolve oils, reſinous ſubſtances, and ſulphur. Their power is greatly promoted by the addition of quicklime; inſtances of which occur in the preparation of ſoap, and in the common cauſtic. Thus acuated, they reduce the fleſh, bones, and other ſolid parts of animals, into a gelatinous matter. This increaſed acrimony in alkaline ſalts is owing to the abſtraction of their fixed air; that acid having a greater attraction for quicklime than for alkalis.

Solutions made in water and in ſpirit of wine poſſeſs the virtues of the body diſſolved; while oils generally ſheath its activity, and acids and alkalis vary its quality. Hence watery and ſpirituous liquors are the proper menſtrua of the native virtues of vegetable and animal matters.

Moſt of the foregoing ſolutions are eaſily effected, by pouring the menſtruum on the body to be diſſolved, and ſuffering them to ſtand together for ſome time expoſed to a ſuitable warmth. A ſtrong heat is generally requiſite to enable oils and alkaline liquors to perform their office; nor will acids act on ſome metallic bodies without its aſſiſtance. The action of watery and ſpirituous menſtrua is likewiſe expedited by a moderate heat; though the quantity which they afterwards keep diſſolved is not, as ſome ſuppoſe, by this means increaſed; all that heat occaſions theſe to take up, more than they would do in a longer time in the cold, will, when the heat ceaſes, ſubſide again. This at leaſt is moſt commonly the caſe, though there may be ſome inſtances of the contrary.

The action of acids on the bodies which they diſſolve, is generally accompanied with heat, effervеſcence, and a copious diſcharge of fumes. The fumes which ariſe during the ſolution of ſome metals in the vitriolic acid, prove inflammable: hence, in the preparation of the artificial vitriols of iron and zinc, the operator ought to be careful, eſpecially where the ſolution is made in a narrow-mouthed veſſel, leſt by the imprudent approach of a candle the exhaling vapour be ſet on fire. This vapour is the inflammable air of Dr. Prieſtley and other modern chemiſts.

There is another ſpecies of ſolution, in which the moiſture of the air is the menſtruum. Fixed alkaline ſalts, and thoſe of the neutral kind, compoſed of alkaline ſalts and the vegetable acids, or of ſoluble earths and any acid, except the vitriolic, and ſome metallic ſalts, on being expoſed for ſome time to a moiſt air, gradually attract its humidity, and at length become liquid. Some ſubſtances, not diſſoluble by the application of water in its groſſer form, as the butter of antimony, are eaſily liquefied by this ſlow action of the aerial moiſture. This proceſs is called *deliquation*.

Sect. II. Extraction.

The liquors which diſſolve certain ſubſtances in their pure ſtate, ſerve likewiſe to *extract* them from admixtures of other matter. Thus ardent ſpirit, the menſtruum of eſſential oils and reſins, takes up the virtues of the reſinous and oily vegetables, as water does thoſe of the mucilaginous and ſaline;

the inactive earthy parts remaining untouched by both. Water extracts likewiſe from many plants, ſubſtances which by themſelves it has little effect upon; even eſſential oils being, as we have formerly obſerved, rendered ſoluble in that fluid by the admixture of gummy and ſaline matter, of which all vegetables participate in a greater or leſs degree. Thus many of the aromatic plants, and moſt of the bitters and aſtringents, yield their virtues to this menſtruum.

Extraction is performed, by *macerating* or *ſteeping* the ſubject in its appropriated menſtruum in the cold: or *digeſting* or *circulating* them in a moderate warmth; or *infuſing* the plant in the boiling liquor, and ſuffering them to ſtand in a covered veſſel till grown cold; or actually *boiling* them together for ſome time. If the vegetable matter is itſelf ſucculent and watery, it is ſometimes only neceſſary to expreſs the juice, and evaporate it to the proper conſiſtence.

The term *digeſtion* is ſometimes uſed for maceration; and in this caſe the proceſs is directed to be performed *without heat*: where this circumſtance is not expreſſed, digeſtion always implies the uſe of heat. Circulation differs from digeſtion only in this, that the ſteam, into which a part of the liquor is reſolved by the heat, is, by means of a proper diſpoſition of the veſſels, condenſed and conveyed back again upon the ſubject. Digeſtion is uſually performed in a matraſs (or bolt-head), Florence flaſk, or the like; either of which may be converted into a circulatory veſſel, by inverting another into the mouth, and ſecuring the juncture with a piece of wet bladder. A ſingle matraſs, if its neck be very long and narrow, will anſwer the purpoſe as effectually; the vapour cooling and condenſing before it can riſe to the top: in a veſſel of this kind, even ſpirit of wine, one of the moſt volatile liquors we know, may be boiled without any conſiderable loſs: the uſe of this inſtrument is likewiſe free from an inconvenience which may in ſome caſes attend the other, of the uppermoſt veſſel being burſt or thrown off. As the long-necked matraſſes here recommended are difficultly filled or emptied, and likewiſe very dear, a long glaſs pipe may be occaſionally luted to the ſhorter ones.

Heat greatly expedites extraction; but by this means proves as injurious to ſome ſubſtances, by occaſioning the menſtruum to take up their groſſer and more ungrateful parts, as it is neceſſary for enabling it to extract the virtues of others. Thus, guaiacum and logwood impart little to aqueous liquors without a boiling heat; whilſt even a ſmall degree of warmth proves greatly prejudicial to the fine bitter of carduus benedictus. This plant, which infuſed in boiling, or digeſted in ſenſibly hot water, gives out a nauſeous taſte, ſo offenſive to the ſtomach as to promote vomiting, yields to the cold clement a grateful balſamic bitter.

As heat promotes the diſſolving power of liquids; ſo cold, on the other hand, diminiſhes it. Hence tinctures or extractions made by a conſiderable heat, depoſit in cold weather a part of their contents, and thus become proportionally weaker: a circumſtance which deſerves particular regard.

Sect. III. Depuration.

There are different methods of depurating or purifying liquors from their feculencies, according as the liquor itſelf is more or leſs tenacious, or the feculent matter of greater or leſs gravity.

Thin fluids readily depoſit their more ponderous impurities upon ſtanding at reſt for ſome time in a cool place; and may then be decanted or poured off clear, by inclining the veſſel.

Glutinous, unctuous, or thick ſubſtances are to be liquefied by a ſuitable heat; when the groſſer feculencies will fall to the bottom, the lighter ariſing to the ſurface to be *deſpumated* or ſcummed off.

Where the impurities are neither ſo ponderous as to ſubſide freely to the bottom, nor ſo light as to ariſe readily to the ſurface, they may be ſeparated in great meaſure by *colature* through ſtrainers of linen, woollen, or other cloth; and more perfectly by *filtration* through a ſoft bibulous kind of paper made for the purpoſe.

The grey paper, which covers pill-boxes as they come from abroad, is one of the beſt for this purpoſe: it does not eaſily break when wetted, or tinge the liquor which paſſes through it, which the reddiſh ſort called *bloſſom paper* frequently does. The paper is ſupported by a funnel or piece of canvas fixed in a frame. When the funnel is uſed, it is convenient to put ſome ſtraws or ſmall ſticks between the paper and its ſides, to prevent the weight of the liquor from preſſing the paper ſo cloſe to it, as not to allow room for the fluid to tranſude. In ſome caſes a funnel made of wire is put between the paper and the glaſs funnel. There is alſo a kind of glaſs funnel with ridges down its ſides made on purpoſe for this uſe.

Glutinous and unctuous liquors, which do not eaſily paſs through the pores of a filter or ſtrainer, are clarified by beating them up with whites of eggs; which concreting and growing hard when heated, and entangling the impure matter, ariſe with it to the ſurface: the mixture is to be gently boiled till the ſcum begins to break, when the veſſel is to be removed from the fire, the cruſt taken off, and the liquor paſſed through a flannel bag.

Decantation, colature, and filtration, are applicable to moſt of the medicated liquors that ſtand in need of purification. Deſpumation and clarification very rarely have place; ſince theſe, along with the impurities of the liquor, frequently ſeparate its medicinal parts. Thus, if the decoction of poppy heads, for making diacodium, be ſolicitouſly ſcummed or clarified, the medicine will loſe almoſt all that the poppies communicated; and, inſtead of a mild opiate, turns out little other than a plain ſyrup of ſugar.

It may be proper to obſerve, that the common ſorts of filtering paper are apt to communicate a diſagreeable flavour: and hence in filtering fine bitters, or other liquors whoſe gratefulneſs is of primary conſequence, the part which paſſes through firſt ought to be kept apart for inferior purpoſes.

Sect. IV. Cryſtallization.

Water, aſſiſted by heat, diſſolves a larger proportion of moſt ſaline ſubſtances than it can retain when grown cold: hence, on the abatement of the heat, a part of the ſalt ſeparates from the menſtruum, and concretes at the ſides and bottom of the veſſel. The concretions, unleſs too haſtily formed by the ſudden cooling of the liquor, or diſturbed in their coaleſcence by agitation, or other ſimilar cauſes, prove tranſparent and of regular figures, reſembling in appearance the natural ſpring-cryſtals.

Salts, diſſolved in a large quantity of water, may in like manner be recovered from it in their cryſtalline form, by boiling down the ſolution, till ſo much of the fluid has exhaled as that the remainder will be too little to keep the ſalt diſſolved when grown perfectly cold. It is cuſtomary to continue the evaporation till the ſalt ſhows a diſpoſition to concrete even from the hot water, by forming a pellicle on that part which is leaſt hot, *viz.* on the ſurface. If large, beautiful, and perfectly figured cryſtals are required, this point is ſomewhat too late: for, if the ſalt thus begins to coaleſce whilſt conſiderably hot, on being removed into a cold place its particles will run too haſtily and irregularly together: the pellicle at the ſame time falling down through the liquor, proves a farther diſturbance to the regularity of the cryſtallization.

In order to perform this proceſs in perfection, the evaporation muſt be gentle, and continued no longer than till ſome drops of the liquor, let fall on a cold glaſs-plate, diſcover cryſtalline filaments. When this mark of ſufficient exhalation appears,

the veſſel is to be immediately removed from the fire into a leſs warm but not cold place, and covered with a cloth to prevent the acceſs of cold air, and conſequently the formation of a pellicle.

The fixed alkalis, eſpecially the mineral, when fully ſaturated with fixed air or the aerial acid, aſſume a cryſtalline form; but theſe cryſtals are not ſo perfect as when the ſame alkalis are united with the other acids; the volatile alkalis cannot cryſtallize, becauſe they eſcape before the menſtruum exhales.

Some even of the other neutral ſalts, particularly thoſe of which certain metallic bodies are the baſis, are ſo ſtrongly retained by the aqueous fluid, as not to exhibit any appearance of cryſtallization, unleſs ſome other ſubſtance be added with which the water has a greater affinity. The Table of Affinity ſhows that ſpirit of wine is ſuch a ſubſtance; by the prudent addition of which, theſe kinds of ſalt ſeparate freely from the menſtruum, and form large and beautiful cryſtals ſcarcely obtainable by any other means.

The operator muſt be careful not to add too much of the ſpirit; leſt, inſtead of a gradual and regular cryſtallization, the baſis of the ſalt be haſtily precipitated in a powdery form. One twentieth part of the weight of the liquor will in moſt caſes be a ſufficient, and in ſome too large a quantity.

Different ſalts require different quantities of water to keep them diſſolved: and hence, if a mixture of two or more be diſſolved in this fluid, they will begin to ſeparate and cryſtallize at different periods of the evaporation. Upon this foundation, ſalts are freed not only from ſuch impurities as water is not capable of diſſolving and carrying through the pores of a filter, but likewiſe from admixtures of each other; that which requires moſt water to diſſolve ſhooting firſt into cryſtals.

It is proper to remark, that a ſalt, when cryſtallizing, ſtill retains and combines with a certain portion of water: this water is not eſſential to the ſalt as a ſalt, but is eſſential to a ſalt as being cryſtallized; it is therefore called by the chemiſts the *water of cryſtallization*. The quantity of this water varies in different ſalts: in ſome of them, as in Glauber's ſalt, alum, and copperas, it makes up about one half of their weight; in others, as in nitre, common ſalt, and eſpecially ſelenites, it is in very ſmall quantity. As ſalts unite to the water of their cryſtallization by their attraction for water alone, we accordingly find that this water is perfectly pure, and contains, in complete cryſtals, no ſubſtance foreign to the ſalt. Salts not only differ in the quantity of water neceſſary to their ſolution, but ſome of them are alſo ſoluble with equal facility in cold as in hot water. Sometimes then we employ evaporation; ſometimes cooling; and at other times both theſe expedients are uſed alternately, to ſeparate different ſalts diſſolved in the ſame liquor. It is obvious, then, that thoſe which are nearly or equally ſoluble in cold as in boiling water can only be cryſtallized by evaporation; thoſe again which are much more ſoluble in boiling than in cold water are to be ſeparated by cooling. Of the firſt of theſe is common or marine ſalt; of the latter is nitre or ſaltpetre. It remains, then, that we ſhould know how to ſeparate theſe two ſalts, when both of them happen to be diſſolved in the ſame water; this method conſiſts in alternate evaporation and cooling. If in ſuch a ſolution a pellicle appears in the boiling liquor before cryſtals can be formed in the cooling, we then conclude that the common ſalt predominates: in this caſe we evaporate the water, and ſeparate the common ſalt as faſt as it is formed, till the liquor on cooling ſhows cryſtals of nitre: we then allow the nitre to cryſtallize by cooling. After all the nitre which had been diſſolved by the heat alone has now ſeparated by cooling, we reſume the evaporation, and ſeparate the common ſalt till the cooling liquor again ſhows cryſtals of nitre. We thus repeat the ſame ſeries of operations, by which means theſe two ſalts may be alternately cryſtallized; the one by evaporation, the other by cooling till they are perfectly ſeparated from each other. If in the beginning of the operation the liquor had, upon trial, given cryſtals of nitre by cooling, before any pellicle appeared on its ſurface when boiling, this would have indicated that the nitre was predominant in the ſolution; the nitre in this caſe would have been cryſtallized, firſt by cooling, till the quantity of nitre exceeding that of the common ſalt having been ſeparated, the common ſalt would next have cryſtallized in its turn by evaporation. The example we have now given may be applied to other ſalts, or to a number of ſalts which may happen to be diſſolved in the ſame liquor. For, though there are few ſo completely ſoluble in cold water as common ſalt, and few ſo ſcantily as nitre; yet there are ſcarcely two ſalts which either preciſely ſhow the ſame ſolubility or the ſame appearance of their cryſtals. It is obvious, too, that by cryſtallization we diſcover the peculiar predominant ſalt in any ſolution of mixed ſaline matter; but as one ſalt always takes down a ſmall portion of another, it is neceſſary to redilſolve the firſt products, and repeat the cryſtallization, in order to render the ſeparation complete.

We ſee, then, that though the cryſtal appearance and form does not alter the ſalt itſelf, yet that this proceſs affords an elegant method of diſcovering compound ſolutions of ſalts, of judging of their purity, and laſtly of ſeparating different ſalts very completely from each other. Cryſtallization, then, is one of the moſt important agents in pharmacy, and ought to be well underſtood. We ſhall attempt to explain the particular management in cryſtallizing particular ſalts, when we come to treat of each of them ſeparately.

Sect. V. Precipitation.

By this operation bodies are recovered from their ſolutions by means of the addition of ſome other ſubſtance, with which either the menſtruum or the body diſſolved have a greater affinity than they have with each other.

Precipitation, therefore, is of two kinds; one, where the ſubſtance ſuperadded unites with the menſtruum, and occaſions that before diſſolved to be thrown down; the other, in which it unites with the diſſolved body, and falls along with it to the bottom. Of the firſt, we have an example in the precipitation of ſulphur from alkaline lixivia by the means of acids; of the ſecond, in the precipitation of mercury from aquafortis by ſea-ſalt, or its acid.

The ſubjects of this operation, as well thoſe which are capable of being precipitated as thoſe which precipitate them, will readily appear from inſpection of the Table of Affinity. See Chemistry. The manner of performing it is ſo ſimple, as not to ſtand in need of any particular directions; no more being required than to add the precipitant by degrees as long as it continues to occaſion any precipitation. When the whole of the powder has fallen, it is to be well *edulcorated*, that is, waſhed in ſeveral freſh parcels of water, and afterwards dried for uſe.

Where metals are employed as precipitants, as in the purification of martial vitriol from copper by the addition of freſh iron, they ought to be perfectly clean, and free from any ruſty or greaſy matter; otherwiſe they will not readily, if at all, diſſolve, and conſequently the precipitation will not ſucceed; for the ſubſtance to be precipitated ſeparates only by the additional one diſſolving and taking its place. The ſeparated powder often, inſtead of falling to the bottom, lodges upon the precipitant; from which it muſt be occaſionally ſhaken off, for reaſons ſufficiently obvious.

Though in this operation the precipitated powder is generally the part required for uſe, yet ſome advantage may frequently be made of the liquor remaining after the precipitation. Thus, when when fixed alkaline ſalt is diſſolved in water, and ſulphur diſſolved in this lixivium, the addition of acids ſeparates and

throws down the ſulphur only in virtue of the acid uniting with and neutralizing the alkali by which the ſulphur was held diſſolved; conſequently, if the precipitation be made with the vitriolic acid, and the acid gradually dropt in till the alkali be completely ſatiated, that is, as long as it continues to occaſion any precipitation or turbidneſs, the liquor will yield, by proper evaporation and cryſtallization, a neutral ſalt, compoſed of the vitriolic acid and fixed alkali, that is, vitriolated tartar. In like manner, if the precipitation be made with the nitrous acid, a true nitre may be recovered from the liquor; if with the marine, the ſalt called *ſpiritus ſalis marini coagulatus*; and if with the acid of vinegar, the *ſal diureticus*.

Sect. VI. Evaporation.

Evaporation, the third method of recovering ſolid bodies from their ſolutions, is effected by the means of heat; which evaporating the fluid part, that is, forcing it off in ſteam, the matter which was diſſolved therein is left behind in its ſolid form.

The general rules for evaporation are, to place the matter in a flat, ſhallow, wide veſſel, ſo that a large ſurface of the liquor may be preſented to the air; for it is only from the ſurface that evaporation takes place. The degree of heat ought to be proportioned to the volatility of the ſubſtance to be evaporated, and to the degree of the fixity of the matter to be left: thus, the leſs fixed the matter to be left is, and the more ſtrongly it adheres to the volatile parts, the leſs the degree of heat ought to be; and in ſuch caſes, too, a forcible current of air is ſometimes ſcarcely admiſſible: on the contrary, when the matter to be evaporated is not very volatile, and when the matter to be left is very fixed, and does not adhere ſtrongly to the volatile part, the evaporation may be urged by a ſtrong heat, aided by a current of air directed upon the ſurface of the liquor.

This proceſs is applicable to the ſolutions of all theſe ſubſtances which are leſs volatile than the menſtruum, or which will not exhale by the heat requiſite for the evaporation of the fluid; as the ſolutions of fixed alkaline ſalts; of the gummy, gelatinous, and other inodorous parts of vegetables and animals in water; and of many reſinous and odorous ſubſtances in ſpirit of wine.

Water extracts the virtues of ſundry fragrant aromatic herbs, almoſt as perfectly as rectified ſpirit of wine; but the aqueous infuſions are far from being equally ſuited to this proceſs with thoſe made in ſpirit, water carrying off the whole odour and flavour of the ſubject, which that lighter liquor leaves entire behind it. Thus, a watery infuſion of mint loſes in evaporation the ſmell, taſte, and virtues, of the herb; whilſt a tincture drawn with pure ſpirit yields on the ſame treatment a thick balſamic liquor, or ſolid gummy reſin, extremely rich in the peculiar qualities of the mint.

In evaporating theſe kinds of liquors, particular care muſt be had, towards the end of the proceſs, that the heat be very gentle; otherwiſe the matter as it grows thick will burn to the veſſel, and contract a diſagreeable ſmell and taſte: this burnt flavour is called *empyreuma*. The liquor ought to be kept ſtirring during the evaporation; otherwiſe a part of the matter concretes on the ſurface expoſed to the air, and forms a pellicle which impedes the farther evaporation.

Sect. VII. Distillation.

In the foregoing operation fluids are rarefied by heat into ſteam or vapour, which is ſuffered to exhale in the air, but which it is the buſineſs of diſtillation to collect and preſerve. For this purpoſe the ſteam is received in proper veſſels, luted to that in which the ſubject is contained; and, being there cooled, condenſes into a fluid form again.

There are two kinds of diſtillation; by the one, the more ſubtile and volatile parts of liquors are elevated from the groſſer; by the other, liquids incorporated with ſolid bodies are forced out from them with vehemence by fire.

To the firſt belong the diſtillation of the pure inflammable ſpirit from vinous liquors; and of ſuch of the active parts of vegetables as are capable of being extracted by boiling water or ſpirit, and at the ſame time of ariſing along with their ſteam.

As boiling water extracts or diſſolves the eſſential oils of vegetables, while blended with the other principles of the ſubject, without ſaturation, but imbibes only a determinate, and that a ſmall proportion of them, in their pure ſtate; as theſe oils are the only ſubſtances contained in common vegetables, which prove totally volatile in that degree of heat; and as it is in them that the virtues of aromatics, and the peculiar odour and flavour of all plants, reſide;—it is evident, that water may be impregnated by diſtillation with the more valuable parts of many vegetables: that this impregnation is limited, the oil ariſing in this proceſs pure from thoſe parts of the plant which before rendered it ſoluble in water without limitation; hence the greateſt part of the oil ſeparates from the diſtilled aqueous liquor, and, according to its greater or leſs gravity, either ſinks to the bottom or ſwims on the ſurface: that conſequently infuſions and diſtilled waters are very different from each other: that the firſt may be rendered ſtronger by pouring the liquor on freſh parcels of the ſubject; but that the latter cannot be in like manner improved by cohobating or rediſtilling them from freſh ingredients.

As the oils of many vegetables do not freely diſtil with a leſs heat than that in which water boils; as rectified ſpirit of wine is not ſuſceptible of this degree of heat; and as this menſtruum totally diſſolves theſe oils in their pure ſtate; it follows, that ſpirit elevates far leſs from moſt vegetables than water; but that nevertheleſs the diſtilled ſpirit, by keeping all that it does elevate perfectly diſſolved, may, in ſome caſes, prove as ſtrong of the ſubject as the diſtilled water. The more gentle the heat, and the ſlower the diſtillation goes on, the volatile parts are the more perfectly ſeparated in their native ſtate.

It may be obſerved, that as the parts which are preſerved in evaporation cannot ariſe in diſtillation, the liquor remaining after the diſtillation, properly depurated and inſpiſſated, will yield the ſame extracts as thoſe prepared from the tincture or decoction of the ſubject made on purpoſe for that uſe; the one of theſe operations collecting only the volatile parts, and the other the more fixed; ſo that where one ſubject contains medicinal parts of both kinds, they may thus be obtained diſtinct, without one being injured by the proceſs which collects the other.

The ſubjects of the ſecond kind of diſtillation are, the groſs oils of vegetables and animals, the mineral acid ſpirits, and the metallic fluid quickſilver; which, as they require a much ſtronger degree of heat to elevate them than the foregoing liquors can ſuſtain, ſo they likewiſe condenſe without ariſing ſo far from the action of the fire. The diſtillation of theſe is performed in low glaſs veſſels, called, from their neck being bent to one ſide, *retorts*: to the farther end of the neck a receiver is luted, which ſtanding without the furnace, the vapours ſoon condenſe in it, without the uſe of a refrigeratory: nevertheleſs, to promote this effect, ſome are accuſtomed, eſpecially in warm weather, to cool the receiver, by occaſionally applying wet cloths to it, or keeping it partly immerſed in a veſſel of cold water.

The vapours of ſome ſubſtances are ſo ſluggiſh, or ſtrongly retained by a fixed matter, as ſcarce to ariſe even over the low neck of the retort. Theſe are moſt commodiouſly diſtilled in ſtraight-necked earthen-veſſels called *long necks*, laid on their ſides, ſo that the vapour paſſes off laterally with little or no aſcent: a receiver is luted to the end of the neck without the furnace. In this manner, the acid ſpirit of vitriol is diſtilled. The

matter which remains in the retort or longneck, after the diſtillation, is vulgarly called *caput mortuum*.

In theſe diſtillations, a quantity of elaſtic air is frequently generated; which, unleſs an exit be allowed, blows off or burſts the receiver. The danger of this may in good meaſure be prevented, by ſlowly raiſing the fire; but more effectually by leaving a ſmall hole in the luting, to be occaſionally opened or ſtopt with a wooden plug; or inſerting at the juncture an upright pipe of ſuch a height, that the ſteam of the diſtilling liquor may not be able to riſe to the top; but it is ſtill better done by fitting to the apparatus other veſſels, by which their vapours may be condenſed. For the proceſs of diſtilling, and the apparatus made uſe of, ſee DISTILLATION; and CHEMISTRY.

SECT. VIII. SUBLIMATION.

As all fluids are volatile by heat, and conſequently capable of being ſeparated, in moſt caſes, from fixed matters, by the foregoing proceſs; ſo various ſolid bodies are ſubjected to a ſimilar treatment. Fluids are ſaid to *diſtil*, and ſolids to *ſublime*; though ſometimes both are obtained in one and the ſame operation. If the ſubliming matter concretes into a maſs, it is commonly called a *ſublimate*; if into a powdery form, *flowers*.

The principal ſubjects of this operation are, volatile alkaline ſalts; neutral ſalts, compoſed of volatile alkalis and acids, as ſal ammoniac; the ſalt of amber, and flowers of benzoin; mercurial preparations; and ſulphur. Bodies of themſelves not volatile, are frequently made to ſublime by the mixture of volatile ones: thus, iron is carried up by ſal ammoniac in the preparation of the *flores martiales*, or *ferrum ammoniacale*.

The fumes of ſolid bodies in cloſe veſſels riſe but little way, and adhere to that part of the veſſel where they concrete. Hence a receiver or condenſer is leſs neceſſary here than in the preceding operation; a ſingle veſſel, as a matraſs, or tall phial, or the like, being frequently ſufficient.

SECT. IX. EXPRESSION.

THE preſs is chiefly made uſe of for forcing out the juices of ſucculent herbs and fruits, and the inſipid oils of the unctuous ſeeds and kernels.

The harder fruits, as quinces, require to be previouſly well beat or ground; but herbs are to be only moderately bruiſed. The ſubject is then included in a hair bag, and preſſed between wooden plates, in the common ſcrew-preſs, as long as any juice runs from it.

The expreſſion of oils is performed nearly in the ſame manner as that of juices: only here, iron-plates are ſubſtituted for the wooden ones there made uſe of. The ſubject is well pounded, and included in a ſtrong canvas bag, between which and the plates of the preſs a haircloth is interpoſed.

The inſipid oils of all the unctuous ſeeds are obtained, uninjured, by this operation, if performed without the uſe of heat; which, though it greatly promotes the extraction of the oil, at the ſame time impreſſes an ungrateful flavour, and increaſes its diſpoſition to grow rancid.

The oils expreſſed from aromatic ſubſtances generally carry with them a portion of their eſſential oil; hence the ſmell and flavour of the expreſſed oils of nutmegs and mace. They are very rarely found impregnated with any of the other qualities of the ſubject: oil of muſtard-ſeed, for inſtance, is as ſoft and void of acrimony as that of the almond, the pungency of the muſtard remaining entire in the cake left after the expreſſion.

SECT. X. EXSICCATION.

THERE are two general methods of exſiccating or drying moiſt bodies; in the one, their humid parts are exhaled by heat; in the other, they are imbibed or abſorbed by ſubſtances whoſe ſoft and ſpongy texture adapts them to that uſe. Bodies intimately combined with, or diſſolved in a fluid, as recent vegetables and their juices, require the firſt; ſuch as are only ſuperficially fixed, as when earthy or indiſſoluble powders are ground with water, are commodiouſly ſeparated from it by the ſecond.

Vegetables and their parts are uſually exſiccated by the natural warmth of the air: the aſſiſtance of a gentle artificial heat may, nevertheleſs, in general, be not only ſafely but advantageouſly had recourſe to. By a moderate fire, even the more tender flowers may be dried, in a little time, without any conſiderable loſs either of their odour or lively colour; which would both be greatly injured or deſtroyed by a more ſlow exſiccation in the air. Some plants, indeed, particularly thoſe of the acrid kind, as horſe-radiſh, ſcurvy-graſs, and arum, loſe their virtues by this proceſs, however carefully performed; but far the greater number retain them unimpaired, and often improved.

The thicker vegetable juices may be exſiccated by the heat of the ſun; or, where this is not ſufficient, by that of a water-bath, or an oven moderately warm. The thinner juices may be gently boiled till they begin to thicken, and then treated as the foregoing. The proceſs termed *inſpiſſation* or *evaporation* has been ſpoken of already. The juices of ſome plants, as arum root, briony root, orris root, wild cucumbers, &c. ſeparate, upon ſtanding for ſome time, into a thick part, which falls to the bottom; and a thin aqueous one, which ſwims above it; this laſt is to be poured off, and the firſt exſiccated by a gentle warmth. Preparations of this kind have been uſually called *fæculæ*; that of the cucumber, to be ſpoken of in its place, is the only one which practice now retains.

Indiſſoluble bodies, mixed with water into a thick conſiſtence, may be eaſily freed from the greateſt part of it, by dropping them on a *chalkſtone*, or ſome powdered chalk preſſed into a ſmooth maſs, which readily imbibes their humidity. Where the quantity of fluid is large, as in the edulcoration of precipitates, it may be ſeparated by decantation or filtration.

We before obſerved, that one of the principal circumſtances favouring fermentation was a certain degree of moiſture. Exſiccation is therefore employed to diſſipate humidity, and render vegetables thereby leſs liable to thoſe changes produced by a kind of inſenſible fermentation.

SECT. XI. COMMINUTION.

COMMINUTION is the bare reduction of ſolid coherent bodies into ſmall particles or powder. The methods of effecting this are various, according to the texture of the ſubject.

Dry friable bodies, or ſuch as are brittle and not very hard, and mixtures of theſe with ſomewhat moiſt ones, are eaſily pulveriſed in a mortar.

For very light dry ſubſtances, reſins, and the roots of tenacious texture, the mortar may in ſome caſes be previouſly rubbed with a little ſweet oil, or a few drops of oil be occaſionally added: this prevents the finer powder of the firſt from flying off, and the others from cohering under the peſtle.—Camphor is commodiouſly powdered by rubbing it with a little rectified ſpirit of wine.

Tough ſubſtances, as woods, the peels of oranges and lemons, &c. are moſt conveniently raſped; and ſoft oily bodies, as nutmegs, paſſed through a grater.

The comminution of the harder minerals, as calamine, cryſtal, flint, &c. is greatly facilitated by extinction: that is, by heating them red-hot, and quenching them in water: by repeating this proceſs a few times, moſt of the hard ſtones become eaſily pulveriſable. This proceſs, however, is not to be applied to any of the alkaline or calcareous ſtones; leſt, inſtead of an inſipid powder, we produce an acrimonious calx or lime.

Some metals, as tin, though ſtrongly cohering in their natu-

ral ſtate, prove extremely brittle when heated, inſomuch as to be eaſily divided into ſmall particles by dexterous agitation. Hence the officinal method of pulveriſing tin, by melting it, and, at the inſtant of its beginning to return into a ſtate of ſolidity, briſkly ſhaking it in a wooden box. The comminution of metals in this manner is termed by the metallurgiſts *granulation*.

On a ſimilar principle, certain ſalts, as nitre, may be reduced into powder in large quantity, by diſſolving them in boiling water, ſetting the ſolution over a moderate fire, and keeping the ſalt conſtantly ſtirring during its exſiccation, ſo as to prevent its particles, disjoined by the fluid, from reuniting together into larger maſſes.

Powders are reduced to a great degree of fineneſs by triturating or rubbing them for a length of time in a mortar. Such as are not diſſoluble in water, or injured by the admixture of that fluid, are moiſtened with it into the conſiſtence of a paſte, and levigated or ground in a flat ſmooth marble or iron plate; or, where a large quantity is to be prepared at a time, in mills made for that uſe.

Comminution, though one of the moſt ſimple operations of pharmacy, has in many caſes very conſiderable effect. The reſinous purgatives, when finely triturated, are more eaſily ſoluble in the animal fluids, and conſequently prove more cathartic, and leſs irritating, than in their groſſer ſtate. Crude antimony, which, when reduced to a tolerably fine powder, diſcovers little medicinal virtue, if levigated to a great degree of ſubtility, proves a powerful medicine in many chronical diſorders.

By comminution, the heavieſt bodies may be made to float in the lighteſt fluids *, for a longer or ſhorter time, according to their greater or leſs degree of tenuity. Hence we are furniſhed with an excellent criterion of the fineneſs of certain powders, and a method of ſeparating the more ſubtile parts from the groſſer, diſtinguiſhed by the name of *elutrition*, or *waſhing over*.

Sect. XII. Fusion.

Fusion is the reduction of ſolid bodies into a ſtate of fluidity by fire. Almoſt all natural ſubſtances, the pure earths and the ſolid parts of animals and vegetables excepted, melt in proper degrees of fire; ſome in a very gentle heat, while others require its utmoſt violence.

Turpentine, and other ſoft reſinous ſubſtances, liquefy in a gentle warmth: wax, pitch, ſulphur, and the mineral bitumens, require a heat too great for the hand to ſupport: fixed alkaline ſalt, common ſalt, nitre, require a red or almoſt white heat to melt them; and glaſs, a full white heat.

Among metallic ſubſtances, tin, biſmuth, and lead, flow long before ignition: antimony likewiſe melts before it is viſibly red-hot, but not before the veſſel is conſiderably ſo: the regulus of antimony demands a much ſtronger fire. Zinc begins to melt in a red heat; gold and ſilver require a low white heat; copper a bright white heat; and iron an extreme white heat.

One body, rendered fluid by heat, becomes ſometimes a menſtruum for another not fuſible of itſelf in the ſame degree of fire. Thus, red hot ſilver melts on being thrown into melted lead leſs hot than itſelf: and thus, if ſteel, heated to whiteneſs, be taken out of the furnace, and applied to a roll of ſulphur, the ſulphur inſtantly liquefying occaſions the ſteel to melt with it; hence the *chalybs cum ſulphure* of the ſhops. This concrete, nevertheleſs, remarkably impedes the fuſion of ſome other metals, as lead; which when united with a certain quantity of ſulphur is ſcarce to be perfectly melted by a very ſtrong fire. Hence the method, deſcribed in its place, of purifying zinc; a metal upon which ſulphur has no effect from the lead ſo frequently mixed with it.

Sulphur is the only unmetallic ſubſtance which mingles in fuſion with metals. Earthy, ſtony, and other like matters, even the calces and glaſſes prepared from metals themſelves, float diſtinct upon the ſurface, and form what is called *ſcoria* or droſs. Where the quantity of this is large in proportion to the metal, it is moſt commodiouſly ſeparated by pouring the whole into a conical mould: the pure metal or *regulus*, though ſmall in quantity, occupies a conſiderable height in the lower narrow part of the cone; and, when congealed, may be eaſily freed from the ſcoriæ by a hammer. The mould ſhould be previouſly greaſed, or rather ſmoked, to make the metal come freely out; and thoroughly dried and heated, to prevent the exploſion which ſometimes happens from the ſudden contact of melted metals with moiſt bodies.

Sect. XIII. Calcination.

By calcination is underſtood the reduction of ſolid bodies, by the means of fire, from a coherent to a powdery ſtate, accompanied with a change of their quality; in which laſt reſpect this proceſs differs from comminution.

To this head belong the burning of vegetable and animal matters, otherwiſe called *uſtion*, *incineration*, or *concremation*; and the change of metals into a powder, which in the fire either does not melt or vitrifies, that is, runs into glaſs.

The metals which melt before ignition are calcined by keeping them in fuſion for ſome time. The free admiſſion of air is eſſentially neceſſary to the ſucceſs of this operation; and hence, when the ſurface of the metal appears covered with calx, this muſt be taken off or raked to one ſide, otherwiſe the remainder excluded from the air will not undergo the change intended. If any coal, or other inflammable matter which does not contain a mineral acid, be ſuffered to fall into the veſſel, the effect expected from this operation will not be produced, and part of what is already calcined will be revived or reduced; that is, it will return into its metallic form again.

Thoſe metals which require a ſtrong fire for fuſion, calcine with a much leſs heat than is ſufficient to make them flow. Hence the burning or ſcorification of ſuch iron or copper veſſels as are long expoſed to a conſiderable fire without defence from the air. Gold and ſilver are not calcinable by any degree of fire.

In calcination, the metals viſibly emit fumes; nevertheleſs the weight of the calx proves greater than that of the metal employed. The antimonial regulus gains about one eleventh part of its weight; zinc ſometimes one tenth; tin above one ſixth; and lead in its converſion into minium often one fourth.

The calcination of metallic bodies, gold, ſilver, and mercury excepted, is greatly promoted by nitre. This ſalt, expoſed to the fire in conjunction with any inflammable ſubſtances, extricates their inflammable matter, and burſts with it into flame,

* Some attribute this effect to a diminution of the ſpecific gravity of the body; and, at the ſame time, ſuppoſe the peculiar virtues of certain medicines, particularly mercury, to be in great meaſure owing to their gravity. If theſe hypotheſes were juſt, it ſhould follow, that the mercurial preparations, by being finely comminuted, would loſe proportionably of their efficacy; and ſo indeed mercurius dulcis, for inſtance, has been ſuppoſed to do. But experience ſhows, that this is far from being the caſe; and that comminution by no means leſſens but rather increaſes its power: when reduced to a great degree of ſubtility, it paſſes readily into the habit, and operates, according to its quantity, as an alterative or a ſialogogue; while, in a groſſer form, it is apt to irritate the ſtomach and bowels, and run off by the inteſtines, without being conveyed into the blood.

accompanied with a hiſſing noiſe. This proceſs is uſually termed *deflagration* or *detonation*.

All the metallic calces and ſcoriæ are revived into their metallic ſtate by fuſion with any vegetable or animal inflammable matter. They are all more difficult of fuſion than the reſpective metals themſelves; and ſcarcely any of them, thoſe of lead and biſmuth excepted, can be made to melt at all, without ſome addition, in the ſtrongeſt fire that can be produced in the common furnaces. The additions called *fluxes*, employed for promoting the fuſion, conſiſt chiefly of fixed alkaline ſalts. A mixture of alkaline ſalt with inflammable matter, as powdered charcoal, is called a *reducing flux*, as contributing at the ſame time to bring the calx into fuſion, and to revive it into metal. Such a mixture is commonly prepared from one part of nitre and two parts of tartar, by grinding them well together, ſetting the powders on fire with a bit of coal or a red hot iron, then covering the veſſel, and ſuffering them to deflagrate or burn till they are changed into a black alkaline coaly maſs. This is the common reducing flux of the chemiſts, and is called from its colour the *black flux*. Metallic calces or ſcoriæ, mingled with twice their weight of this compound, and expoſed to a proper fire in a cloſe covered crucible, melt, and reſume their metallic form; but though they received an increaſe of weight in the calcination, the revived metal is always found to weigh conſiderably leſs than the quantity from which the calx was made.

For a more particular account of all theſe proceſſes, and an explanation of the principles on which they depend, ſee CHEMISTRY *paſſim*, and the articles themſelves as they occur in the order of the alphabet.

PART II. PREPARATIONS AND COMPOSITIONS.

In ſpeaking of theſe, we ſhall occaſionally cite Inſtances illuſtrative of the Subject, from the Pharmacopœias of LONDON and EDINBURGH; though it can hardly be thought neceſſary in a Treatiſe on Pharmacy to tranſcribe every Recipe contained in them.

CHAP. I. *The more Simple Preparations.*

The preparation of ſome ſubſtances not ſoluble in water. L.

POUND theſe ſubſtances firſt in a mortar; then, pouring on a little water, levigate them on a hard and poliſhed, but not calcareous, ſtone, that they may be made as fine as poſſible. Dry this powder on blotting-paper laid on chalk, and ſet it in a warm, or at leaſt a dry, place, for ſome days.

In this manner are to be prepared, amber, antimony, calamine, chalk, coral, oyſter-ſhells, firſt cleanſed from their impurities, tutty.

Crabs claws, firſt broken into ſmall pieces, muſt be waſhed with boiling water before they be levigated.

Verdegriſe muſt be prepared in the ſame manner.

Where large quantities of the foregoing powders are to be prepared, it is cuſtomary, inſtead of the ſtone and mullet, to employ hand mills made for this purpoſe, conſiſting of two ſtones; the uppermoſt of which turns horizontally on the lower, and has an aperture in the middle, for ſupplying freſh matter, or for returning that which has already paſſed, till it be reduced to a proper degree of fineneſs.

For the levigation of hard bodies, particular care ſhould be taken, whatever kind of inſtruments be uſed, that they may be of ſufficient hardneſs, otherwiſe they will be abraded by the powders. The hematites, a hard iron ore, is moſt conveniently levigated between two iron planes; for, if the common levigating ſtones be uſed, the preparation, when finiſhed, will contain almoſt as much foreign matter from the inſtrument as the hematites.

It has been cuſtomary to moiſten ſeveral powders in levigation, with roſe, balm, and other diſtilled waters: theſe, nevertheleſs, have no advantage above common water, ſince in the ſubſequent exſiccation they muſt neceſſarily exhale, leaving the medicine poſſeſſed of no other virtue than what might be equally expected from it when it is prepared with the cheaper element.

Some few ſubſtances, indeed, are more advantageouſly levigated with ſpirit of wine than with water. Thus, bezoar has the green colour uſually expected in this coſtly preparation conſiderably improved thereby. A little ſpirit may be added to the other animal ſubſtances, if the weather be very hot, and large quantities of them are prepared at once, to prevent their running into putrefaction; an accident which in thoſe circumſtances ſometimes happens when they are levigated with water only. Crabs-eyes, which abound with animal gelatinous matter, are particularly liable to this inconvenience.

The caution given above for reducing antimony, calamine, and tutty, to the greateſt ſubtility poſſible, demands particular attention. The tenderneſs of the parts to which the two laſt are uſually applied, requires them to be perfectly free from any admixture of groſs irritating particles. The firſt, when not thoroughly comminuted, might not only, by its ſharp needle-like ſpicula, wound the ſtomach, but likewiſe anſwers little valuable purpoſe as a medicine, proving either an uſeleſs load upon the viſcera, or at beſt paſſing off without any other ſenſible effect than an increaſe of the groſſer evacuations; while, if reduced to a great degree of fineneſs, it turns out a medicine of conſiderable efficacy.

The moſt ſucceſsful method of obtaining theſe powders of the requiſite tenuity, is, to waſh off the finer parts by means of water, and continue levigating the remainder till the whole become fine enough to remain for ſome time ſuſpended in the fluid; this proceſs is received in the Edinburgh pharmacopœia, and there directed in the preparation of the following article.

Prepared antimony. E.

Let the antimony be firſt pounded in an iron mortar, and then levigated on a porphyry with a little water. After this, put it into a large veſſel, and pour a quantity of water on it. Let the veſſel be repeatedly ſhaken, that the finer part of the powder may be diffuſed through the water; the liquor is then to be poured off, and ſet by till the powder ſettles. The groſs part, which the water would not take up, is to be further levigated, and treated in the ſame manner.

By this method, which is that commonly practiſed in the preparation of colours for the painter, powders may be obtained of any required degree of tenuity; and without the leaſt mixture of the groſs parts, which are always found to remain in them after long continued levigation; all the coarſer matter ſettles at firſt, and the finer powder continues ſuſpended in the water longer and longer, in proportion to the degree of its fineneſs. The ſame proceſs may likewiſe be advantageouſly applied to other hard pulveriſable bodies of the mineral kingdom, or artificial preparations of them; provided they be not

ſoluble in, or ſpecifically lighter than, water. The animal and abſorbent powders, crabs-claws, crabs-eyes, oyſter-ſhells, egg-ſhells, chalk, pearl, coral, and bezoar, are not well adapted to this treatment; nor indeed do they require it. Theſe ſubſtances are readily ſoluble in acid juices without much comminution: if no acid be contained in the firſt paſſages, they are apt to concrete, with the mucous matter uſually lodged there, into hard indiſſoluble maſſes; the greater degree of fineneſs they are reduced to, the more they are diſpoſed to form ſuch concretions, and become liable to obſtruct the orifices of the ſmall veſſels.

Prepared calamine. E.

Calamine previouſly calcined for the uſe of thoſe who make braſs, is to be treated in the ſame manner as antimony.

Prepared chalk.

Chalk firſt triturated, and then frequently waſhed with water, till it imparts to it neither taſte nor colour, is to be treated in the ſame manner as antimony.

As calamine is intended for external application, and often to parts very eaſily irritated, too much pains cannot be beſtowed in reducing it to a fine powder; and the frequent waſhing of the chalk may have the effect of freeing it from ſome foreign matters: But with regard to this ſubſtance, the after part of the proceſs, if not improper, is, in our opinion at leaſt, unneceſſary: and this obſervation may alſo be made with reſpect to the oculi, or more properly lapilli cancrorum, which the Edinburgh college direct to be treated in the ſame manner.

The purification of gum ammoniacum. L.

If gum ammoniac do not ſeem to be pure, boil it in water till it become ſoft; then ſqueeze it through a canvas bag, by means of a preſs. Let it remain at reſt till the reſinous part ſubſide; then evaporate the water; and toward the end of the evaporation reſtore the reſinous part, mixing it with the gummy.

In the ſame manner are purified aſſafœtida and ſuch-like gum-reſins.

You may alſo purify any gum which melts eaſily, ſuch as galbanum, by putting it in an ox-bladder, and holding it in boiling water till it be ſo ſoft that it can be ſeparated from its impurities by preſſing through a coarſe linen cloth.

In ſtraining all the gums, care ſhould be taken that the heat be neither great nor long continued; otherwiſe a conſiderable portion of the more active volatile matter will be loſt; an inconvenience which cannot by any care be wholly avoided. Hence the purer tears, unſtrained, are in general to be preferred, for internal uſe, to the ſtrained gums.

As an additional reaſon for this preference, we may add, that ſome of the gum-reſins, purified in the common way, by ſolution in water, expreſſion and evaporation, are not ſo eaſily ſoluble in aqueous menſtrua after as before ſuch depuration. On theſe accounts this proceſs is entirely omitted by the Edinburgh college; and in every caſe where a gummy-reſinous ſubſtance, before it be taken, is to be diſſolved in water, it may be as effectually freed from impurities at the time of ſolution as by this proceſs. And when it is to be employed in a ſolid ſtate, great care ſhould be taken that the purer parts alone be ſelected.

The burning of hartſhorn. L.

Burn pieces of hartſhorn till they become perfectly white; then reduce them to a very fine powder.

The pieces of horn generally employed in this operation are thoſe left after diſtillation.

In the burning of hartſhorn, a ſtrong fire and the free admiſſion of air are neceſſary. The potter's furnace was formerly directed for the ſake of convenience; but any common furnace or ſtove will do. If ſome lighted charcoal be ſpread on the bottom of the grate, and above this the pieces of the horns are laid, they will be burnt to whiteneſs, ſtill retaining their original form.

Burnt hartſhorn is not now conſidered as a pure earth, having been found to be a compound of calcareous earth and phoſphoric acid. It is the weakeſt of the animal abſorbents, and is difficultly ſoluble in acids; but whether it be of equal or ſuperior uſe in diarrhœas to more powerful abſorbents, muſt be left to obſervation.

The drying of herbs and flowers.

Let theſe, ſpread out lightly, be dried by a gentle heat. *L.*

Herbs and flowers muſt be dried by a gentle heat, from a ſtove or common fire. They muſt be taken in ſuch quantities at a time, that the proceſs will be ſpeedily finiſhed; for by this means their medical powers are beſt preſerved. The moſt certain teſt of this is the perfect preſervation of the natural colour: but the leaves of cicuta, and of other plants containing a volatile matter, muſt be immediately pounded, after being dried, and afterwards kept in a phial with a ground ſtopper. *E.*

The directions given by the London college are here leſs explicit, and perhaps leſs proper, than thoſe of the Edinburgh college: for there can be no doubt of the propriety of drying theſe ſubſtances haſtily, by the aid of artificial heat, rather than by the heat of the ſun. In the application of artificial heat, the only caution requiſite is to avoid burning; and of this a ſufficient teſt is afforded by the preſervation of colour. And the direction given with regard to cicuta may perhaps with advantage be followed with moſt of the other flowers and herbs, afterwards to be exhibited in powder.

The extraction of pulps. L. E.

Unripe pulpy fruits, and ripe ones if they be dry, are to be boiled in a ſmall quantity of water until they become ſoft: then preſs out the pulp through a ſtrong hair ſieve, and afterwards boil it down to the conſiſtence of honey in an earthen veſſel, over a gentle fire; taking care to keep the matter continually ſtirring, to prevent its burning.

The pulp of caſſia fiſtularis is in like manner to be boiled out from the bruiſed pod, and reduced afterwards to a proper conſiſtence by evaporating the water.

The pulps of fruits that are both ripe and freſh, are to be preſſed out through the ſieve, without any previous boiling.

In the extraction of pulps, the directions of both colleges ſo nearly agree, that it is unneceſſary to give a ſeparate tranſlation of each. We may only obſerve, that the London college, inſtead of ſoftening the fruits by boiling them in a ſmall quantity of water, direct them to be put in a moiſt place. This direction, though proper in ſome caſes, is not generally found to be the moſt ſuitable.

The drying of ſquills. L. E.

Let the ſquill, cleared from its outer ſkin, be cut tranſverſely into thin ſlices, and dried with a very gentle heat. When properly managed, the ſquill is friable, and retains its bitterneſs and acrimony.

By this method the ſquill dries much ſooner than when its ſeveral coats are only ſeparated, as has been uſually directed; the internal part is here laid bare, but, in each of the entire coats, it is covered with a thin ſkin, which impedes the exhalation of the moiſture. The root loſes in this proceſs four fifths of its original weight; the parts which exhale appear to be merely watery; ſix grains of the dry root being equivalent to

half a dram of the freſh; a circumſtance to be particularly regarded in the exhibition of this medicine. In the preceding editions of our pharmacopœias, a particular caution was given, not to uſe an iron knife for cutting ſquills, but one of wood, ivory, or bone: the reaſon of this caution is ſaid to be, not ſo much that the ſquill would receive any ill qualities from the iron, as, that its acrid juice, adhering to the knife, might render a wound received by it extremely painful, or even dangerous: but as no danger is to be apprehended from ſuch an accident, the direction appears unneceſſary. Dried ſquills furniſh us with a medicine, ſometimes advantageouſly employed as an emetic, often as an expectorant, but ſtill more frequently as a powerful diuretic.

The burning of ſponge.

Beat the ſponge, after cutting it in pieces; and, when ſeparated from its gritty matter, burn it in a cloſe iron veſſel, until it becomes black and friable; afterwards rub it to a very fine powder. *L.*

Put the ſponge, cut into ſmall pieces, and well freed from adhering earthy matters, into a cloſe earthen veſſel. Place it on the fire, and let it be ſtirred frequently till it become black and friable; then reduce it to a powder in a glaſs or marble mortar. *E.*

This medicine has been in uſe for a conſiderable time, and employed againſt ſcrofulous diſorders and cutaneous foulneſſes, in doſes of a ſcruple and upwards. Its virtues ſeem to depend on a volatile ſalt juſt formed, and combined with its own oil. If the ſponge be diſtilled with a ſtrong heat, it yields a large proportion of that ſalt in its proper form. The ſalt is in this preparation ſo far extricated, that if the burnt ſponge be ground in a braſs mortar, it corrodes the metal ſo as to contract a diſagreeable taint, and ſometimes an emetic quality.

Bees, earthworms, and other animal ſubſtances, have by ſome been prepared in the ſame manner, and recommended in different diſeaſes: but as theſe ſubſtances fall much ſhort of ſponge in the quantity of volatile ſalt producible from them by fire, they are probably inferior alſo in medicinal efficacy. Of all the animal matters that have been tried, raw ſilk is the only one which exceeds or equals ſponge in the produce of ſalt.

A good deal of addreſs is requiſite for managing this proceſs in perfection. The ſponge ſhould be cut ſmall, and beaten for ſome time in a mortar, that all the ſtony matters may be got out, which, compared with the weight of the ſponge when prepared, will ſometimes amount to a conſiderable quantity. The burning ſhould be diſcontinued as ſoon as the matter is become thoroughly black. If the quantity put into the veſſel at once be large, the outſide will be ſufficiently burnt before the inſide be affected; and the volatile ſalt of the former will in part eſcape, before that in the latter is begun to be formed. The beſt method of avoiding this inconvenience ſeems to be, to keep the ſponge continually ſtirring, in ſuch a machine as is uſed for the roaſting of coffee.

And from this circumſtance the iron veſſel directed by the London college is preferable to the earthen one directed by that of Edinburgh. But the pounding in a glaſs or marble mortar, directed by the latter, is a neceſſary caution which the former college have omitted.

The purification of ſtorax. L.

Diſſolve the ſtorax in rectified ſpirit of wine, and ſtrain the ſolution: afterwards reduce it to a proper thickneſs with a gentle heat.

Storax was formerly directed to be purified by means of water: hence it was ſtyled *ſtoracis collatio*: but the method now adopted is much preferable, for the active parts of the ſtorax totally diſſolve in ſpirit of wine, the impurities alone being left. And as theſe active parts do not riſe in diſtillation, the ſpirit may be again recovered by diſtillation.

Purified filings of iron. E.

Apply a magnet to a ſieve placed on filings of iron, ſo that the filings may be attracted upwards through the ſieve.

Ruſt of iron, commonly called *ſhavings of iron, prepared.* E.

Set purified filings of iron in a moiſt place, that they may turn to ruſt, which is to be ground into an impalpable powder.

The cleanſing of iron filings by means of a magnet is very tedious, and does not anſwer ſo well as might be expected; for, if they are ruſty, they will not be attracted by it, or not ſufficiently: nor will they by this means be entirely freed from braſs, copper, or other metallic ſubſtances which may adhere to them. It appears from the experiments of Henckel, that if iron be mixed by fuſion with even its own weight of any of the other metals, regulus of antimony alone excepted, the compound will be vigorouſly attracted by the loadſtone. The ruſt of iron, however, is beſt procured for medical purpoſes by precipitating a ſolution of *vitriolated iron* with an alkali.

The ruſt of iron is by ſome preferred as a medicine to the calces or croci made by a ſtrong fire. Hoffman relates, that he has frequently given it with remarkable ſucceſs in obſtinate chlorotic caſes accompanied with exceſſive headachs and other violent ſymptoms; and that he uſually joined with it pimpinella, arum root, and ſalt of tartar, with a little cinnamon and ſugar. The doſe is from four or five grains to twenty or thirty: ſome have gone as far as a dram: but all the preparations of this metal anſwer beſt in ſmall doſes, which ſhould rather be often repeated than enlarged.

Scales of iron purified. E.

Let the ſcales of iron, which may be had at the anvils of the workmen, be purified by the magnet; for the magnet only attracts the ſmaller and purer parts, leaving the more thick and impure behind.

This is perhaps of all the forms the moſt eligible for obtaining the pure matter in ſuch a divided ſtate as to render it eaſily acted on by different menſtrua; and the mode of purification here propoſed is not only very effectual, but alſo very eaſily put into practice.

The extraction of mucilage. Gen.

Boil the gums or mucilaginous ſeeds in a ſufficient quantity of water till it becomes viſcid, nearly reſembling the white of an egg; and then ſtrain it by preſſure through a linen cloth.

By this means vegetable mucilage may be eaſily obtained from many different ſubſtances in its pure ſtate. And although this proceſs is not directed in our pharmacopœias, yet we think that it might with advantage be adopted.

Chap. II. *Of* Conserves.

Conserves are compoſitions of recent vegetable matters and ſugar, beaten together into an uniform maſs.

This management is introduced for preſerving certain ſimples, undried, in an agreeable form, with as little alteration as poſſible in their native virtues; and to ſome ſubjects it is very advantageouſly applied. Vegetables, whoſe virtues are loſt or deſtroyed by drying, may in this form be kept uninjured for a length of time: for, by carefully ſecuring the mouth of the containing veſſel, the alteration, as well as diſſipation, of their active principles is generally prevented; and the ſugar preſerves them from the corruption which juicy vegetables would otherwiſe undergo. There are, however, ſundry vegetables whoſe virtues are impaired by this treatment. Mucilaginous ſubſtances, by long lying with ſugar, become leſs glutinous; and aſtringents

become ſenſibly ſofter on the palate. Many of the fragrant flowers are of ſo tender and delicate a texture, as almoſt entirely to loſe their peculiar qualities on being beaten or bruiſed.

In general, it is obvious, that in this form, on account of the large admixture of ſugar, ſubſtances of conſiderable activity can alone be taken to advantage as medicines. And, indeed, conſerves are at preſent conſidered chiefly as auxiliaries to medicines of greater efficacy, or as intermedia for joining them together. They are very convenient for reducing into boluſes or pills the more ponderous powders, as mercurius dulcis, the calces of iron, and other mineral preparations; which, with liquid or leſs conſiſtent matters, as ſyrups, will not cohere.

The ſhops were formerly encumbered with many conſerves altogether inſignificant; the few now retained have in general either an agreeable flavour to recommend them, or are capable of anſwering ſome uſeful purpoſes as medicines. Their common doſe is the bulk of a nutmeg, or as much as can be taken up at once or twice upon the point of a knife. There is in general no great danger of exceeding in this particular.

Conſerves of wood ſorrel;
ſea wormwood;
the red roſe;
the outer rind of the Seville orange. L.

Pluck the leaves from the ſtalks, the unblown petals from the cups, taking off the heels. Take off the outer rind of the oranges by a grater; then beat each of them with a wooden peſtle in a marble mortar, firſt by themſelves, afterwards with three times their weight of double refined ſugar, until they be mixed.

Conſerves of the freſh leaves of mint;
red roſes not blown;
the outer rind of Seville oranges raſped off by a grater. E.

Theſe are directed to be prepared with triple their weight of ſugar in the ſame manner as the conſerves of the London college. The ſugar ſhould be pounded by itſelf, and paſſed through a ſieve before it be mixed with the vegetable maſs; for without this it cannot be properly incorporated. Roſe buds, and ſome other vegetables, are prepared for mixing with ſugar by a ſmall wooden mill contrived for that purpoſe.

In the ſame manner conſerves may be prepared from many other vegetables. But beſides the conſerves for which general directions are given, there are others, for which, either on account of the particular mode of preparation, or of the proportion, our pharmacopœias have thought it neceſſary to give particular directions.

Chap. III. *Of* Juices.

Juices are obtained from the ſucculent parts of plants, by including them, after being properly cut, bruiſed, &c. in a hair bag, and preſſing them, between wooden cheeks, in the common ſcrew-preſs, as long as any liquor exudes.

The harder fruits require to be previouſly well beaten or ground: but herbs are to be only moderately bruiſed; for, if theſe are over bruiſed, a large quantity of the herbaceous matter will be forced out along with the juice. Hempen or woollen bags are apt to communicate a diſagreeable flavour; the threads of theſe likewiſe ſwell in proportion as they imbibe moiſture, ſo as in great meaſure to prevent the free percolation of the juice.

The fluids thus extracted from ſucculent fruits, both of the acid and ſweet kind, from moſt of the acrid herbs, as ſcurvy-graſs and water-creſſes, from the acid herbs, as ſorrel and wood-ſorrel, from the aperient lacteſcent plants, as dandelion and hawkweed, and from ſundry other vegetables, contain great part of the peculiar taſte and virtues of the reſpective ſubjects. The juices, on the other hand, extracted from moſt of the aromatic herbs, as thoſe of mint and the fragrant Turkey balm, commonly called *balm of Gilead*, have ſcarcely any thing of the flavour of the plants, and ſeem to differ little from decoctions of them made in water boiled till the volatile odorous parts have been diſſipated. Many of the odoriferous flowers, as the lily, violet, hyacinth, not only impart nothing of their fragrance to their juice, but have it totally deſtroyed by the previous bruiſing. From want of ſufficient attention to theſe particulars, practitioners have been frequently deceived in the effects of preparations of this claſs: juice of mint has been often preſcribed as a ſtomachic, though it wants thoſe qualities by which mint itſelf and its other preparations operate.

The juices, thus forcibly preſſed out from plants, differ from thoſe which flow ſpontaneouſly, or from inciſions; theſe laſt conſiſting chiefly of ſuch fluids as are not diffuſed through the whole ſubſtance of the vegetable ſubject, but elaborated in diſtinct veſſels, or ſecreted into particular receptacles. From poppy heads, ſlightly wounded, there iſſues a thick milky liquor, which dries by a moderate warmth into opium; whilſt the juice obtained from them by preſſure is of a dark green colour, and far weaker virtue.

Juices newly expreſſed are generally thick, viſcid, and very impure: by colature, a quantity of groſs matter is ſeparated, the juice becomes thinner, limpid, and better fitted for medicinal purpoſes, though as yet not entirely pure: on ſtanding, it becomes again turbid, and apt to run into a fermentative or putrefactive ſtate. Clarification with whites of eggs renders the juices more perfectly fine; but there are few that will bear this treatment without a manifeſt injury to their flavour, taſte, and virtue.

The moſt effectual method of purifying and preſerving theſe liquors, is to let the ſtrained juices ſtand in a cool place till they have depoſited their groſſer fæces, and then gently paſs them ſeveral times through a fine ſtrainer till perfectly clear; when about a fortieth part of their weight of good ſpirit of wine may be added, and the whole ſuffered to ſtand as before: a freſh ſediment will now be depoſited, from which the liquor is to be poured off, ſtrained again, and put into ſmall bottles which have been waſhed with ſpirit and dried. A little oil is to be poured on the ſurface, ſo as very nearly to fill the bottles, and the mouths cloſed with leather, paper, or ſtopped with ſtraw, as the flaſks in which Florence wine is brought to us: this ſerves to keep out duſt, and ſuffers the air, which in proceſs of time ariſes from all vegetable liquors, to eſcape; which air would otherwiſe endanger the burſting of the bottles; or, being imbibed afreſh, render their contents vapid and foul. The bottles are to be kept on the bottom of a good cellar or vault, placed up to the necks in ſand. By this method ſome juices may be preſerved for a year or two; and others for a much longer time.

It has already been obſerved, that there are great differences in juices, in regard to their being accompanied in the expreſſion with the virtues of the ſubjects. There are equal differences in regard to their preſerving thoſe virtues, and this independently of the volatility of the active matter, or its diſpoſition to exhale. Even the volatile virtue of ſcurvy-graſs may by the above method be preſerved almoſt entire in its juice for a conſiderable time; while the active parts of the juice of the wild cucumber quickly ſeparate and ſettle to the bottom, leaving the fluid part inert. Juices of arum root, iris root, bryony root, and ſundry other vegetables, throw off in like manner their medicinal parts to the bottom.

Inspissated Juices.

When vegetable juices, or watery or ſpirituous decoctions or

infuſions, are expoſed to a continued heat, the fluid gradually evaporating carries off with it ſuch volatile matters as it was impregnated with, and leaves the more fixed united together into one maſs. The maſs which remains from the evaporation of the expreſſed juice of a plant is called *inſpiſſated juice*; from watery decoctions or infuſions, an *extract*; from ſpirituous tinctures, a *reſin*, or *eſſential extract*. The term *extract* is frequently uſed alſo as a general appellation of all the three kinds. Inſpiſſated juices and watery decoctions, particularly the former, when evaporated no further than to the conſiſtence of oil or honey, are called *robs*; and ſpirituous tinctures, reduced to a like conſiſtence, are called *balſams*.

What relates to the expreſſion of juices has already been delivered, with the moſt effectual means of preſerving them in their liquid ſtate, and a general account of what ſubſtances do or do not give out their virtues with their juices. In the inſpiſſation of juices, there is further to be conſidered the volatility or fixity of their medicinal parts: if a plant loſes its virtue, or part of its virtue, in being dried, it is obvious that the juice muſt loſe as much in being inſpiſſated to dryneſs, how gentle ſoever the heat be with which the inſpiſſation is performed. It is likewiſe to be obſerved, that the medicinal parts of ſome juices are kept in a ſtate of perfect ſolution by the watery fluid, ſo as to be completely retained by it after the liquor has been made fine by ſettling, ſtraining, or other means; while the medicinal parts of others, not diſſoluble by watery menſtrua, are only diffuſed through the liquor in the ſame manner as the feculencies are, and ſeparate along with theſe on ſtanding.

We ſhall here inſtance the Edinburgh mode of preparing the juice of hemlock.

Inſpiſſated juice of hemlock.

Having expreſſed the juice of the leaves and ſtalks of hemlock when flowering, in the ſame manner as directed for that of the aconitum, evaporate it to the conſiſtence of pretty thin honey; when it is cooled, add of the powder of the dried leaves of the plant as much as to make it into a maſs fit for forming pills. Care, however, is to be taken, that the evaporation proceed only to ſuch length, that as much of the powder can be mixed with the inſpiſſated juice as ſhall make up about a fifth part of the whole maſs.

A preparation ſimilar to this was publiſhed at Vienna by Dr. Stoerk, who recommends it as an efficacious reſolvent in many obſtinate diſorders, where the common remedies avail nothing. He obſerves, that ſmall doſes ſhould always be begun with, as two grains, made into a pill twice a-day; and that by gradually increaſing the doſe, it may be given to two, three, or even four drams a-day, and continued in ſuch quantities for ſeveral weeks: that it may be uſed in ſafety in infancy, old age, and pregnancy: that it neither accelerates nor diſturbs the circulation; neither heats, nor cools, nor affects the animal functions; that it increaſes the ſecretions, and renders the mouth moiſt; ſeldom purges; very rarely vomits; ſometimes augments perſpiration; often produces a copious diſcharge of viſcid urine; but in many patients does not increaſe any of the ſenſible evacuations: that it removes obſtructions and their conſequences; relieves rheumatic pains, though of long continuance; diſcuſſes ſcirrhous tumors, both internal and external; and cures dropſies and conſumptions proceeding from ſcirrhoſities: that it often diſſolves cataracts, or ſtops their progreſs, and has ſometimes removed the gutta ſerena: that inveterate cutaneous eruptions, ſcald heads, malignant ulcers, cancers, the malignant fluor albus and gonorrhœa of long ſtanding, obſtinate remains of the venereal diſeaſe, and caries of the bones, generally yield to it; that for the moſt part it is neceſſary to continue this medicine for a conſiderable time before the cure be effected, or much benefit perceived from it: that in ſome caſes it failed of giving any relief; that he met with ſome perſons who could not bear its effects; and that conſequently there muſt be ſome latent difference in the habit, the diagnoſtic ſigns of which are at preſent unknown: that though it is by no means infallible any more than other medicines, yet the great number of deplorable caſes that have been happily cured by it, is ſufficient to recommend it to further trials. The efficacy of this medicine is confirmed by many eminent practitioners abroad; though the trials hitherto made of it in this country have not been attended with much ſucceſs. Somewhat, perhaps, may depend on the time of the plant's being gathered, and the manner of the preparation of the extract. Dr. Stoerk himſelf takes notice of ſome miſtakes committed in this reſpect: ſome have left the herb in a heap for ſeveral days, whence part of it withered, part rotted, and the juice became thick and mucilaginous: others have taken a very large quantity of the juice, and boiled it down in copper veſſels with a great heat; by which means a ſtrong fetor was diffuſed to a conſiderable diſtance, and the moſt efficacious parts diſſipated: others, with officious care, have clarified the juice, and thus obtained a black tenacious extract, retaining but a ſmall degee of the ſpecific ſmell of the plant. The extract, duly prepared according to the above preſcription, is of a greeniſh brown colour, and a very diſagreeable ſmell, like that of mice. But though there be reaſon to believe that much of the extract uſed here had been ill prepared, we can by no means admit that its general inefficacy was owing to this cauſe; for, though there are not many inſtances of its diſcovering any valuable medicinal powers, there are ſeveral of its having activity enough, even in ſmall doſes, to produce alarming ſymptoms.

Modern practice, however, ſeems to hold a middle place; being neither influenced by the extravagant encomiums of Dr. Stoerk, nor frightened by the wary ſuſpicions of Dr. Lewis. The inſpiſſated juice of the hemlock is accordingly given with freedom in a great variety of complaints, without our experiencing the wonderful effects aſcribed to it by the former, or the baneful conſequences dreaded by the latter. Like other preparations of this valuable herb, it is no doubt a very uſeful addition to our pharmacopœia; nor does its uſe ſeem to be more hazardous than that of opium and ſome other narcotics.

The London college direct the inſpiſſated juice of cicuta to be prepared in the ſame manner as that of the elder-berry, and without the addition of any of the powder. This is the moſt pure extract; and the powder may eaſily be occaſionally added. They direct the cicuta to be collected as ſoon as the flowers appear: and at that time the leaves are moſt fully impregnated with their active powers.

Chap. IV. Extracts *and* Reſins.

Obſervations on Extracts with Water.

These extracts are prepared by boiling the ſubject in water, and evaporating the ſtrained decoction to a thick conſiſtence.

This proceſs affords us ſome of the more active parts of the plants, free from the uſeleſs indiſſoluble earthy matter which makes the largeſt ſhare of their bulk. There is a great difference in vegetable ſubſtances, with regard to their fitneſs for this operation; ſome yielding to it all its virtues, and others ſcarce any. Thoſe parts in which the ſweet, glutinous, emollient, cooling, bitter, auſtere, aſtringent virtues reſide, are for the moſt part totally extracted by the boiling water, and remain almoſt entire on evaporating it: whilſt thoſe which contain the peculiar odour, flavour and aromatic quality, are either not extracted at all, or exhale along with the menſtruum. Thus gentian root, which is almoſt ſimply bitter, yields an extract poſſeſſing in a ſmall volume the whole taſte and virtues of the root.—Wormwood, which has a degree of warmth and ſtrong flavour-

joined to the bitter, loſes the two firſt in the evaporation, and gives an extract not greatly different from the foregoing: the aromatic quality of cinnamon is diſſipated by this treatment, its aſtringency remaining; while an extract made from the flowers of lavender and roſemary diſcovers nothing either of the taſte, ſmell, or virtues of the flowers.

General Rules for making Extracts with Water.

1. It is indifferent, with regard to the medicine, whether the ſubject be uſed freſh or dry; ſince nothing that can be preferred in this proceſs will be loſt by drying. With regard to the facility of extraction, there is a very conſiderable difference; vegetables in general giving out their virtues more readily when moderately dried than when freſh.

2. Very compact dry ſubſtances ſhould be reduced into exceeding ſmall parts, previous to the affuſion of the menſtruum.

3. The quantity of water ought to be no greater than is neceſſary for extracting the virtues of the ſubject. A difference herein will ſometimes occaſion a variation in the quality of the product; the larger the quantity of liquor, the longer time will be requiſite for evaporating it, and conſequently the more volatile parts of the ſubject will be diſſipated. A long continued heat likewiſe makes a conſiderable alteration in the matter which is not volatile. Sweet ſubſtances, by long boiling with water, become nauſeous: and the draſtic purgatives loſe their virulence, though without any remarkable ſeparation of their parts.

4. The decoctions are to be depurated by colature; and afterwards ſuffered to ſtand for a day or two, when a conſiderable quantity of ſediment is uſually found at the bottom. If the liquor poured off clear be boiled down a little, and afterwards ſuffered to cool again, it will depoſit a freſh ſediment, from which it may be decanted before you proceed to finiſh the evaporation. The decoctions of very reſinous ſubſtances do not require this treatment, and are rather injured by it; the reſin ſubſiding along with the inactive dregs.

5. The evaporation is moſt conveniently performed in broad ſhallow veſſels; the larger the ſurface of the liquor, the ſooner will the aqueous parts exhale. This effect may likewiſe be promoted by agitation.

6. When the matter begins to grow thick, great care is neceſſary to prevent its burning. This accident, almoſt unavoidable if the quantity be large, and the fire applied as uſual under the evaporating pan, may be effectually provided againſt, by carrying on the inſpiſſation after the common manner, no farther than to the conſiſtence of a ſyrup, when the matter is to be poured into ſhallow tin or earthen pans, and placed in an oven, with its door open, moderately heated; which acting uniformly on every part of the liquid, will ſoon reduce it to any degree of conſiſtence required. This may likewiſe be more ſecurely done, by ſetting the evaporating veſſel in boiling water; but the evaporation is in this way very tedious.

Obſervations on Extracts with Rectified Spirit.

Rectified ſpirit of wine diſſolves the eſſential oils and reſins of vegetables, and does not readily carry off the oil in its exhalation; the heat ſufficient to exhale pure ſpirit being much leſs than that in which water evaporates to any conſiderable degree, or moſt eſſential oils diſtil. Hence a reſinous or ſpirituous extract of wormwood, contrary to that made with water, contains the warmth and flavour, as well as bitterneſs, of the herb; one made from cinnamon poſſeſſes its aromatic virtue, as well as its aſtringency; and one from lavender and roſemary flowers, retains great part of their flavour and virtues; the volatile parts, which are carried off by water in its evaporation, being left behind by the ſpirit.

The ſpirit employed for this purpoſe ſhould be perfectly free from any ill flavour, which would be communicated in part to the preparation; and from any admixture of phlegm or water, which would not only vary its diſſolving power, but likewiſe, evaporating towards the end of the inſpiſſation, would promote the diſſipation of the volatile parts of the ſubject. Hence, alſo, the ſubject itſelf ought always to be dry: thoſe ſubſtances which loſe their virtue by drying, loſe it equally on being ſubmitted to this treatment with the pureſt ſpirit.

The inſpiſſation ſhould be performed from the beginning, in the gentle heat of a water bath. It is not needful to ſuffer the ſpirit to evaporate in the air: greateſt part of it may be recovered by collecting the vapour in common diſtilling veſſels. If the diſtilled ſpirit be found to have brought over any flavour from the ſubject, it may be advantageouſly reſerved for the ſame purpoſes again.

It is obſervable, that though rectified ſpirit be the proper menſtruum of the pure volatile oils, and of the groſſer reſinous matter of vegetables, and water of the mucilaginous and ſaline; yet theſe principles are, in almoſt all plants, ſo intimately combined together, that whichever of theſe liquors is applied at firſt, it will take up a portion of what is directly ſoluble only in the other. Hence ſundry vegetables extremely reſinous, and whoſe virtues conſiſt chiefly in their reſin, afford nevertheleſs very uſeful extracts with water, though not equal to thoſe which may be obtained by a prudent application of ſpirit. Hence alſo the extracts made from moſt vegetables by pure ſpirit, are not mere reſins; a part of the gummy matter, if the ſubject contained any ſuch, is taken up along with the reſin; an admixture of great advantage to it in a medicinal view. The ſpirituous extracts of ſeveral vegetable ſubſtances, as mint leaves, rhubarb, ſaffron, diſſolve in water as well as in ſpirit.

Pure reſins are prepared by mixing, with ſpirituous tincture of very reſinous vegetables, a quantity of water. The reſin, incapable of remaining diſſolved in the watery liquor, ſeparates and falls to the bottom; leaving in the menſtruum ſuch other principles of the plant as the ſpirit might have extracted at firſt along with it.

Obſervations on Extracts with Spirit and Water.

There are ſundry vegetables, particularly thoſe of a reſinous nature, which are treated to better advantage with a mixture of water and ſpirit, than with either of them ſingly. The virtues of reſinous woods, barks, and roots, may indeed be in great part extracted by long boiling in freſh portions of water; but at the ſame time they ſuffer a conſiderable injury from the continued heat neceſſary for the extraction, and for the ſubſequent evaporation of ſo large a quantity of the fluid. Rectified ſpirit of wine is not liable to this inconvenience; but the extracts obtained by it from the ſubſtances here intended, being almoſt purely reſinous, are leſs adapted to general uſe than thoſe in which the reſin is divided by an admixture of the gummy matter, of which water is the direct menſtruum.

There are two ways of obtaining theſe compound or gummy-reſinous extracts: one, by uſing proof ſpirit, that is, a mixture of about equal parts of ſpirit and water, for the menſtruum; the other, by digeſting the ſubject firſt in pure ſpirit and then in water, and afterwards uniting into one maſs the parts which the two menſtrua have ſeparately extracted. In ſome caſes, where a ſufficiency of gummy matter is wanting in the ſubject, it may be artificially ſupplied, by inſpiſſating the ſpirituous tincture to the conſiſtence of a balſam, then thoroughly mixing with it a thick ſolution of any ſimple gum, as mucilage of gum-arabic, and drying the compound with a gentle heat. By this method are obtained elegant gummy-reſins, extemporaneouſly miſcible with water into milky liquors.

Obſervations on Extracts by long Digeſtion.

It has been obſerved, that the virtues of vegetable decoctions are altered by long boiling. Decoctions or infuſions of draſtic vegetables, by long continued boiling or digeſtion, loſe more and more of their virulence; and at the ſame time depoſit more and more of a groſs ſediment, reſulting probably from the decompoſition of their active parts. On this foundation it has been attempted to obtain ſafe and mild preparations from ſundry virulent drugs; and ſome of the chemiſts have ſtrongly recommended the proceſs, though without ſpecifying, or giving any intimation of, the continuance of boiling requiſite for producing the due mildneſs in different ſubjects. M. Beaumé, in his *Elèmens de Pharmacie*, lately publiſhed, has given a particular account of an extract of opium prepared on this principle; which is alleged to be very uſeful in practice.

Obſervations on particular Extracts.

Extract of chamomile, broom tops, gentian, liquorice, black hellebore, rue, ſavin. L.

Boil the article in diſtilled water, preſs out the decoction, ſtrain it, and ſet it apart that the fæces may ſubſide; then boil it again in a water-bath ſaturated with ſea-ſalt to a conſiſtence proper for making pills.

The ſame kind of bath is to be uſed in the preparation of all the extracts, that the evaporation may be properly perſormed.

Extract of gentian. E.

Take of gentian root as much as you pleaſe. Having cut and bruiſed it, pour upon it four times its quantity of water. Boil to the conſumption of one half of the liquor; and, ſtrongly expreſſing it, ſtrain. Evaporate the decoction to the conſiſtence of thick honey in veſſels expoſed to the vapour of hot water.

In preparing this and every other extract, it is neceſſary to keep up a conſtant ſtirring towards the end of the proceſs, in order to prevent an empyreuma, and that the extract may be of an uniform conſiſtence, and free of clots.

In the ſame manner are prepared, Extracts of the roots of black hellebore; leaves of the pulſatilla nigricans; leaves of rue; leaves of white poppies, and of the imperfectly ripe ſeeds of hemlock; and all theſe contain the virtues of the vegetable in a ſtate of tolerable perfection.

The extract of chamomile loſes in its formation the ſpecific flavour of the plant; but it is ſaid to furniſh a bitter remarkably antiſeptic, and to be given with advantage in different ſtomach ailments to the extent of a ſcruple or two, either by itſelf, or in conjunction with other remedies. The extract of broom tops is chiefly employed in hydropic caſes; and when taken to the quantity of about a dram, it is ſaid to operate as a powerful diuretic.

The mode of preparing theſe extracts directed by the London and Edinburgh colleges is not eſſentially different: but ſome advantage will ariſe from employing the diſtilled water directed by the former: and the directions given by the latter with regard to the quantity of water to be uſed, and the degree of boiling to be employed before expreſſion, are not without ſome uſe.

The extract is the only preparation of the pulſatilla nigricans, and it ſeems ſufficiently well ſuited to be brought into this form. The extract of the white poppy-heads is not perhaps ſuperior in any reſpect to opium; but to thoſe who may think otherwiſe, it is convenient to preſerve them in this form for preparing the ſyrup occaſionally. The ſeeds of hemlock have by ſome been thought ſtronger, or at leaſt that they produce giddineſs ſooner, than the leaves; but this extract has not hitherto come into general uſe.

As a farther ſpecimen of theſe proceſſes, we ſhall give an account of the purification of opium.

Purified opium. L.

Take of opium, cut into ſmall pieces, one pound; proof-ſpirit of wine, 12 pints. Digeſt the opium with a gentle heat, ſtirring now and then till it be diſſolved, and filter through paper. Diſtil the tincture, ſo prepared, to a proper thickneſs.

Purified opium muſt be kept in two forms; one *ſoft*, proper for forming into pills; the other *hard*, which may be reduced into powder.

Opium was formerly purified by means of water; and in this ſtate it had the name in our pharmacopœia of *extractum thebaicum*. But proof-ſpirit has been found, by experiments, to be the beſt menſtruum for opium, having diſſolved three-fourths of dried opium, which was much more than was taken up either by rectified ſpirit or water. Hence we thus obtained moſt entirely the conſtituents of opium free from any adhering impurities: but it has been imagined that ſome particular advantages ariſe from the parts which are extracted by water, eſpecially after long digeſtion; and accordingly the following extract of opium has been recommended by Mr. Beaumé.

Extract of opium prepared by long digeſtion.

Let five pounds of good opium, cut in pieces, be boiled about half an hour, in 12 or 15 quarts of water: ſtrain the decoction, and boil the remainder once or twice in freſh water, that ſo much of the opium as is diſſoluble in water may be got out. Evaporate the ſtrained decoctions to about ſix quarts; which being put into a tin cucurbit, placed in a ſand-bath, keep up ſuch a fire as may make the liquor nearly boil, for three months together if the fire is continued day and night, and for ſix months if it is intermitted in the night; filling up the veſſel with water in proportion to the evaporation, and ſcraping the bottom with a wooden ſpatula from time to time, to get off the ſediment which begins to precipitate after ſome days digeſtion. The ſediment needs not to be taken out till the boiling is finiſhed; at which time the liquor is to be ſtrained when cold, and evaporated to an extract of a due conſiſtence for being formed into pills.

The author obſerves, that by keeping the liquor ſtrongly boiling, the tedious proceſs may be conſiderably expedited, and the ſix months digeſtion reduced to four months; that in the beginning of the digeſtion, a thick, viſcous, oily matter riſes to the top and forms a tenacious ſkin as the liquor cools; this is ſuppoſed to be analogous to eſſential oils, though wanting their volatility: that the oil begins to diſappear about the end of the firſt month, but ſtill continues ſenſible till the end of the third, forming oily clouds as often as the liquid cools: that the reſin at the ſame time ſettles to the bottom in cooling, preſerving for a long while its reſinous form, but by degrees becoming powdery, and incapable of being any longer ſoftened, or made to cohere by the heat: that when the proceſs is finiſhed, part of it ſtill continues a perfect reſin, diſſoluble in ſpirit of wine, and part an indiſſoluble powder: that when the digeſted liquor is evaporated to about a quart, and ſet in the cold till next day, it yields a browniſh earthy ſaline matter, called the *eſſential ſalt of opium*, in figure nearly like the ſedative ſalt obtained from borax, intermingled with ſmall needled cryſtals. He gives an account of his having made this preparation ſix or ſeven times. The veſſel he made uſe of was about two inches and a half diameter in the mouth: the quantity of water evaporated was about 24 ounces a-day, and from 130 to 140 quarts during the whole digeſtion. Out of 64 ounces of opium, 17 ounces remained undiſſolved in the water; the quantity of reſinous mat-

ter precipitated during the digeſtion, was 12 ounces: from the liquor, evaporated to a quart, he obtained a dram of eſſential ſalt, and might, he ſays, have ſeparated more: the liquor being then further evaporated to a pilular conſiſtence, the weight of the extract was 31 ounces.

It is ſuppoſed that the narcotic virtue of opium reſides in the oily and reſinous parts; and that the gummy extract, prepared by the above proceſs, is endowed with the calming, ſedative, or anodyne powers of the opium, diveſted of the narcotic quality as it is of the ſmell, and no longer productive of the diſorders which opium itſelf, and the other preparations of it, frequently occaſion. A caſe is mentioned, from which the innocence and mildneſs of the medicine are apparent; 50 grains having been taken in a day, and found to agree well, where the common opiate preparations could not be borne. But what ſhare it poſſeſſes of the proper virtues of opium is not ſo clear; for the cure of convulſive motions of the ſtomach and vomitings,, which at length happened after the extract had been continued daily in the above doſes for ſeveral years *(pluſieurs années)*, cannot perhaps be aſcribed fairly to the medicine.

If the theory of the proceſs, and of the alteration produced by it in the opium, be juſt, a preparation equivalent to the above may be obtained in a much ſhorter time. If the intention is to ſeparate the reſinous and oily parts of opium, they may be ſeparated by means of pure ſpirit of wine, in as many hours as the digeſtion requires months. The ſeparation will alſo be as complete, in regard to the remaining gum, though ſome part of the gum will in this method be loſt, a little of it being taken up by the ſpirit along with the other principles.

In what particular part of opium its peculiar virtues reſide, has not perhaps been inconteſtably aſcertained; but this much ſeems clear from experiment, that the pure gum, freed from all that ſpirit can diſſolve, does not differ eſſentially in its ſoporific power from the reſinous part.

There are grounds alſo to preſume, that by whatever means we deſtroy or diminiſh what is called the *narcotic, ſoporific, virulent quality of opium*, we ſhall deſtroy or diminiſh likewiſe its ſalutary operation. For the ill effects which it produces in certain caſes, ſeem to be no other than the neceſſary conſequences of the ſame power, by which it proves ſo beneficial in others.

Chap. V. Expressed Oils.

Expressed oils are obtained chiefly from certain ſeeds and kernels of fruits, by thoroughly pounding them in a ſtone mortar, or, where the quantities are large, grinding them in mills, and then including them in a canvas bag, which is wrapt in a hair-cloth, and ſtrongly preſſed between iron plates. The canvas, if employed alone, would be ſqueezed ſo cloſe to the plates of the preſs as to prevent the oil from running down: by the interpoſition of the hair-cloth a free paſſage is allowed it.

Sundry machines have been contrived, both for grinding the ſubject and preſſing out the oil, in the way of buſineſs. To facilitate the expreſſion, it is uſual to warm either the plates of the preſs, or the ſubject itſelf after the grinding, by keeping it ſtirring in a proper veſſel over the fire; the oil, liquefied by the heat, ſeparates more freely and more plentifully. When the oil is deſigned for medicinal purpoſes, this practice is not to be allowed; for heat, eſpecially if its degree be ſufficient to be of any conſiderable advantage for promoting the ſeparation, renders the oil leſs ſoft and palatable, impreſſes a diſagreeable flavour, and increaſes its diſpoſition to grow rancid: hence the colleges both of London and Edinburgh expreſsly require the operation to be performed without heat.

Nor are the oils to be kept in a warm place after their expreſſion. Expoſed for a few days to a heat no greater than that of the human body, they loſe their emollient quality, and become highly rancid and acrimonious. Too much care cannot be taken for preventing any tendency to this acrid iritating ſtate in medicines, ſo often uſed for abating immoderate irritation.

So much are theſe oils diſpoſed to this injurious alteration, that they frequently contract an acrimony and rancidity while contained in the original ſubjects. Hence great care is requiſite in the choice of the unctuous ſeeds and kernels, which are often met with very rancid; almonds are particularly liable to inconveniences of this kind.

Expreſſed oils are prepared for mechanic uſes from ſundry different ſubjects, as nuts, poppy-ſeed, hemp-ſeed, rape-ſeed, and others. Thoſe directed for medicinal purpoſes in the London and Edinburgh pharmacopœias are various: but the following will be a ſufficient ſpecimen.

Oil of almonds. L. E.

Pound freſh almonds, either ſweet or bitter, in a mortar, then preſs out the oil in a cold preſs.

In the ſame manner is to be expreſſed oil of linſeed and oil of muſtard-ſeed.

The oil of almonds is prepared from the ſweet and bitter almonds indifferently, the oils obtained from both ſorts being exactly the ſame. Nor are the differences of the other oils very conſiderable, the diſcriminating qualities of the ſubjects not reſiding in the oils that are thus obtained by expreſſion. The oil of linſeed requires indeed ſome peculiarities from containing a proportion of vegetable mucilage; but the oil of muſtard-ſeed is as ſoft, inſipid, and void of pungency, as that of ſweet almonds, the pungency of the muſtard remaining entire in the cake left after the expreſſion. The ſeveral oils differ in ſome of their properties from each other; but in medicinal qualities they appear to be all nearly alike, and agree in one common emollient virtue. They ſoften and relax the ſolids, and obtund acrimonious humours; and thus become ſerviceable internally in pains, inflammations, heat of urine, hoarſeneſs, tickling coughs, &c. in glyſters, for lubricating the inteſtines, and promoting the ejection of indurated fæces; and in external applications, for tenſion and rigidity of particular parts. Their common doſe is half an ounce; in ſome caſes they are given to the quantity of three or four ounces. The moſt commodious form for their internal exhibition is that of an emulſion.

Notwithſtanding the juſtice of the obſervation reſpecting the great ſimilarity of expreſſed oils in general, yet there can be no doubt that in ſome inſtances they obtain a peculiar impregnation. This manifeſtly appears in the *oleum ricini*, *oleum nucis moſchatæ*, and ſome of the others mentioned above. Indeed, oils expreſſed from aromatic ſubſtances in general retain ſome admixture of the eſſential oil of the ſubject from which they are expreſſed. Nor is this ſurpriſing, when we conſider that in ſome caſes the eſſential oil exiſts in a ſeparate ſtate even in the growing plant.

The rinds of the ſeveral varieties of oranges, lemons, and citrons yield by a kind of expreſſion their eſſential oils almoſt pure, and nearly ſimilar to thoſe which are obtained from them by diſtillation. The eſſential oils, in which the fragrance and aromatic warmth of theſe fruits reſide, are contained in numerous little veſicles, which may be diſtinguiſhed by the naked eye, ſpread all over the ſurface of the peel. If the rind be cut in ſlices, and the ſlices ſeparately doubled or bent in different parts, and ſqueezed between the fingers, the veſicles burſt at the bending, and diſcharge the oil in a number of fine ſlender jets. A glaſs plate being ſet upright in a glaſs or porcelain veſſel, and the ſlices ſqueezed againſt the plates, the little jets

unite into drops upon the plate, and trickle down into the veſſel beneath. But though this proceſs affords the true native oil in the ſame ſtate wherein it exiſted in the ſubject, unaltered by fire or other agents, it is not practicable to advantage unleſs where the fruit is very plentiful, as only a ſmall part of the oil it contains can thus be extracted or collected.

The oil is more perfectly ſeparated by rubbing the rind upon a lump of ſugar. The ſugar, by the inequality of its ſurface, produces the effect of a raſp in tearing open the oily veſicles, and in proportion as the veſicles are opened the ſugar imbibes the oil. When the outward part of the lump is ſufficiently moiſtened, it is ſcraped off, and the operation continued on the freſh ſurface. The oil thus combined with the ſugar is fit for moſt of the uſes to which it is applied in a fluid ſtate. Indeed, the pure eſſential oils obtained by diſtillation are often purpoſely mixed with ſugar to render their uſe the more commodious.

Chap. VI. Essential Oils.

Essential oils are obtained only from odoriferous ſubſtances, but not equally from all of this claſs, nor in quantity proportional to their degree of odour. Some which, if we were to reaſon from analogy, ſhould ſeem very well fitted for this proceſs, yield extremely little oil, and others none at all. Roſes and chamomile flowers, whoſe ſtrong and laſting ſmell promiſes abundance, are found upon experiment to contain but a ſmall quantity; the violet and jeſſamine flower, which perfume the air with their odour, loſe their ſmell upon the gentleſt coction, and do not afford the leaſt perceptible mark of oil on being diſtilled, unleſs immenſe quantities are ſubmitted to the operation at once; while ſavin, whoſe diſagreeable ſcent extends to no great diſtance, gives out the largeſt proportion of oil of almoſt any vegetable known.

Nor are the ſame plants equally fit for this operation when produced in different ſoils or ſeaſons, or at different times of their growth. Some yield more oil if gathered when the flowers begin to fall off than at any other time. Of this we have examples in lavender and rue; others, as ſage, afford the largeſt quantity when young, before they have ſent forth any flowers; and others, as thyme, when the flowers have juſt appeared. All fragrant herbs yield a larger proportion of oil when produced in dry ſoils and warm ſummers than in oppoſite circumſtances. On the other hand, ſome of the diſagreeable ſtrong-ſcented ones, as wormwood, are ſaid to contain moſt in rainy ſeaſons and when growing in moiſt rich grounds.

Several of the chemiſts have been of opinion, that herbs and flowers, moderately dried, yield a greater quantity of eſſential oil than if they were diſtilled when freſh. It is ſuppoſed, that the oil being already blended, in freſh plants, with a watery fluid, great part of it remains diffuſed through the water after the diſtillation, divided into particles too minute to unite and be collected; whereas in drying, the oily parts, on the exhalation of the moiſture which kept them divided and diſperſed, run together into globules, which have little diſpoſition to mingle with watery fluids, and eaſily ſeparate from the water employed in the diſtillation.

This theory, however, does not appear to be quite ſatisfactory; for, though the oil be collected in the ſubject into diſtinct globules, it does not riſe in that form, but is reſolved into vapour, and blended and coagitated by the heat with the vapour of the water; and if the oil in a dry plant was leſs diſpoſed to unite with aqueous fluids than in a freſh one, the dry ought to yield a weaker infuſion than the freſh; the contrary of which is generally found to obtain. As the oil of the dry plant is moſt perfectly extracted and kept diſſolved by the water before the diſtillation, it is difficult to conceive any reaſon why it ſhould have a greater tendency to ſeparate from the water afterwards.

The opinion of dry plants yielding moſt oil ſeems to have ariſen from an obſervation of Hoffman, which has probably been miſunderſtood: "A pound (he ſays) of dry ſpike flowers yields an ounce of oil, but if they were diſtilled freſh they would ſcarcely yield above half an ounce; and the caſe is the ſame in balm, ſage, &c. The reaſon is, that in drying the watery humidity exhales: and as from two pounds of a freſh plant we do not obtain above one pound of dry, and little of the ſubtile oil evaporates in the drying, it follows, that more oil ought to be afforded by the dry than by the freſh." The meaning of which ſeems to be no more than this, that if two pounds of a freſh plant are by drying reduced to one without any loſs of the oil, then the one pound dry ought to be equivalent to the two freſh. A late writer quotes an experiment of Neumann, which appears to be miſunderſtood in the ſame manner; for Neumann, in the place referred to, ſays only that dry wormwood is found to yield much more oil than an *equal weight* of the freſh plant. Trials are yet wanting in which freſh and dry plants have been brought to a fair compariſon, by dividing a quantity of the ſubject into two equal weights, and diſtilling one while freſh, and the other after it has been carefully and moderately dried.

But whatever may be the effect of moderate exſiccation, it is certain, that if the drying be long continued, the produce of oil will be diminiſhed, its colour altered, and its ſmell impaired.

With regard to the proportion of water to be employed, if whole plants moderately dried are uſed, or the ſhavings of woods, as much of either may be put into the veſſel as, lightly preſſed, will occupy half its cavity; and as much water may be added as will fill two-thirds of it. The water and ingredients altogether ſhould never take up more than three-fourths of the ſtill: there ſhould be liquor enough to prevent any danger of an empyreuma, but not ſo much as to be too apt to boil over into the receiver.

The maceration ſhould be continued ſo long that the water may fully penetrate the parts of the ſubject. To promote this effect, woods ſhould be thinly ſhaved acroſs the grain, or ſawn, roots cut tranſverſely into thin ſlices, barks reduced into coarſe powder, and ſeeds ſlightly bruiſed. Very compact and tenacious ſubſtances require the maceration to be continued a week or two, or longer; for thoſe of a ſofter and looſer texture, two or three days are ſufficient; while ſome tender herbs and flowers not only ſtand in no need of maceration, but are even injured by it.

Whether the addition of ſea-ſalt, which ſome have recommended, be of any real ſervice, is much to be doubted. The uſes generally aſſigned to it are, to penetrate and unlock the texture of the ſubject more effectually than ſimple water could do, and to prevent the fermentation or putrefaction which the matter is apt to run into during the length of time for which the maceration is often continued. But ſea-ſalt ſeems rather to harden and condenſe, than to ſoften and reſolve, both vegetable and animal ſubjects; and if it prevents putrefaction, it muſt, on that very account, be injurious rather than of ſervice. The reſolution here aimed at approaches near to a beginning putrefaction; and ſaline ſubſtances, by retarding this, prolong the maceration far beyond the time that would otherwiſe be neceſſary. It is in the power of the operator, when he perceives the proceſs coming near this pitch, to put a ſtop to it at pleaſure, by proceeding immediately to diſtillation. By this means the whole affair will be finiſhed in a very little time, with at leaſt equal advantage in every other reſpect; provided the manual operations of pounding, raſping, and the like, which are equally neceſſary in either caſe, be minutely complied with.

Bodies of a very viſcous and compact texture were directed,

in the Edinburgh pharmacopœia, to be fermented for ſome days with a little yeſt. Half their quantity of water is ſufficient for performing the fermentation; as much more as is neceſſary is to be added afterwards before the diſtillation. This proceſs undoubtedly promotes the reſolution of the ſubject, and the extrication of the oil. It rarely happens, however, that aſſiſtances of this kind are needful. Particular care muſt be had not to continue the fermentation too long; or to give a bad flavour to the oil by an ill-choſen ferment, or uſing too large a quantity of any.

Some chemiſts pretend, that by the addition of ſalts and acid ſpirits they have been enabled to gain more oil from certain vegetable matters than could poſſibly be got from them without ſuch aſſiſtance. Experiments made on purpoſe to ſettle this point ſeem to prove the contrary: this at leaſt is conſtantly found to be true, that where there is any reaſon to think the produce greater than uſual, the quality of the oil is proportionally injured. The quantity of true eſſential oil in vegetables can by no means be increaſed; and what is really contained in them may be eaſily ſeparated without any addition of this kind. All that ſaline matters can do in this reſpect is to make the water ſuſceptible of a greater degree of heat than it can ſuſtain by itſelf, and thus enable it to carry up a groſs unctuous matter, not volatile enough to riſe with pure water: this groſs matter, mingling with the pure oil, increaſes the quantity, but at the ſame time muſt neceſſarily debaſe its quality. And indeed, when water alone is uſed, the oil which comes over about the end of the operation is remarkably leſs fragrant, and of a thicker conſiſtence, than that which riſes at the beginning: diſtilled a ſecond time, with a gentle heat, it leaves a large quantity of groſs almoſt inſipid reſinous matter behind.

The choice of proper inſtruments is of great conſequence for the performance of this proceſs to advantage. There are ſome oils which paſs freely over the ſwan-neck of the head of the common ſtill; others, leſs volatile, cannot eaſily be made to riſe ſo high. For obtaining theſe laſt, we would recommend a large low head, having a rim or hollow canal round it. In this canal the oil is detained on its firſt aſcent, and thence conveyed at once into the receiver, the advantages of which are ſufficiently obvious.

With regard to the fire, the operator ought to be expeditious in raiſing it at firſt, and to keep it up, during the whole proceſs, of ſuch a degree that the oil may freely diſtil; otherwiſe the oil will be expoſed to an unneceſſary heat; a circumſtance which ought as much as poſſible to be avoided. Fire communicates to all theſe oils a diſagreeable impregnation, as is evident from their being much leſs grateful when newly diſtilled, than after they have ſtood for ſome time in a cool place; the longer the heat is continued, the more alteration it muſt produce in them.

The greater number of oils require for their diſtillation the heat of water ſtongly boiling: but there are many alſo which riſe with a heat conſiderably leſs; ſuch as thoſe of lemon and citron-peel, of the flowers of lavender and roſemary, and of almoſt all the more odoriferous kinds of flowers. We have already obſerved, that theſe flowers have their fragrance much injured, or even deſtroyed, by beating or bruiſing them; it is impaired alſo by the immerſion in water in the preſent proceſs, and the more ſo in proportion to the continuance of the immerſion and the heat: hence oils, diſtilled in the common manner, prove much leſs agreeable in ſmell than the ſubjects themſelves. For the diſtillation of ſubſtances of this claſs another method has been contrived; inſtead of being immerſed in water, they are expoſed only to its vapour. A proper quantity of water being put into the bottom of the ſtill, the odoriferous herbs or flowers are laid lightly in a baſket, of ſuch a ſize that it may enter into the ſtill, and reſt againſt its ſides, juſt above the water. The head being then fitted on, and the water made to boil, the ſteam, percolating through the ſubject, imbibes the oil, without impairing its fragrance, and carries it over to the receiver. Oils thus obtained poſſeſs the odour of the ſubject in an exquiſite degree, and have nothing of the diſagreeable ſcent perceivable in thoſe diſtilled by boiling them in water in the common manner.

It may be proper to obſerve, that thoſe oils which riſe with a leſs heat than that of boiling water, are generally called, by the chemical and pharmaceutical writers, *light* oils; and thoſe which require the heat of water ſtrongly boiling, are called *ponderous*. We have avoided theſe expreſſions, as they might be thought to relate to the comparative *gravities* of the oils; with which the volatility or fixedneſs has no connection. Olive oil is lighter than moſt of the eſſential oils; but the heat requiſite to make it diſtil, exceeds that in which the heavieſt eſſential oil diſtils, conſiderably more than the heat of boiling water exceeds that of ice.

The water employed in the diſtillation of eſſential oils always imbibes ſome portion of the oil; as is evident from the ſmell, taſte, and colour, which it acquires. It cannot, however, retain above a certain quantity; and therefore, ſuch as has been already uſed and conſequently ſaturated with oil, may be advantageouſly employed, inſtead of common water, in a ſecond, third, or any future diſtillation of the ſame ſubject.

Some late chemical writers recommend, not the water which comes over, but that which remains in the ſtill, to be uſed a ſecond time. This can be of no ſervice; as containing only ſuch parts of the vegetable as are incapable of ariſing in diſtillation, and which ſerve only to impede the action of the water as a menſtruum, and to endanger an empyreuma.

After the diſtillation of one oil, particular care ſhould be taken to cleanſe the worm before it be employed in the diſtillation of a different plant. Some oils, thoſe of wormwood and aniſeeds for inſtance, adhere to it ſo tenaciouſly, as not to be melted out by heat, or waſhed off by water: the beſt way of cleanſing the worm from theſe, is to run a little ſpirit of wine through it.

Eſſential oils, after they are diſtilled, ſhould be ſuffered to ſtand for ſome days, in veſſels looſely covered with paper, till they have loſt their diſagreeable fiery odour, and become limpid: then put them up in ſmall bottles, which are to be kept quite full, cloſely ſtopped, in a cool place: with theſe cautions, they will retain their virtues in perfection for many years.

When careleſsly kept, they in time gradually loſe their flavour, and become groſs and thick. Some endeavour to recover them after they have undergone this change, by grinding them with about thrice their weight of common ſalt, then adding a large proportion of water, and diſtilling them afreſh: the purer part riſes thin and limpid, poſſeſſing a great degree of the priſtine ſmell and taſte of the oil, though inferior in both reſpects to the original oil. This rectification, as it is called, ſucceeds equally without the ſalt: the oils, when thus altered, are nearly in the ſame ſtate with the turpentines, and other thickened oily juices, which readily yield their purer oil in diſtillation with water alone.

When eſſential oils have entirely loſt their ſmell, ſome recommend adding them in the diſtillation of a freſh quantity of the oil of the ſame plant; by which means they are ſaid to ſatiate themſelves anew with the odorous matter, and become entirely renovated. This practice, however, ought doubtleſs to be diſapproved, as being no other than a ſpecious ſophiſtication; for it can do no more than divide, between the old and the new, the active matter which belongs to the new alone.

Eſſential oils, medicinally conſidered, agree in the general qualities of pungency and heat; in particular virtues, they differ as much as the ſubject from which they are obtained, the

oil being the direct principle in which the virtues, or at leaſt a conſiderable part of the virtues, of the ſeveral ſubjects reſide. Thus, the carminative virtue of the warm ſeeds, the diuretic of juniper-berries, the emmenagogue of ſavin, the nervine of roſemary, the ſtomachic of mint, the anti-ſcorbutic of ſcurvy-graſs, the cordial of aromatics, &c. are ſuppoſed to be concentrated in their oil.

There is another remarkable difference in eſſential oils, the foundation of which is leſs obvious, viz. the degree of their pungency and heat. Theſe are by no means in proportion, as might be expected, to thoſe of the ſubject they were drawn from. The oil of cinnamon, for inſtance, is very pungent and fiery; in its undiluted ſtate it is almoſt cauſtic: whereas cloves, a ſpice which in ſubſtance is far more pungent than the other, yields an oil which is far leſs ſo. This difference ſeems to depend partly on the quantity of oil afforded, cinnamon yielding much leſs than cloves, and conſequently having its active matter concentrated into a ſmaller volume; partly on a difference in the nature of the active parts themſelves; for, though eſſential oils contain always the ſpecific odour and flavour of their ſubjects, whether grateful or ungrateful, they do not always contain the whole pungency; this reſides frequently in a more fixed reſinous matter, and does not riſe with the oil. After the diſtillation of cloves, pepper, and ſome other ſpices, a part of their pungency is found to remain behind: a ſimple tincture of them in rectified ſpirit of wine is even more pungent than their pure eſſential oils.

The more grateful oils are frequently uſed for reconciling to the ſtomach medicines of themſelves diſguſtful. It has been cuſtomary to employ them as correctors for the reſinous purgatives; an uſe which they do not ſeem to be well adapted to. All the ſervice they can here be of, is, to make the reſin ſit more eaſily at firſt on the ſtomach: far from abating the irritating quality on which the virulence of its operation depends, theſe pungent oils ſuperadd a freſh ſtimulus.

Eſſential oils are never given alone, on account of their extreme heat and pungency; which in ſome is ſo great, that a ſingle drop let fall upon the tongue produces a gangrenous eſchar. They are readily imbibed by pure dry ſugar, and in this form may be conveniently exhibited. Ground with eight or ten times their weight of ſugar, they become ſoluble in aqueous liquors, and thus may be diluted to any aſſigned degree. Mucilages alſo render them miſcible with water into an uniform milky liquor. They diſſolve likewiſe in ſpirit of wine; the more fragrant in an equal weight, and almoſt all of them in leſs than four times their own quantity; theſe ſolutions may be either taken on ſugar, or mixed with ſyrups, or the like: on mixing with water, the liquor grows milky, and the oil ſeparates.

The more pungent oils are employed externally againſt paralytic complaints, numbneſs, pains, and aches, cold tumors, and in other caſes where particular parts require to be heated or ſtimulated. The tooth-ach is ſometimes relieved by a drop of theſe almoſt cauſtic oils, received on cotton, and cautiouſly introduced into the hollow tooth.

Eſſential oil of aniſe, caraway, lavender, peppermint, ſpearmint, origanum, pennyroyal, roſemary, juniper-berry, ſaſſafras root. L.

Let theſe oils be drawn off by diſtillation, from an alembic with a large refrigeratory; but, to prevent an empyreuma, water muſt be added to the ingredient; in which they muſt be macerated before diſtillation.

The water that comes over with the oil is to be kept for uſe.

Eſſential oil of garden mint, peppermint, ſavin, roſemary, lavender, aniſeeds, juniper-berries, ſaſſafras root, pimento. E.

Theſe are prepared almoſt in the ſame manner as the ſimple diſtilled waters, excepting that for procuring the oil a ſomewhat leſs quantity of water is to be uſed. Seeds and woody matters are firſt to be bruiſed or raſped. The oil riſes with the water; and, as it is lighter or heavier, ſwims on the ſurface, or ſinks to the bottom, from which it is afterwards to be ſeparated.

It is, however, to be remarked, that, in preparing theſe diſtilled waters and oils, ſo many varieties muſt neceſſarily take place from the goodneſs of the ſubject itſelf, its texture, the time of the year, and ſuch-like circumſtances, that a certain and general rule, which ſhould ſtrictly apply to each example, can ſcarcely be laid down; wherefore we have only explained the general method, leaving many things to be varied by the judgment of the operator.

Oil of foſſil tar.

Diſtil foſſil tar, the *bitumen petroleum*, in a ſand heat.

The oil obtained from this tar will be more or leſs thin according to the continuance of the diſtillation; and by its continuance the tar will at laſt be reduced to a black coal; and then the oil will be pretty deep in colour, though perfectly fluid. This oil has a property ſimilar to that of the tincture of nephritic wood in water, appearing blue when looked upon, but of an orange colour when held between the eye and the light. By long keeping it loſes this property. It is leſs diſagreeable than ſome of the other empyreumatic oils which had formerly a place in our pharmacopœia, ſuch as the oleum lateritium, though very acrid and ſtimulating.

Oil of turpentine. L.

Take of common turpentine five pounds; water four pints. Diſtil the turpentine with the water from an alembic of copper. After the diſtillation of the oil, what remains is yellow reſin.

Rectified oil of turpentine. L.

Take of oil of turpentine one pound; water four pints. Diſtil.

The proceſs here propoſed for rectifying this oil, is not only tedious but accompanied with danger. For, unleſs the luting be very cloſe, ſome of the vapour will be apt to get through; and if this catch fire, it will infallibly burſt the veſſels. This rectified oil, which in many pharmacopœias is ſtyled æthereal, does not conſiderably differ in ſpecific gravity, ſmell, taſte, or medical qualities, from the former.

The ſpirit of turpentine, as this eſſential oil has been ſtyled, is not unfrequently taken internally as a diuretic and ſudorific. And in theſe ways it has ſometimes a conſiderable effect when taken even to the extent of a few drops only. It has, however, been given in much larger doſes, eſpecially when mixed with honey. Recourſe has principally been had to ſuch doſes in caſes of chronic rheumatiſm, particularly in thoſe modifications of it which are ſtyled *ſciatica* and *lumbago*. But they have not been often ſucceſsful, and ſometimes they have had the effect of inducing bloody urine.

Animal oil. L.

Take of oil of hartſhorn one pound. Diſtil three times.

Rectified oil of horns, or *animal oil.* E.

Take of empyreumatic oil, newly diſtilled from the horns of animals, as much as you will. Diſtil with a gentle heat, in a matraſs furniſhed with a head, as long as a thin colourleſs oil comes over, which is to be freed of alkaline ſalt and ſpirit by means of water. That this oil may remain limpid and good, it ought to be put up in ſmall phials, completely filled and inverted, having previouſly put into each phial a few drops of water, that on inverting it the water may interpoſe itſelf between the oil and the mouth of the phial.

The quantity of oil employed in this proceſs ſhould be conſiderable: for it leaves ſo much black matter behind in the ſeveral diſtillations, that it is reduced at laſt to a ſmall portion of its original quantity. It is ſaid, that the product is rendered more limpid, by mixing the oil with quicklime into a ſoft paſte; the lime keeping down more of the groſs matter than would remain without ſuch an addition. The quicklime may here alſo perhaps act by abſtracting fixed air; to the abſorption of which we are diſpoſed to refer in ſome meaſure the ſpoiling of the oil on expoſure to the atmoſphere.

The oil was firſt introduced by Dippelius, whoſe name it has ſince generally borne.

Animal oils thus rectified are thin and limpid, of a ſubtile, penetrating, not diſagreeable ſmell and taſte. They are ſtrongly recommended as anodynes and antiſpaſmodics, in doſes from 15 to 30 drops. Hoffman reports, that they procure a calm and ſweet ſleep, which continues often for 20 hours, without being followed by any languor or debility, but rather leaving the patient more alert and cheerful than before; that they procure likewiſe a gentle ſweat, without increaſing the heat of the blood: that given to 20 drops or more, on an empty ſtomach, ſix hours before the acceſſion of an intermittent fever, they frequently remove the diſorder; and that they are likewiſe a very generous remedy in inveterate and chronical epilepſies and in convulſive motions, eſpecially if given before the uſual time of the attack, and preceded by proper evacuations.

The empyreumatic oils of vegetables, rectified in the ſame manner by repeated diſtillations, ſuffer a like change with the animal; loſing their dark colour and offenſive ſmell, and becoming limpid, penetrating, and agreeable: in this ſtate they are ſuppoſed, like the animal oil, to be anodyne, antiſpaſmodic, and diaphoretic or ſudorific. It is obſervable, that all the empyreumatic oils diſſolve in ſpirit of wine, and that the oftener they are rectified or rediſtilled, they diſſolve the more readily; a circumſtance in which they differ remarkably from eſſential oils, which, by repeated diſtillations, become more and more difficult of ſolution.

How far theſe preparations really poſſeſs the virtues that have been aſcribed to them, has not yet been ſufficiently determined by experience; the tediouſneſs and trouble of the rectification having prevented their coming into general uſe, or being often made. They are liable alſo to a more material inconvenience in regard to their medicinal uſe, precarioufneſs in their quality; for, how perfectly ſoever they be rectified, they gradually loſe in keeping the qualities they had received from that proceſs, and return more and more towards their original fetid ſtate.

Oil and ſalt of amber. E.

Take equal parts of amber reduced to a powder and of pure ſand. Mix them, and put them into a glaſs retort, of which the mixture may fill one half; then adapt a large receiver, and diſtil in a ſand-furnace, with a fire gradually increaſed. At firſt a ſpirit will come over, with ſome yellow oil; then more yellow oil, along with a little ſalt; and on raiſing the heat, more of the ſalt, with a reddiſh and black coloured oil. When the diſtillation is finiſhed, empty the liquor out of the receiver; and having collected together the ſalt which adheres to the ſides, dry it by gentle preſſure between the folds of blotting paper; then purify it by ſolution in warm water and by cryſtallization.

Rectified oil of amber.

Diſtil the oil in a glaſs retort with ſix times its quantity of water till two-thirds of the water have paſſed into the receiver; then ſeparate the rectified oil from the water, and keep it for uſe in cloſe ſhut veſſels. *E.*

Take of oil of amber one pound. Diſtil three times. *L.*

The London college introduce their directions for the preparation of the ſal and oleum ſuccini at an after part of their work under the head of *ſalts*. Here we may only obſerve, that they direct it to be prepared from the amber alone, without the intervention of ſand. But this makes no eſſential difference in the article when prepared.

The Edinburgh college have rejected what was formerly called the ſpirit, as being nothing elſe than the watery parts fraught with the inert impurities of the bitumen and a very ſmall portion of the ſalt. In the diſtillation of amber, the fire muſt for ſome time be continued gentle, ſcarce exceeding the degree at which water boils, till the aqueous phlegm and thin oil have ariſen; after which it is to be ſlowly increaſed. If the fire were urged haſtily, the amber would ſwell up, and riſe in its whole ſubſtance into the receiver, without undergoing the required decompoſition or ſeparation of its parts. When ſand or ſimilar intermedia are mixed with it, it is leſs ſubject to this rarefaction, and the fire may be raiſed ſomewhat more expeditiouſly: though this little advantage is perhaps more than counterbalanced by the room which the ſand neceſſarily takes up in the retort.

Our chemiſts generally leave the receiver unluted, that it may be occaſionally removed as the ſalt riſes and concretes in the neck of the retort; from whence it is every now and then ſcraped out, to prevent the oil from carrying it down into the receiver. When a groſs thick oil begins to ariſe, and no more ſalt appears, the diſtillation is ſtopt, though it might perhaps be continued longer to advantage.

Mr. Pott informs us (in a curious diſſertation on the ſalt of amber, publiſhed in the ninth volume of the Memoirs of the Academy of Sciencies of Berlin), that the Pruſſian workmen, who prepare large quantities of this ſalt for exportation, from cuttings and ſmall pieces of amber, perform the diſtillation without any intermedium, and in an open fire: that, ſweeping out the ſalt from the neck of the retort being found too troubleſome, they ſuffer the oil to carry it down into the receiver, and afterwards ſeparate it by means of bibulous paper, which imbibes the oil, and leaves the ſalt dry; which paper is afterwards ſqueezed and diſtilled: that they continue the diſtillation till all that can be forced over has ariſen, taking care only to catch the laſt thick oil in a ſeparate receiver; and that from this they extract a conſiderable quantity of ſalt, by ſhaking it in a ſtrong veſſel with three or four freſh portions of hot water, and evaporating and cryſtallizing the filtered waters.

The ſpirit of amber, ſo called, is no more than a ſolution of a ſmall proportion of the ſalt in phlegm or water; and therefore is very properly employed for diſſolving the ſalt in order to its cryſtallization.

The ſalt, freed from as much of the oil as ſpongy paper will imbibe, retains ſo much as to appear of a dark brown colour. Mr. Pott ſays, the method he has found to ſucceed beſt, and with leaſt loſs, is, to diſſolve the ſalt in hot water, and put into the paper, through which the ſolution is to be filtered, a little cotton ſlightly moiſtened with oil of amber: this, he ſays, detains a good deal of the oil of the ſalt, and the ſolution paſſes through the more pure. The liquor being evaporated with a very gentle fire, as that of a water bath, and ſet to ſhoot, the firſt cryſtals prove tranſparent, with a ſlight yelloviſh tinge; but thoſe which follow are brown, oily, and bitter, and are therefore to be further depurated in the ſame manner. The whole quantity of cryſtals amounts to about one-thirtieth of the weight of the crude amber employed. By ſublimation from ſea-ſalt, as directed in former editions of the Edinburgh pharmacopœia, the ſalt is thought to be more perfectly and more expeditiouſly purified. Mr. Pott objects to ſublimation, that a part of the ſalt is decompoſed by it, a coaly matter being left behind, even though the ſalt was previouſly purified by cryſtallization: it may be pre-

ſumed, however, that this coal proceeds rather from the burning of ſome remains of the oily matter, than from the decompoſition of any part of the true ſalt.

Pure ſalt of amber has a penetrating, ſubaſtringent, acid taſte. It diſſolves both in water and in rectified ſpirit; though not readily in either, and ſcarcely at all in the latter without the aſſiſtance of heat: of cold water in ſummer, it requires for its ſolution about twenty times its own weight; of boiling water only about twice its weight. Expoſed in a glaſs veſſel, to a heat little greater than that of boiling water, it firſt melts, then riſes in a white fume, and concretes again in the upper part of the glaſs into fine white flakes, leaving, unleſs it was perfectly pure, a little coaly matter behind. It effervesces with alkalis both fixed and volatile, and forms with them neutral compounds much reſembling thoſe compoſed of the ſame alkalis and vegetable acids. Mixed with acid liquors, it makes no ſenſible commotion. Ground with fixed alkaline ſalts, it does not exhale any urinous odour. By theſe characters, it is conceived this ſalt may be readily diſtinguiſhed from all the other matters that have been mixed with or vended for it. With regard to its virtue, it is accounted aperient, diuretic, and, on account of its retaining ſome portion of the oil, antihyſteric: Boerhaave gives it the character of *diureticorum et antihyſtericorum princeps*. Its great price, however, has prevented its coming much into uſe; and perhaps its real virtues are not equal to the opinion generally entertained of them.

The rectified oil has a ſtrong bituminous ſmell, and a pungent acrid taſte. Given in a doſe of ten or twelve drops, it heats, ſtimulates, and promotes the fluid ſecretions. It is chiefly celebrated in hyſterical diſorders, and in deficiencies of the uterine purgations. Sometimes it is uſed externally, in liniments for weak or paralytic limbs and rheumatic pains. This oil differs from all thoſe of the vegetable kingdom, and agrees with the mineral petrolea, in not being ſoluble either in its rectified or unrectified ſtate by ſpirit of wine, fixed alkaline lixivia, or volatile alkaline ſpirits; the oil, after long digeſtion or agitation, ſeparating as freely as common oil does from water.

Eſſence of lemons.

Of theſe eſſential oils, as exiſting in a ſeparate ſtate in the growing vegetable, we have already offered ſome obſervations. They are obtained in a very pure ſtate by diſtillation. They are now rejected from our pharmacopœias, being employed rather as perfumes than as medicines. This is particularly the caſe with the eſſence of lemons, which is a pleaſant oil, of a fine ſmell, very nearly as agreeable as that of the freſh peel; it is one of the lighteſt and moſt volatile eſſential oils we have, perfectly limpid, and almoſt colourleſs. It is taken in doſes of two or three drops, as a cordial, in weakneſs of the ſtomach, &c. though more frequently uſed as a perfume. It gives a fine flavour to the officinal volatile aromatic ſpirit of the Edinburgh college, or the compound ſpirit of ammonia, as it is now ſtyled by that of the London: and it may be remarked, that it enters the formula of both colleges, although neither of them has given it a place among their preparations, probably as it is one of thoſe articles which the apothecary rarely prepares for himſelf. When ſoap is given in the form of pills, by the addition of a few drops of this oil they are thought to ſit more eaſily on the ſtomach.

Eſſential oil of cloves. Roſſ.

This oil is ſo ponderous as to ſink in water, and is not eaſily elevated in diſtillation: if the water which comes over be returned on the remaining cloves, and the diſtillation repeated, ſome more oil will generally be obtained, though much inferior in quality to the firſt. The oil of cloves is uſually deſcribed as being "in taſte exceſſively hot and fiery, and of a gold yellow colour." (*Boerh. proceſſ.*) Such indeed is the compoſition which we receive under this name from Holland; but the genuine oil of cloves is one of the milder oils: it may be taken with great ſafety (duly diluted) to the quantity of 10 or 12 drops or more. Nor is its colour at all yellow, unleſs it has been long and careleſsly kept, or diſtilled by too violent a fire: when in perfection, it is limpid and colourleſs, of a pleaſant, moderately warm, and pungent taſte, and a very agreeable ſmell, much reſembling that of the ſpice itſelf. The Dutch oil of cloves contains a large quantity of expreſſed oil, as evidently appears upon examining it by diſtillation. This, however, cannot be the addition to which it owes its acrimony. A mean proportion of a reſinous extract of cloves communicates to a large one of oil a deep colour, and a great degree of acrimony.

Eſſential oil of chamomile. Roſſ.

An oil of chamomile had formerly a place in our pharmacopœias made by infuſion of the recent plant and its flowers in olive oil; and again ſeparating it by preſſure after impregnating it with the active parts of the plant by heat. This, however, was intended only for external application; but the eſſential oil is meant to be uſed internally.

It is a very pungent oil, of a ſtrong not ungrateful ſmell, reſembling that of the flowers: its colour is yellow, with a caſt of greenith or brown. It is ſometimes given in the doſe of a few drops, as a carminative, in hyſteric diſorders, and likewiſe as a vermifuge: it may be conveniently made into pills with crumb of bread.

The number of eſſential oils which have now a place in the London and Edinburgh pharmacopœias, and likewiſe in the foreign ones of modern date, is much leſs conſiderable than formerly; and perhaps thoſe ſtill retained afford a ſufficient variety of the more active and uſeful oils. Moſt of the oils mentioned above, particularly thoſe which have a place in the London and Edinburgh pharmacopœias, are prepared by our chemiſts in Britain, and are eaſily procurable in a tolerable degree of perfection: but the oils from the more expenſive ſpices, though ſtill introduced among the preparations in the foreign pharmacopœias, are when employed among us uſually imported from abroad.

Theſe are frequently ſo much adulterated, that it is not an eaſy matter to meet with ſuch as are fit for uſe. Nor are theſe adulterations eaſily diſcoverable. The groſſer abuſes, indeed, may be readily detected: thus, if the oil be mixed with ſpirit of wine, it will turn milky on the addition of water; if with expreſſed oils, rectified ſpirit will diſſolve the eſſential, and leave the other behind; if with oil of turpentine, on dipping a piece of paper in the mixture, and drying it with a gentle heat, the turpentine will be betrayed by its ſmell. But the more ſubtle artiſts have contrived other methods of ſophiſtication, which elude all trials of this kind.

Some have looked upon the ſpecific gravity of oils as a certain criterion of their genuineneſs; and accordingly we have given a table of the gravity of ſeveral. This, however, is not to be abſolutely depended on: for the genuine oils, obtained from the ſame ſubjects, often differ in gravity as much as thoſe drawn from different ones. Cinnamon and cloves, whoſe oils uſually ſink in water, yield, if ſlowly and warily diſtilled, an oil of great fragrancy, which is nevertheleſs ſpecifically lighter than the aqueous fluid employed in the diſtillation of it; while, on the other hand, the laſt runnings of ſome of the lighter oils prove ſometimes ſo ponderous as to ſink in water.

As all eſſential oils agree in the general properties of ſolubility in ſpirit of wine, indiſſolubility in water, miſcibility with water by the intervention of certain intermedia, volatility in the heat of boiling water, &c. it is plain that they may be variouſly mixed with each other, or the dearer ſophiſticated with the

cheaper, without any poſſibility of diſcovering the abuſe by any trials of this kind. And indeed it would not be of much advantage to the purchaſer, if he had infallible criteria of the genuineneſs of every individual oil. It is of as much importance that they be *good*, as that they be *genuine*; for genuine oils, from inattentive diſtillation and long and careleſs keeping, are often weaker both in ſmell and taſte than the common ſophiſticated ones.

The ſmell and taſte ſeem to be the only certain teſts of which the nature of the thing will admit. If a bark ſhould have in every reſpect the appearance of good cinnamon, and ſhould be proved indiſputably to be the genuine bark of the cinnamon-tree; yet if it want the cinnamon flavour, or has it but in a low degree, we reject it; and the caſe is the ſame with the oil. It is only from uſe and habit, or compariſons with ſpecimens of known quality, that we can judge of the goodneſs either of the drugs themſelves or of their oils.

Moſt of the eſſential oils, indeed, are too hot and pungent to be taſted with ſafety: and the ſmell of the ſubject is ſo much concentrated in them, that a ſmall variation in this reſpect is not eaſily diſtinguiſhed; but we can readily dilute them to any aſſignable degree. A drop of the oil may be diſſolved in ſpirit of wine, or received on a bit of ſugar, and diſſolved by that intermedium in water. The quantity of liquor which it thus impregnates with its flavour, or the degree of flavour which it communicates to a certain determinate quantity, will be the meaſure of the degree of goodneſs of the oil.

We ſhall here ſubjoin the reſult of ſome experiments, ſhowing *the quantity of eſſential oil obtained from different vegetables*, reduced into the form of a table. The firſt column contains the names of the reſpective vegetable ſubſtances; the ſecond, the quantity of each which was ſubmitted to the diſtillation; and the third, the quantity of oil obtained. In every other part of this article, where *pound* weights are mentioned, the Troy pound of 12 ounces is meant: but theſe experiments having been all made by a pound of 16 ounces, it was thought expedient to ſet down the matter of fact in the original weights; eſpecially as the ſeveral materials, in the large quantity commonly required for the diſtillation of oils, are purchaſed by weights of the ſame kind. But to remove any ambiguity which might ariſe from hence, and to enable the reader to judge more readily of the product, a reduction of the weights is given in the next column; which ſhows the number of parts of each of the ſubjects from which one part of oil was obtained. To each article is affixed the author's name from whom the experiment was taken. The different diſtillations of one ſubject, ſeveral of which are inſerted in the table, ſhow how variable the product of oil is, and that the exotic ſpices, as well as our indigenous plants, do not always contain the ſame proportion of this active principle; though it muſt be obſerved, alſo, that part of the differences may probably ariſe from the operation itſelf having been more or leſs carefully performed.

TABLE *of the Quantity of* ESSENTIAL OIL *obtained from different* VEGETABLES.

		yielded of eſſential oil		ſo that one part of oil was obtained from		
Agallochum wood	10 lb.	4 dra.		320		*Hoff.*
Angelica root	1 lb.	1 dra.		128		*Carth.*
Aniſeed	1 lb.	4 dra.		32		*Neum.*
Aniſeed	3 lb.	1 oz		48		**Lewis.**
Aniſeed	4 lb.	1 oz.		64		*Lewis.*
Aſafœtida	4 oz.	1 dra.		32		*Neum.*
Calamus aromaticus	50 lb.	2 oz.		185		*Hoff.*
Calamus aromaticus	1 lb.	2 ſcr.		152		*Neum.*
Caraway ſeeds	4 lb.	2 oz.		32		*Lewis.*
Caraway ſeeds	2 lb.	9 dra.		$28\frac{1}{2}$		*Lewis.*
Caraway ſeeds	1 cwt.	83 oz.		$21\frac{1}{2}$		*Lewis.*
Caroline thiſtle roots	1 lb.	$2\frac{1}{2}$ ſcr.		153		*Neum.*
Cardamom ſeeds	1 oz.	1 ſcr.		24		*Neum.*
Carrot ſeeds	2 lb.	$1\frac{1}{2}$ dra.		171		**Lewis.**
Caſcarilla	1 lb.	1 dra.		128		*Carth.*
Camomile flowers	1 lb.	30 gra.		256		*Carth.*
Common camomile flowers	6 lb.	5 dra.		153		*Lewis.*
Wild camomile flowers	1 lb.	20 gra.		384		*Carth.*
Wild camomile flowers	6 lb.	$2\frac{1}{2}$ dra.		307		*Lewis.*
Chervil leaves, freſh	9 lb.	30 gra.		2304		*Neum.*
Cedar wood	1 lb.	2 dra.		64		*Marg.*
Cinnamon	1 lb.	1 dra.		128		*Sala.*
Cinnamon	1 lb.	$2\frac{1}{2}$ ſcr.		153		*Neum.*
Cinnamon	4 lb.	6 dra.		$85\frac{1}{3}$		*Lemery.*
Cinnamon	1 lb.	2 dra.		64		*Carth.*
Cinnamon	1 lb.	8 ſcr.		$45\frac{1}{2}$		*Carth.*
Clary ſeeds	4 lb.	2 dra.		256		*Lewis.*
Clary in flower, freſh	130 lb.	$3\frac{1}{2}$ oz.		504		*Lewis.*
Cloves	1 lb.	$1\frac{1}{2}$ oz.		$101\frac{2}{3}$		*Trilbm.*
Cloves	1 lb.	$2\frac{1}{2}$ oz.		$76\frac{1}{6}$		*Carth.*
Cloves	2 lb.	5 oz.		$65\frac{2}{5}$		*Hoff.*
Copaiba balſam	1 lb.	6 oz.		$23\frac{2}{3}$		*Hoff.*
Copaiba balſam	1 lb.	8 oz.		2		*Lewis.*
Cummin-ſeed	1 buſh.	21 oz.		256		*Lewis.*
Dictamnus Creticus	1 lb.	30 gra.		32		*Lewis.*
Dill-ſeed	4 lb.	2 oz.		245		*Neum.*
Elecampane root	2 lb.	$3\frac{1}{2}$ ſcr.		16		*Neum.*
Elemi	1 oz.	1 oz.		48		*Neum.*
Fennel-ſeed, common	2 oz.	1 ſcr.		128		*Lewis.*
Fennel-ſeed, ſweet	1 buſh.	18 oz.		128		*Carth.*
Galangal root	1 lb.	1 dra.		256		*Neum.*
Garlic root, freſh	2 lb.	30 gra.		128		*Neum.*
Ginger	1 lb.	1 dra.		256		*Neum.*
Horſe-radiſh root, freſh	8 oz.	15 gra.		237		*Carth.*
Hyſſop leaves	2 lb.	$1\frac{1}{2}$ dra.		85		*Carth.*
Hyſſop leaves	1 lb.	$1\frac{1}{2}$ dra.		64		*Carth.*
Hyſſop leaves	1 lb.	2 dra.				

TABLE *of the Quantity of* ESSENTIAL OIL *obtained from different* VEGETABLES, *concluded.*

		yielded of essential oil		so that one part of oil was obtained from	
Hyssop leaves, fresh	2 cwt.	6 oz.		597	*Lewis.*
Hyssop leaves, fresh	10 lb.	3 dra.		427	*Lewis.*
Hyssop leaves, fresh	30 lb.	9 dra.		427	*Lewis.*
Juniper berries	8 lb.	3 oz.		42 2/3	*Hoff.*
Juniper berries	1 lb.	3 dra.		42 2/3	*Carth.*
Lavender in flower, fresh	48 lb.	12 oz.		64	*Lewis.*
Lavender in flower, fresh	30 lb.	6 3/4 oz.		72	*Lewis.*
Lavender in flower, fresh	13 1/2 lb.	60 oz.		403	*Lewis.*
Lavender flowers, fresh	2 lb.	4 dra.		64	*Hoff.*
Lavender flowers, dried	4 lb.	2 oz.		32	*Lewis.*
Lavender flowers, dried	2 lb.	1 oz.		32	*Hoff.*
Lavender flowers, dried	4 lb.	3 oz.		21 1/3	*Hoff.*
Broad leaved lavender flowers, dry	4 lb.	1 oz.		64	*Hoff.*
Brood leaved lavender flowers, dry	1 lb.	2 dra.		64	*Carth.*
Lovage root	1 lb.	1 dra.		128	*Carth.*
Mace	1 lb.	5 dra.		25 3/5	*Neum.*
Mace	1 lb.	6 dra.		21 1/3	*Carth.*
Marjoram in flower, fresh	81 lb.	3 3/4 oz.		347	*Lewis.*
Marjoram in flower, fresh	13 1/2 lb.	3 1/2 dra.		493	*Lewis.*
Marjoram in flower, fresh	34 lb.	1 1/2 oz.		362	*Lewis.*
Marjoram leaves, fresh	18 1/4 lb.	4 dra.		592	*Lewis.*
Marjoram leaves, dried	4 lb.	1 oz.		64	*Hoff.*
Masterwort root	1 lb.	30 gra.		256	*Neum.*
Milfoil flowers, dried	14 lb.	4 dra.		448	*Neum.*
Mint in flower, fresh	6 lb.	4 1/2 dra.		177	*Neum.*
Mint-leaves, dried	4 lb.	1 1/2 oz.		42 2/3	*Hoff.*
Peppermint, fresh	4 lb.	3 dra.		170 2/3	*Hoff.*
Myrrh	1 lb.	2 dra.		64	*Hoff.*
Myrrh	1 lb.	3 dra.		42 2/3	*Neum.*
Nutmegs	1 lb.	1 oz.		16	*Hoff.*
Nutmegs	1 lb.	1 oz.		15	*Geoff.*
Nutmegs	1 lb.	4 dra.		32	*Neum.*
Nutmegs	1 lb.	6 dra.		21 1/3	*Sala.*
Nutmegs	1 lb.	5 dra.		25 3/5	*Carth.*
Parsley seeds	2 lb.	1 dra.		256	*Carth.*
Parley leaves, fresh	238 lb.	2 oz.		1904	*Carth.*
Parsnip seeds	8 lb.	2 dra.		512	*Carth.*
Pennyroyal in flower, fresh	13 lb.	6 dra.		277	*Carth.*
Black pepper	2 lb.	6 dra.		42 2/3	*Carth.*
Black pepper	1 lb.	2 1/2 dra.		82	*Neum.*
Black pepper	1 lb.	4 scr.		96	*Carth.*
Black pepper	1 lb.	1 dra.		128	*Heister.*
Black pepper	6 lb.	3 dra.		256	*Geoff.*
Pimento	1 oz.	30 gra.		16	*Neum.*
Rhodium wood	1 lb.	3 dra.		42 2/3	*Neum.*
Rhodium wood	1 lb.	2 dra.		64	*Sala.*
Rhodium wood	1 lb.	3 dra.		42 2/3	*Sala.*
Rhodium wood	1 lb.	3 dra.		42 2/3	*Carth.*
Rhodium wood	1 lb.	4 dra.		32	*Carth.*
Rosemary in flower	1 cwt.	8 oz.		224	*Lewis.*
Rosemary leaves	1 lb.	2 dra.		64	*Sala.*
Rosemary leaves	1 lb.	3 dra.		42 2/3	*Sala.*
Rosemary leaves	3 lb.	3 1/4 dra.		121	*Neum.*
Rosemary leaves	1 lb.	1 dra.		128	*Carth.*
Rosemary leaves	1 lb.	1 1/2 dra.		82	*Carth.*
Rosemary leaves, fresh	70 lb.	5 oz.		224	*Lewis.*
Roses	100 lb.	4 dra.		3200	*Tachen.*
Roses	100 lb.	1 oz.		1600	*Homb.*
Roses	12 lb.	30 gra.		768	*Hoff.*
Rue	10 lb.	2 dra.		640	*Hoff.*
Rue	10 lb.	4 dra.		320	*Hoff.*
Rue in flower	4 lb.	1 dra.		512	*Hoff.*
Rue in flower	60 lb.	2 1/2 oz.		507	*Hoff.*
Rue with the seeds	72 lb.	3 oz.		384	*Hoff.*
Saffron	1 lb.	1 1/2 dra.		85 1/3	*Vogel.*
Sage leaves	1 lb.	5 scr.		77	*Carth.*
Sage in flower, fresh	34 lb.	1 1/2 oz.		544	*Lewis.*
Sage of virtue in flower	27 lb.	6 dra.		576	*Lewis.*
Sage of virtue in flower	8 lb.	1 1/2 dra.		681	*Lewis.*
Saffafras	6 lb.	1 3/4 oz.		55	*Hoff.*
Saffafras	6 lb.	2 oz.		48	*Neum.*
Savin	2 lb.	5 oz.		6 2/3	*Hoff.*
Saunders, yellow	1 lb.	2 dra.		64	*Carth.*
Smallage seeds	1 lb.	2 1/2 scr.		154	*Neum.*
Stechas in flower, fresh	5 1/2 lb.	2 dra.		368	*Lewis.*
Thyme in flower, fresh	2 cwt.	5 1/2 oz.		652	*Lewis.*
Thyme in flower, dry	3 3/4 lb.	1 1/2 dra.		298	*Lewis.*
Lemon-thyme in flower, fresh	51 lb.	1 1/4 oz.		653	*Lewis.*
Lemon-thyme in flower, fresh	98 lb.	2 1/2 oz.		627	*Lewis.*
Lemon-thyme, a little dried	104 lb.	3 oz.		555	*Lewis.*
Wormwood leaves, dry	4 lb.	1 oz.		64	*Lewis.*
Wormwood leaves, dry	18 lb.	1 1/2 oz.		192	*Lewis.*
Wormwood leaves, dry	25 lb.	3 1/2 oz.		114	*Lewis.*
Zedoary	1 lb.	1 dra.		128	*Neum.*

Chap. VII. Salts.

Vitriolic acid. L.

The acid of vitriol is the moſt ponderous of all the liquids we are acquainted with, and the moſt powerful of the acids. If any other acid be united with a fixed alkaline ſalt or earth, on the addition of the vitriolic ſuch acid will be diſlodged, and ariſe on applying a moderate heat, leaving the vitriolic in poſſeſſion of the alkali; though without this addition it would not yield to the moſt vehement fire. Mixed with water, it inſtantly creates great heat, inſomuch that glaſs veſſels are apt to crack from the mixture, unleſs it be very ſlowly performed: expoſed to the air, it imbibes moiſture, and ſoon acquires a remarkable increaſe of weight. In medicine, it is employed chiefly as ſubſervient to other preparations: it is alſo frequently mixed with juleps and the like, in ſuch quantity as will be ſufficient to give the liquor an agreeable tartneſs, and it then is a cooling antiſeptic, a reſtringent, and a ſtomachic.

Nitrous acid. L.

Take of purified nitre, by weight, 60 ounces; vitriolic acid, by weight, 29 ounces. Mix and diſtil.

The ſpecific gravity of this is to the weight of diſtilled water as 1550 to 1000.

Nitrous acid, commonly called *Glauber's ſpirit of nitre.* E.

Take of pureſt nitre, bruiſed, two pounds; vitriolic acid, one pound. Having put the nitre into a glaſs retort, pour on it the ſpirit; then diſtil in a ſand heat, gradually increaſing the fire, till the ſand-pot ſhall become of a dull red colour.

Here the vitriolic acid expels the nitrous, in red corroſive vapours, which begin to iſſue immediately on mixture; and which the operator ought cautiouſly to avoid. A pound of acid of vitriol is ſufficient to expel all the acid from about two pounds of nitre, not from more: ſome direct equal parts of the two. The ſpirit, in either caſe, is in quality the ſame; the difference, in this reſpect, affecting only the reſiduum. If two parts of nitre be taken to one of vitriolic acid, the remaining alkaline baſis of the nitre is completely ſaturated with the vitriolic acid; and the reſult is a neutral ſalt, the ſame with vitriolated tartar, as we ſhall ſee hereafter. If more nitre be uſed, a part of the nitre in ſubſtance will remain blended with this neutral ſalt: if leſs nitre, it cannot afford alkali enough to ſaturate the vitriolic acid, and the reſiduum will not be a neutral ſalt, but a very acid one. In this laſt caſe there is one conveniency; the acid ſalt being readily ſoluble in water, ſo as to be got out without breaking the retort, which the others are not.

Muriatic acid. L.

Take of dry ſea-ſalt, 10 pounds; vitriolic acid, ſix pounds; water, five pounds. Add the vitriolic acid, firſt mixed with the water, by degrees, to the ſalt; then diſtil.

The ſpecific gravity of this acid is to diſtilled water as 1170 to 1000.

Muriatic acid, commonly called *ſpirit of ſea-ſalt.* E.

Take of ſea-ſalt, two pounds; vitriolic acid, water, each one pound. Let the ſalt be firſt put into a pot, and brought to a red heat, that the oily impurities may be conſumed; then put it into the retort. Next mix the acid with the water, and, when the mixture has cooled, pour it upon the ſalt. Laſtly, diſtil in a ſand-bath with a middling heat, as long as any acid comes over.

The marine or muriatic acid ariſes, not in red fumes like the nitrous, but in white ones. The addition of water is more neceſſary here than in the foregoing proceſs; the marine vapours being ſo volatile as ſcarcely to condenſe without ſome adventitious humidity. The acid of vitriol is moſt conveniently mixed with the water in an earthen or ſtone-ware veſſel; for, unleſs the mixture be made exceedingly ſlow, it grows ſo hot as to endanger breaking a glaſs one.

The ſpirit of ſea-ſalt is the weakeſt of the mineral acids, but ſtronger than any of the vegetable; it requires a greater fire to diſtil it than that of nitre, yet it is more readily diſſipated by the action of the air. It is uſed chiefly as a menſtruum for the making of other preparations; ſometimes, likewiſe, it is given, properly diluted, as an antiphlogiſtic, aperient, and diuretic, from 10 to 60 or 70 drops.

Concentrated vinegar. Suec.

Let white-wine vinegar be frozen in a wooden veſſel in cold winter weather, and let the fluid ſeparated from the ice be preſerved for uſe. It may be conſidered as ſufficiently ſtrong, if one dram of it be capable of ſaturating a ſcruple of the fixed vegetable alkali.

This is a very eaſy mode for obtaining the acid of vinegar in a concentrated ſtate, and freed from a conſiderable portion of its water. But, at the ſame time, we do not thus obtain the acid either ſo much concentrated, or in ſo pure a ſtate, as by the following proceſs:

Acetous acid. L.

Take of verdegriſe, in coarſe powder, two pounds. Dry it perfectly by means of a water-bath ſaturated with ſea-ſalt; then diſtil it in a ſand-bath, and after that diſtil the liquor. Its ſpecific gravity is to that of diſtilled water as 1050 to 1000.

By this proceſs, it may be readily concluded that we obtain the acetous acid in its moſt concentrated ſtate, and with the leaſt admixture of water. And after the re-diſtillation, it may alſo be ſuppoſed that it will be free from all mixture of the copper. But the internal uſe of it has been objected to by ſome, on the ſuppoſition that it may ſtill retain a portion of the metal; and hitherto it has, we believe, been but little employed.

Diſtilled acid of tartar. Suec.

Let pounded crude tartar be put into a tubulated earthen or iron retort till it fills about two-thirds of it, and let diſtillation be performed by gradually increaſing the heat. Into the recipient, which ſhould be very large, an acid liquor will paſs over together with the oil; which, being ſeparated from the oil, muſt again be diſtilled from a glaſs retort. If the reſiduum contained in the earthen or iron retort be diluted with water, ſtrained through paper, and boiled to dryneſs, it gives what is called the *alkali* of tartar. If this do not appear white, it may be made ſo by burning, ſolution, ſtraining, and evaporation.

This is another mode of obtaining both the acid and alkali of tartar in a pretty pure ſtate; and, as well as the former, it is not unworthy of being adopted into our pharmacopœias.

Aerated water. Roſſ.

Let ſpring-water be ſaturated with the fixed air, or aerial acid, ariſing from a ſolution of chalk in vitriolic acid, or in any ſimilar acid. Water may alſo be impregnated by the fixed air riſing from fermenting liquors.

The aerial acid, on which we have already had occaſion to

make ſome obſervations, beſides the great influence which it has as affecting different ſaline bodies into whoſe compoſition it enters, is alſo frequently employed in medicine, with a view to its action on the human body. The late ingenious Dr. Dobſon, in his Commentary on Fixed Air, has pointed out many purpoſes for which it may be uſefully employed, and ſeveral different forms under which it may be uſed. But there is no form under which it is at preſent more frequently had recourſe to than that of aerated or mephitic water, as it has often been called. And although not yet received either into the London or Edinburgh pharmacopœias, it is daily employed in practice, and is we think juſtly entitled to a place among the ſaline preparations.

The moſt convenient mode of impregnating water with the aerial acid, and thus having it in our power to exhibit that acid as it were in a diluted ſtate, is by means of a well-known and ſufficiently ſimple apparatus, contrived by that ingenious philoſopher Dr. Nooth. Such a machine ought, we think, to be kept in every ſhop for the more ready preparation of this fluid. Water properly impregnated with the aerial acid has an agreeable acidulous taſte. It is often employed with great advantage in the way of common drink, by thoſe who are ſubjected to ſtomach complaints, and by calculous patients. But, beſides this, it furniſhes an excellent vehicle for the exhibition of many other medicines.

Beſides the ſimple aerated water, the Pharmacopœia Roſſica contains alſo an aqua aëris fixi martialis, or ferruginous aerated water. This is prepared by ſuſpending iron wires in that water till the water be fully ſaturated with the metal. And in conſequence of this acid, ſimple water becomes a menſtruum both for different metallic and earthy ſubſtances. But water in this ſtate may be conſidered rather as fitted for thoſe purpoſes for which chalybeates are in uſe, than as a preparation of the aerial acid.

Flowers of benzoin.

Take of benzoin, in powder, one pound. Put it into an earthen pot, placed in ſand; and, with a ſlow fire, ſublime the flowers into a paper cone fitted to the pot.

If the flowers be of a yellow colour, mix them with white clay, and ſublime them a ſecond time. *L.*

Put any quantity of powdered benzoin into an earthen pot; to which, after fitting it with a large conical paper cap, apply a gentle heat, that the flowers may ſublime. If the flowers be impregnated with oil, let them be purified by ſolution in warm water and cryſtallization. *E.*

Benzoin, expoſed in a retort to a gentle fire, melts, and ſends up into the neck white ſhining cryſtalline flowers, which are followed by an oily ſubſtance. Theſe flowers, which are at preſent conſidered as a peculiar acid, are by ſome termed *acidum benzoicum*. On raiſing the heat a little (a recipient being applied to the neck of the retort), a thin yellowiſh oil comes over, intermingled with an acid liquor, and afterwards a thick butyraceous ſubſtance: this laſt, liquefied in boiling water, gives out to it a conſiderable quantity of ſaline matter (ſeparable by filtration and proper exhalation), which appears in all reſpects ſimilar to the flowers.

It appears, therefore, that the whole quantity of flowers which benzoin is capable of yielding, cannot be obtained by the above proceſſes, ſince a conſiderable portion ariſes after the time of their being diſcontinued. The greateſt part of the flowers ariſe with a leſs degree of heat than what is neceſſary to elevate the oil; but if the operation be haſtily conducted, or if the fire be not exceedingly gentle, the oil will ariſe along with the flowers, and render them foul. Hence, in the way of trade, it is extremely difficult to prepare them of the requiſite whiteneſs and purity; the heat which becomes neceſſary, when large quantities of the benzoin are employed, being ſo great as to force over ſome of the oil along with them.

In order, therefore, to obtain theſe flowers in perfection, only a ſmall quantity of benzoin ſhould be put into the veſſel at a time; and that this may not be any impediment to the requiſite diſpatch, a number of ſhallow flat-bottomed earthen diſhes may be employed, each fitted with another veſſel inverted over it, or a paper cone. With theſe you may fill a ſand furnace; having freſh diſhes charged in readineſs to replace thoſe in the furnace, as ſoon as the proceſs ſhall appear finiſhed in them. The reſiduum of the benzoin ſhould be ſcraped out of each of the veſſels before a freſh parcel be put in.

Theſe flowers, when made in perfection, have an agreeable taſte and fragrant ſmell. They totally diſſolve in ſpirit of wine; and likewiſe, by the aſſiſtance of heat, in water; but ſeparate again from the latter upon the liquor's growing cold, ſhooting into ſaline ſpicula, which unite together into irregular maſſes. By the mediation of ſugar they remain ſuſpended in cold water, and thus form an elegant balſamic ſyrup. Some have held them in great eſteem as pectoral and ſudorific, in the doſe of half a ſcruple or more: but at preſent they are rarely uſed, on account of the offenſive oil which, as uſually prepared, they are tainted with, and from which a freſh ſublimation from tobacco-pipe clay, as formerly practiſed, did not free them ſo effectually as might be wiſhed. The obſervations above related point out the method of depurating them more perfectly, *viz.* by ſolution, filtration, and cryſtallization.

They enter the compoſition of the paregoric elixir, or *tinctura opii camphorata*, as it is now called.

Prepared kali. L.

Take of pot-aſh, two pounds; boiling diſtilled water, three pints. Diſſolve and filter through paper; evaporate the liquor till a pellicle appears on the ſurface; then ſet it aſide for a night, that the neutral ſalts may cryſtalliſe; after which, pour out the liquor, and boil away the whole of the water, conſtantly ſtirring, leſt any ſalt ſhould adhere to the pot. In like manner is purified impure kali from the aſhes of any kind of vegetable. The ſame ſalt may be prepared from tartar burnt till it becomes of an aſh-colour.

Water of pure kali. L.

Take of kali, four pounds; quicklime, ſix pounds; diſtilled water, four gallons. Put four pints of water to the lime, and let them ſtand together for an hour; after which, add the kali and the reſt of the water; then boil for a quarter of an hour: ſuffer the liquor to cool, and ſtrain. A pint of this liquor ought to weigh 16 ounces. If the liquor effervesces with any acid, add more lime.

A preparation ſimilar to this had a place in the former edition of the London pharmacopœia, under the title of *ſoap-ley*. Quicklime, by depriving the mild alkali of its aerial acid, renders it cauſtic: hence this ley is much more acrimonious, and acts more powerfully as a menſtruum of oils, fats, &c. than a ſolution of the potaſſa alone. The lime ſhould be uſed freſh from the kiln; by long keeping, even in cloſe veſſels, it loſes its ſtrength: ſuch ſhould be made choice of as is thoroughly burnt or calcined, which may be known by its comparative lightneſs.

All the inſtruments employed in this proceſs ſhould be either of wood, earthen ware, or glaſs: the common metallic ones would be corroded by the ley, ſo as either to diſcolour or

communicate diſagreeable qualities to it. If it ſhould be needful to filter or ſtrain the liquor, care muſt be taken that the filter or ſtrainer be of vegetable matter: woollen, ſilk, and that ſort of filtering paper which is made of animal ſubſtances, are quickly corroded and diſſolved by it.

The liquor is moſt conveniently weighed in a narrow-necked glaſs bottle, of ſuch a ſize that the meaſure of a wine pint may ariſe ſome height into its neck; the place to which it reaches being marked with a diamond. A pint of the common leys of our ſoap-makers weighs more than 16 ounces: it has been found that their ſoap-ley will be reduced to the ſtandard here propoſed, by mixing it with ſomething leſs than an equal meaſure of water.

Although this liquor is indeed pure alkali diſſolved in water, yet we are inclined to give the preference to the name employed by the Edinburgh college, as well as to the modes of preparing it, directed in the following formula.

Pure kali. L.

Take of water of pure kali, one gallon. Evaporate it to dryneſs; after which, let the ſalt melt on the fire, and form it into rods or ſticks for uſe.

The ſtrongeſt common cauſtic. E.

Take of cauſtic ley, what quantity you pleaſe. Evaporate it in a very clean iron veſſel on a gentle fire, till, on the ebullition ceaſing, the ſaline matter gently flows like oil, which happens before the veſſel becomes red. Pour out the cauſtic thus liquefied on a ſmooth iron plate; let it be divided into ſmall pieces before it hardens, which are to be kept in well-ſhut phials.

Theſe preparations may be conſidered as differing in no eſſential particular. But the directions given by the Edinburgh college are the moſt preciſe and diſtinct.

The effect of the above proceſſes is ſimply to diſcharge the water of the ſolution, whereby the cauſticity of the alkali is more concentrated in any given quantity. Theſe preparations are ſtrong and ſudden cauſtics. The cauſtic prepared in this way has an inconvenience of being apt to liquefy too much on the part to which it is applied, ſo that it is not eaſily confined within the limits in which it is intended to operate; and indeed the ſuddenneſs of its action depends on this diſpoſition to liquefy.

Prepared natron. L.

Take of barilla, powdered, two pounds; diſtilled water, one gallon. Boil the barilla in four pints of water for half an hour, and ſtrain. Boil that part which remains after ſtraining with the reſt of the water, and ſtrain. Evaporate the mixed liquors to two pints, and ſet them by for eight days; ſtrain this liquor again; and, after due boiling, ſet it aſide to cryſtallize. Diſſolve the cryſtals in diſtilled water; ſtrain the ſolution, boil, and ſet it aſide to cryſtallize.

The name of *natron*, here uſed by the London college for the fixed foſſil alkali, has, as well as their name for the vegetable alkali, been objected to; and though they are here ſupported by the authority of the ancients, yet perhaps they would have done better in following the beſt modern chemiſts by employing the term *ſalt of ſoda*.

It is with great propriety, that in this, as well as many other proceſſes, the London college direct the uſe of diſtilled water, as being free from every impregnation.

The natron, or foſſil alkali, is found lying on the ground in the iſland of Teneriff, and ſome other countries. The native productions of this ſalt ſeem to have been better known to the ancients than to late naturaliſts; and it is, with good reaſon, ſuppoſed to be the nitre of the Bible. How far the native natron may ſuperſede artificial means to procure it from mixed bodies, we have not been able to learn with certainty.

The foſſil alkali is not only a conſtituent of different neutrals, but is alſo ſometimes employed as a medicine by itſelf. And in its purified ſtate it has been by ſome reckoned uſeful in affections of the ſcrofulous kind. See NATRUM.

Prepared ammonia. L.

Take of ſal ammoniac, powdered, one pound; prepared chalk, two pounds. Mix and ſublime.

Water of ammonia. L.

Take of ſal ammoniac, one pound; pot-aſh, one pound and a half; water, four pints. Draw off two pints, by diſtillation, with a ſlow fire.

Volatile alkali from ſal ammoniac, commonly called *volatile ſal ammoniac.*

Take of ſal ammoniac, one pound; chalk, very pure and dry, two pounds; mix them well, and ſublime from a retort into a refrigerated receiver.

Spirit of ſal ammoniac. E.

Take ſal ammoniac, purified vegetable fixed alkali, of each ſixteen ounces; water, two pounds. Having mixed the ſalts, and put them into a glaſs retort, pour in the water: then diſtil to dryneſs with a ſand-bath, gradually raiſing the heat.

Theſe articles, which in the laſt edition of the London pharmacopœia were ſtyled *the volatile ſalt and ſpirit of ſal ammoniac*, were then directed to be prepared in the ſame manner.

Sal ammoniac is a neutral ſalt, compoſed of volatile alkali and marine acid. In theſe proceſſes the acid is abſorbed by the fixed alkali or chalk; and the volatile alkali is of courſe ſet at liberty.

The volatile alkali is, however, in its mild ſtate, being combined with the fixed air, or diſcharged from the fixed alkali or chalk on their uniting with the muriatic acid.

The fixed alkali begins to act on the ſal ammoniac, and extricates a pungent urinous odour as ſoon as they are mixed. Hence it is moſt convenient not to mix them till put into the diſtilling veſſel. The two ſalts may be diſſolved ſeparately in water, the ſolutions poured into a retort, and a receiver immediately fitted on. An equal weight of the fixed ſalt is fully, perhaps more than, ſufficient to extricate all the volatile.

The matter which remains in the retort after the diſtillation of the ſpirit, and ſublimation of the volatile ſal ammoniac, is found to conſiſt of marine acid united with the fixed alkali or chalk employed. When fixed alkaline ſalt has been uſed as the intermedium, the reſiduum, or *caput mortuum* as it is called, yields, on ſolution and cryſtallization, a ſalt exactly ſimilar to the ſpirit of ſea-ſalt coagulated afterwards deſcribed; and hence we may judge of the extraordinary virtues formerly attributed to this ſalt under the names of *ſal antihyſtericum, antihypochondriacum, febrifugum, digeſtivum Sylvii*, &c.

The caput mortuum of the volatile ſalt, where chalk is employed as an intermedium, expoſed to a moiſt air, runs into a pungent liquor, which proves nearly the ſame with a ſolution of chalk made directly in the marine acid. It is called by ſome *oleum cretæ*, oil of chalk. If calcined ſhells, or other animal limes, be mingled with ſal ammoniac, a maſs will be obtained, which likewiſe deliqueſces in the air, and forms a liquor of the ſame kind.

Water of pure ammonia. L.

Take of ſal ammoniac, one pound; quicklime, two pounds; water, one gallon. Add to the lime two pints of the water. Let them ſtand together an hour: then add the ſal ammoniac and the other ſix pints of water boiling, and immediately cover the veſſel. Pour out the liquor when cold, and diſtil off with a ſlow fire one pint.

This ſpirit is held to be too acrimonious for internal uſe, and has therefore been chiefly employed for ſmelling to in faintings, &c. though, when properly diluted, it may be given inwardly with ſafety. It is a powerful menſtruum for ſome vegetable ſubſtances, as Peruvian bark, from which the other ſpirits extract little. It is alſo moſt convenient for the purpoſe of rendering oils miſcible with water, as in the preparation of what is called, in extemporaneous practice, *the oily mixture*.

The volatile-liquor, ſalt, and oil, of hartſhorn. L.

Take of hartſhorn, ten pounds. Diſtil with a fire gradually increaſed. A volatile liquor, ſalt, and oil, will aſcend. The oil and ſalt being ſeparated, diſtil the liquor three times. To the ſalt add an equal weight of prepared chalk, and ſublime thrice, or till it become white.

The ſame volatile liquors, ſalt, and oil, may be obtained from any parts (except the fat) of all kinds of animals.

The volatile alkali obtained from hartſhorn, whether in a ſolid or fluid ſtate, is preciſely the ſame with that obtained from ſal ammoniac. And as that proceſs is the eaſieſt, the Edinburgh college have entirely rejected the preſent. While, however, the names of ſpirit and ſalt of hartſhorn are ſtill in daily uſe, ammonia, or the volatile alkali, is ſtill prepared from bones, and other animal ſubſtances, by ſeveral very extenſive traders.

The wholeſale dealers have very large pots for the diſtillation of hartſhorn, with earthen heads almoſt like thoſe of the common ſtill. For receivers, they uſe a couple of oil jars, the mouths of which are luted together; the pipe that comes from the head enters the lowermoſt jar through a hole made on purpoſe in its bottom. When a large quantity of the ſubject is to be diſtilled, it is cuſtomary to continue the operation for ſeveral days ſucceſſively; only unluting the head occaſionally to put in freſh materials.

When only a ſmall quantity of ſpirit or ſalt is wanted, a common iron pot, ſuch as is uſually fixed in ſand furnaces, may be employed, an iron head being fitted to it. The receiver ought to be large, and a glaſs, or rather tin, adopter inſerted between it and the pipe of the head.

The diſtilling veſſel being charged with pieces of the horn, a moderate fire is applied, which is ſlowly increaſed, and raiſed at length almoſt to the utmoſt degree. At firſt a watery liquor ariſes, the quantity of which will be ſmaller or greater according as the horns were more or leſs dry: this is ſucceeded by the ſalt and oil: the ſalt at firſt diſſolves as it comes over in the phlegm, and thus forms what is called *ſpirit*. When the phlegm is ſaturated, the remainder of the ſalt concretes in a ſolid form to the ſides of the recipient. If it be required to have the whole of the ſalt ſolid and undiſſolved, the phlegm ſhould be removed as ſoon as the ſalt begins to ariſe, which may be known by the appearance of white fumes; and that this may be done the more commodiouſly, the receiver ſhould be left unluted till this firſt part of the proceſs be finiſhed. The white vapours which now ariſe ſometimes come with ſuch vehemence as to throw off or burſt the receiver. To prevent this accident, it is convenient to have a ſmall hole in the luting, which may be occaſionally ſtopped with a wooden peg, or opened, as the operator ſhall find proper. After the ſalt has all ariſen, a thick dark-coloured oil comes over. The proceſs is now to be diſcontinued; and the veſſels, when grown cold, unluted.

All the liquid matters being poured out of the receiver, the ſalt which remains adhering to its ſides is to be waſhed out with a little water and added to the reſt. It is convenient to let the whole ſtand for a few hours, that the oil may the better diſengage itſelf from the liquor, ſo as to be firſt ſeparated by a funnel, and afterwards more perfectly by filtration through wet paper. The ſalt and ſpirits are then to be farther purified as above directed.

The ſpirit of hartſhorn met with in the ſhops is extremely precarious in point of ſtrength; the quantity of ſalt contained in it (on which its efficacy depends) varying according as the diſtillation in rectifying it is continued for a longer or ſhorter time. If, after the volatile ſalt has ariſen, ſo much of the phlegm or watery part be driven over as is juſt ſufficient to diſſolve it, the ſpirit will be fully ſaturated, and as ſtrong as it can be made. If the proceſs be not at this inſtant ſtopped, the phlegm, continuing to ariſe, muſt render the ſpirit continually weaker and weaker. The diſtillation therefore ought to be diſcontinued at this period, or rather while ſome of the ſalt ſtill remains undiſſolved; the ſpirit will thus prove always equal, and the buyer be furniſhed with a certain criterion of its ſtrength. Very few have taken any notice of the above-mentioned inconvenience of theſe kinds of ſpirits; and the remedy is firſt hinted at in the *Pharmacopœia Reformata*. The purity of the ſpirit is eaſily determined from its clearneſs and grateful odour.

Volatile alkaline ſalts, and their ſolutions called *ſpirits*, agree in many reſpects with fixed alkalis, and their ſolutions or leys: as in changing the colour of blue flowers to a green; effervеſcing when in their mild ſtate with, and neutralizing, acids; liquefying the animal juices; and corroding the fleſhy parts, ſo as, when applied to the ſkin, and prevented from exhaling by a proper covering, to act as cauſtics; diſſolving oils and ſulphur, though leſs readily than the fixed alkalis, on account probably of their not being able to bear any conſiderable heat, by which their activity might be promoted. Their principal difference from the other alkalis ſeems to conſiſt in their volatility. They exhale or emit pungent vapours in the coldeſt ſtate of the atmoſphere; and by their ſtimulating ſmell they prove ſerviceable in languors and faintings. Taken internally, they diſcover a greater colliquating as well as ſtimulating power; the blood drawn from a vein, after their uſe has been continued for ſome time, is ſaid to be remarkably more fluid than before; they are likewiſe more diſpoſed to operate by perſpiration, and to act on the nervous ſyſtem. They are particularly uſeful in lethargic caſes; in hyſterical and hypochondriacal diſorders; and in the languors, headachs, inflations of the ſtomach, flatulent colics, and other ſymptoms which attend them. They are generally found more ſerviceable to aged perſons, and in phlegmatic habits, than in the oppoſite circumſtances. In ſome fevers, particularly thoſe of the low kind, accompanied with a cough, hoarſeneſs, and a redundance of phlegm, they are of great utility, raiſing the *vis vitæ*, and exciting a ſalutary diaphoreſis; but in putrid fevers, ſcurvies, and wherever the maſs of blood is thin and acrimonious, their uſe is ambiguous. As they are more powerful than the fixed in liquefying tenacious humours, ſo they prove more hurtful where the fluids are already in a colliquated ſtate. In vernal intermittents, particularly thoſe of the ſlow kind, they are often the moſt efficacious remedy. Dr. Biſſet obſerves, in his Eſſay on the Medical Conſtitution of Great Britain, that though many caſes occur which will yield to no other medicine than the bark, yet he has met with many which were only ſuppreſſed from time to time by the bark, but were com-

pletely cured by alkaline ſpirits. He tells us, that theſe ſpirits will often carry off vernal intermittents without any previous evacuation: but that they are generally more effectual if a purge be premiſed; and in plethoric or inflammatory caſes, or where the fever perſonates a remittent, veneſection is neceſſary.

Theſe ſalts are moſt commodiouſly taken in a liquid form, largely diluted; or in that of a bolus, which ſhould be made up only as it is wanted. The doſe is from a grain or two to ten or twelve. Ten drops of a well-made ſpirit, or ſaturated ſolution, are reckoned to contain about a grain of the ſalt. In intermittents, 15 or 20 drops of the ſpirit are given in a tea-cupful of cold ſpring water, and repeated five or ſix times in each intermiſſion.

The volatile ſalts and ſpirits prepared from different animal ſubſtances have been ſuppoſed capable of producing different effects on the human body, and to receive ſpecific virtues from the ſubject. The ſalt of vipers has been eſteemed particularly ſerviceable in diſorders occaſioned by the bite of that animal; and a ſalt drawn from the human ſkull, in diſeaſes of the head. But modern practice acknowledges no ſuch different effects from theſe preparations: and chemical experiments have ſhown their identity. There is indeed, when not ſufficiently purified, a very perceptible difference in the ſmell, taſte, degree of pungency, and volatility of theſe ſalts; and in this ſtate their medicinal virtues vary conſiderably enough to deſerve notice: but this difference they have in common, according as they are more or leſs loaded with oil, not as they are produced from this or that animal ſubſtance. As firſt diſtilled, they may be looked on as a kind of volatile ſoap, in which the oil is the prevailing principle; in this ſtate they have much leſs of the proper alkaline acrimony and pungency than when they have undergone repeated diſtillations, and ſuch other operations as diſengage the oil from the ſalt; for by theſe means they loſe their ſaponaceous quality, and, acquiring greater degrees of acrimony, become medicines of a different claſs. Theſe preparations therefore do not differ near ſo much from each other as they do from themſelves in different ſtates of purity. To which may be added, that when we conſider them as loaded with oil, the virtues of a diſtilled animal oil itſelf are likewiſe to be brought into the account.

Theſe oils, as firſt diſtilled, are highly fetid and offenſive, of an extremely heating quality, and of ſuch activity, that, according to Hoffman's account, half a drop diſſolved in a dram of ſpirit of wine is ſufficient to raiſe a copious ſweat. By repeated rectifications, they loſe their offenſiveneſs, and at the ſame time become mild in their medicinal operation. The rectified oils may be given to the quantity of twenty or thirty drops, and are ſaid to be anodyne and antiſpaſmodic, to procure a calm ſleep and gentle ſweat, without heating or agitating the body, as has been obſerved in treating of the animal oil. It is obvious, therefore, that the ſalts and ſpirits muſt differ, not only according to the quantity of oil they contain, but according to the quality of the oil itſelf in its different ſtates.

The volatile ſalt and ſpirits, as firſt diſtilled, are of a brown colour, and a very offenſive ſmell: by repeated rectification, as directed in the proceſſes above ſet down, they loſe great part of the oil on which theſe qualities depend, the ſalt becomes white, the ſpirit limpid as water, and of a grateful odour; and this is the mark of ſufficient rectification.

It has been objected to the repeated rectification of theſe preparations, that, by ſeparating the oil, it renders them ſimilar to the pure ſalt and ſpirit of ſal ammoniac, which are procurable at an eaſier rate. But the intention is not to purify them wholly from the oil, but to ſeparate the groſſer part, and to ſubtilize the reſt, ſo as to bring it towards the ſame ſtate as when the oil is rectified by itſelf. The rectification of ſpirit of hartſhorn has been repeated twenty times ſucceſſively, and found ſtill to participate of oil, but of an oil very different from what it was in the firſt diſtillation.

The rectified oils, in long keeping, become again fetid. The ſalts and ſpirits alſo, however carefully rectified, ſuffer in length of time the ſame change; reſuming their original brown colour and ill ſmell; a proof that the rectification is far from having diveſted them of oil. Any intentions, however, which they are thus capable of anſwering, may be as effectually accompliſhed by a mixture of the volatile alkali with the animal oil, in its rectified ſtate, to any extent that may be thought neceſſary.

Vitriolated kali. L.

Take of the ſalt which remains after the diſtillation of the nitrous acid, two pounds. Diſtilled water, two gallons. Burn out the ſuperfluous acid with a ſtrong fire in an open veſſel; then boil it a little while in the water; ſtrain, and ſet the liquor aſide to cryſtallize.

The ſalt thus formed is the ſame with the vitriolated tartar of the laſt edition of the London pharmacopœia; but it is now prepared in a cheaper and eaſier manner, at leaſt for thoſe who diſtil the nitrous acid. In both ways a neutral is formed, conſiſting of the fixed vegetable alkali, united to the vitriolic acid. But a ſimilar compound may alſo be obtained by the following proceſs of the Edinburgh pharmacopœia.

Vitriolated tartar in ſmall doſes, as a ſcruple or half a dram, is an uſeful aperient; in large ones, as four or five drams, a mild cathartic, which does not paſs off ſo haſtily as the bitter cathartic ſal or ſalt of Glauber, and ſeems to extend its action further. The wholeſale dealers in medicines have commonly ſubſtituted for it an article otherwiſe almoſt uſeleſs in their ſhops, the reſiduum of Glauber's ſpirit of nitre. This may be looked on as a venial fraud, if the ſpirit has been prepared as formerly directed, and the reſiduum diſſolved and cryſtallized: but it is a very dangerous one if the vitriolic acid has been uſed in an over proportion, and the caput mortuum employed without cryſtallization; the ſalt in this caſe, inſtead of a mild neutral one, of a moderately bitter taſte, proving highly acid. The purchaſer ought therefore to inſiſt on the ſalt being in a cryſtalline form. The cryſtals when perfect are oblong, with ſix flat ſides, and terminated at each end by a ſix-ſided pyramid: ſome appear compoſed of two pyramids joined together by the baſes; and many, in the moſt perfect cryſtallizations we have ſeen, are very irregular. They decrepitate in the fire, ſomewhat like thoſe of ſea-ſalt, for which they have ſometimes been miſtaken.

Vitriolated natron. L.

Take of the ſalt which remains after the diſtillation of the muriatic acid, two pounds; diſtilled water, two pints and an half. Burn out the ſuperfluous acid with a ſtrong fire in an open veſſel; then boil it for a little in the water: ſtrain the ſolution, and ſet it by to cryſtallize.

The title of *cathartic ſalt*, which this ſalt has often had, expreſſes its medical virtues. Taken from half an ounce to an ounce, or more, it proves a mild and uſeful purgative; and in ſmaller doſes, largely diluted, a ſerviceable aperient and diuretic. The ſhops frequently ſubſtitute for it the bitter cathartic ſalt, which is nearly of the ſame quality, but ſomewhat more unpleaſant, and, as is ſaid, leſs mild in operation. They are very eaſily diſtinguiſhable from each other, by the effect of alkaline ſalts upon ſolutions of them. The ſolutions of Glauber's ſalt ſuffer no viſible change from this addition, its own baſis being a true fixed alkali: but the ſolution of the bitter cathartic ſalt grows inſtantly white and turbid; its baſis, which is an earth, being extricated copiouſly by the alkaline ſalt.

Acetated kali. L.

Take of kali one pound; boil it with a ſlow fire in four or five times its quantity of diſtilled vinegar: the effervescence ceaſing, let there be added at different times more diſtilled vinegar, until the laſt vinegar being nearly evaporated, the addition of freſh will excite no effervescence, which will happen when about twenty pounds of diſtilled vinegar are conſumed; afterwards let it be dried ſlowly. An impure ſalt will be left, which melt for a little while with a ſlow fire; then let it be diſſolved in water, and filtered through paper. If the fuſion has been rightly performed, the ſtrained liquor will be colourleſs; if otherwiſe, of a brown colour. Laſtly, evaporate this liquor with a ſlow fire, in a very ſhallow glaſs veſſel; frequently ſtirring the maſs, that the ſalt may be more completely dried, which ſhould be kept in a veſſel cloſe ſtopped. The ſalt ought to be very white, and diſſolve wholly, both in water and ſpirit of wine, without leaving any fæces. If the ſalt, although white, ſhould depoſit any fæces in ſpirit of wine, that ſolution in the ſpirit ſhould be filtered through paper, and the ſalt again dried.

This ſalt had formerly the name of *diuretic ſalt* in the London pharmacopœia. Its purification is not a little troubleſome. The operator muſt be particularly careful, in melting it, not to uſe a great heat, or to keep it long liquefied: a little ſhould be occaſionally taken out, and put into water; and as ſoon as it begins to part freely with its black colour, the whole is to be removed from the fire. In the laſt drying, the heat muſt not be ſo great as to melt it, otherwiſe it will not prove totally ſoluble. If the ſolution in ſpirit of wine be exſiccated, and the remaining ſalt liquefied with a very gentle fire, it gains the leafy appearance which has procured it the name *terra foliata.*

Water of acetated ammonia. L.

Take of ammonia, by weight, two ounces; diſtilled vinegar, four pints; or as much as is ſufficient to ſaturate the ammonia.

This article has long been known by the name of *Spiritus Mindereri*, ſo called from the inventor. It is an excellent aperient ſaline liquor. Taken warm in bed, it proves commonly a powerful diaphoretic or ſudorific; and as it operates without heat, it has place in febrile and inflammatory diſorders, where medicines of the warm kind, if they fail of procuring ſweat, aggravate the diſtemper. Its action may likewiſe be determined to the kidneys, by walking about in a cool air. The common doſe is half an ounce, either by itſelf, or along with other medicines adapted to the intention. Its ſtrength is not a little precarious, depending much on that of the vinegar; an inconvenience which cannot eaſily be obviated, for the ſaline matter is not reducible to the form of a concrete ſalt.

Tartarized kali. L.

Take of kali one pound; cryſtals of tartar, three pounds; diſtilled water, boiling, one gallon. To the ſalt, diſſolved in water, throw in gradually the cryſtals of tartar, powdered: filter the liquor, when cold, through paper; and, after due evaporation, ſet it apart to cryſtallize.

Soluble tartar, in doſes of a ſcruple, half a dram, or a dram, is a mild cooling aperient: two or three drams commonly looſen the belly, and an ounce proves pretty ſtrongly purgative. It has been particularly recommended as a purgative for maniacal and melancholic patients. Malouin ſays, it is equal in purgative virtue to the cathartic ſalt of Glauber. It is an uſeful addition to the purgatives of the reſinous kind, as it promotes their operation, and at the ſame time tends to correct their griping quality. But it muſt never be given in conjunction with any acid; for all acids decompound it, abſorbing its alkaline ſalt, and precipitating the tartar. On this account it is improper to join it to tamarinds, or ſuch like acid fruits; which is too often done in the extemporaneous practice of thoſe phyſicians who are fond of mixing different cathartics together.

Tartarized natron. L.

Take of natron, 20 ounces; cryſtals of tartar, powdered, 2 pounds; diſtilled water, boiling, 10 pints. Diſſolve the natron in the water, and gradually add the cryſtals of tartar: filter the liquor through paper; evaporate, and ſet it aſide to cryſtallize.

Tartarized ſoda, commonly called *Rochel ſalt.* E.

The Rochel ſalt may be prepared from purified foſſil alkaline ſalt and cryſtals of tartar, in the ſame manner as directed for the ſoluble tartar.

This is a ſpecies of ſoluble tartar, made with the ſalt of kali or ſoda, which is the ſame with the mineral alkali, or baſis of ſea-ſalt. It cryſtallizes far more eaſily than the preceding preparation, and does not, like it, grow moiſt in the air. It is alſo conſiderably leſs purgative, but is equally decompounded by acids. It appears to be a very elegant ſalt, and begins now to come into eſteem in this country, as it has long been in France.

Acid ſalt of borax. Suec.

Take of borax, an ounce and a half; warm ſpring-water, one pound. Mix them in a glaſs veſſel, that the borax may be diſſolved; then pour into it three drams of the concentrated acid of vitriol: evaporate the liquor till a pellicle appears upon it; after this let it remain at reſt till the cryſtals be formed. Let them be waſhed with cold water, and kept for uſe.

This ſalt, which has long been known by the title of the *ſedative ſalt of Homberg*, is not unfrequently formed by ſublimation: but the proceſs by cryſtallization here directed is leſs troubleſome, though the ſalt proves generally leſs white, and is apt likewiſe to retain a part of Glauber's ſalt, eſpecially if the evaporation be long protracted.

The ſalt of borax to the taſte appears to be a neutral; but when it is examined by alkalis, it ſhows the properties of an acid, effervescing, uniting, and cryſtallizing with them, and it deſtroys their alkaline quality. It diſſolves both in water and ſpirit of wine, although not very readily in either.

The virtues attributed to it may in ſome degree be inferred from the name of *ſedative*, by which it was long diſtinguiſhed. It has been ſuppoſed to be a mild anodyne, to diminiſh febrile heat, to prevent or remove delirium, and to allay, at leaſt for ſome time, ſpaſmodical affections, particularly thoſe which are the attendants of hypochondriaſis and hyſteria. It may be given in doſes from two to twenty grains.

Chap. VIII. *Magneſia.*

White magneſia.

Take of bitter purging ſalt, kali, each two pounds; diſtilled water, boiling, 20 pints. Diſſolve the bitter ſalt and the kali ſeparately in 10 pints of water, and filter through paper; then mix them. Boil the liquor a little while, and ſtrain it while hot through linen, upon which will remain the white magneſia; then waſh away, by repeated affuſions of diſtilled water, the vitriolated kali. *L.*

Take of bitter purging ſalt, purified fixed vegetable alkali, equal weights. Diſſolve them ſeparately in double their quantity of warm water, and let the liquor be ſtrained or otherwiſe freed from the fæces; then mix them, and inſtantly add eight times their quantity of warm water. Let the liquor boil a little, ſtirring it very well at the ſame time; then let it reſt till the heat be ſomewhat diminiſhed; after which ſtrain it through a cloth: the magneſia will remain

upon the cloth, and it is to be washed with pure water till it be altogether void of saline taste. *E.*

The processes here directed by the London and Edinburgh colleges are nearly the same; but the former seem to have improved somewhat on the latter, both in simplifying the process, and in the employment of distilled water.

Magnesia, when prepared in perfection, is a white and very subtile earth, perfectly void of smell or taste, of the class of those which dissolve in acids. It dissolves freely even in the vitriolic acid; which, in the common way of making solutions, takes up only an inconsiderable portion of other earths. Combined with this acid, it forms the bitter purging or Epsom salt, very easily soluble in water; while the common absorbents form with the same acid almost insipid concretes, very difficult of solution. Solutions of magnesia in all acids are bitter and purgative, while those of the other earths are more or less austere and astringent. A large dose of magnesia, if the stomach contain no acid to dissolve it, does not purge, or produce any sensible effect; a moderate one, if an acid be lodged there, or if acid liquors be taken after it, procures several stools; whereas the common absorbents, in the same circumstances, instead of loosening, bind the belly. It is obvious, therefore, that magnesia is specifically different from the other earths, and that it is applicable to several useful purposes in medicine.

Calcined magnesia.

Take of white magnesia, four ounces. Expose it to a strong heat for two hours; and, when cold, set it by. Keep it in a vessel closely stopped. *L.*

Let magnesia, put into a crucible, be continued in a red heat for two hours; then put it up in close glass vessels. *E.*

By this process the magnesia is freed of fixed air; which, according to Dr. Black's experiments, constitutes about $\frac{7}{12}$ths of its weight. A kind of opaque foggy vapour is observed to escape during the calcination, which is nothing else than a quantity of fine particles of magnesia buoyed off along with a stream of the disengaged air. About the end of the operation, the magnesia exhibits a kind of luminous or phosphorescent property; and this may be considered as a pretty exact criterion of its being deprived of air.

Calcined magnesia is equally mild as when saturated with fixed air; and this circumstance is sufficient to establish a difference between it and calcareous earths, all of which are converted by calcination into a caustic quicklime.

The calcined magnesia is used for the same general purposes as the magnesia combined with fixed air. In certain affections of the stomach, accompanied with much flatulence, the calcined magnesia is found preferable, not only as containing more of the real earth of magnesia in a given quantity, but as being also deprived of its air. It neutralizes the acid of the stomach without that extrication of air which is often a troublesome consequence in employing the aerated magnesia in these complaints. It is proper to observe, that magnesia, whether combined with or deprived of fixed air, is similar to the mild calcareous earths in promoting and increasing putrefaction. The same has even been observed with respect to the Epsom and some other salts which have this earth for their base.

Chap. IX. *Preparations of* Sulphur.

Sulphurated kali. L.

Take of flowers of sulphur, one ounce; kali, five ounces. Mix the salt with the melted sulphur, by frequently stirring, until they unite into an uniform mass.

This preparation, in the former editions of our pharmacopœias, had the name of *hepar sulphuris*, or *liver of sulphur*.

It is much more convenient to melt the sulphur first by itself, and add the salt of tartar by degrees, as here directed, than to grind them together and afterwards endeavour to melt them as ordered in former editions; for in this last case the mixture will not flow sufficiently thin to be properly united by stirring; and the sulphur either takes fire or sublimes in flowers, which probably has been the reason why so large a proportion of it has been commonly directed. Even in the present method a considerable part of the sulphur will be dissipated; and if it were not, the hepar would not be of its due quality; for one part of sulphur requires two of the alkaline salt to render it perfectly soluble in water, which this preparation ought to be.

The hepar sulphuris has a fetid smell and a nauseous taste. Solutions of it in water, made with sugar into a syrup, have been recommended in coughs and other disorders of the breast. Our pharmacopœias, nevertheless, have deservedly rejected this syrup, as common practice has almost done the balsams. Solutions of the hepar in water have been also recommended in herpetic and other cutaneous affections. Some physicians have even employed this solution, in a large quantity, as a bath for the cure of psora; and in cases of tinea capitis it has often been used by way of lotion.

The hepar, digested in rectified spirit of wine, imparts a rich gold colour, a warm, somewhat aromatic, taste, and a peculiar, not ungrateful, smell. A tincture of this kind is kept in the shops under the name of another mineral. The hepar sulphuris has been by some strongly recommended to prevent the effects of mineral poison.

Sulphurated oil and sulphurated petroleum. L.

Take of flowers of sulphur, four ounces; olive oil, sixteen ounces. Boil the flowers of brimstone with the oil, in a pot slightly covered, until they be united.

In the same manner is made *sulphurated petroleum.*

These articles are analogous to what had formerly a place in our pharmacopœias, under the titles of *balsamum sulphuris simplex, crassum, et Barbadense*. And, besides these, a place was also given to the *balsamum sulphuris anisatum, terebinthinatum*, &c. While these articles, however, are now banished from our pharmacopœias, even those retained are less in use than formerly.

These preparations are more conveniently and safely made in a tall glass body, with the mouth at least an inch in diameter, than in the circulatory or close vessels in which they have commonly been directed to be prepared; for, when the sulphur and oil begin to act vehemently upon each other, they not only rarefy into a large volume, but likewise throw out impetuously great quantities of an elastic vapour; which, if the vessels be closed, or the orifices not sufficient to allow it a free exit, will infallibly burst them. Hoffman relates a very remarkable history of the effects of an accident of this kind. In the vessel above recommended the process may be completed, without danger, in four or five hours, by duly managing the fire, which should be very gentle for some time, and afterwards increased so as to make the oil just bubble or boil; in which state it should be kept till all the sulphur appears to be taken up.

Essential oils, employed as menstrua for sulphur, undergo a great alteration from the degree of heat necessary for enabling them to dissolve the sulphur; and hence the balsams have not near so much of their flavour as might be expected. It should therefore seem more eligible to add a proper quantity of the essential oils to the simple balsam: these readily incorporate by a gentle warmth, if the vessel be now and then shaken. We may thus compose a balsam more elegant than those made in the manner formerly recommended, and which retains so much of the flavour of the oil as is in some measure sufficient to cover the taste of the sulphur, and render it supportable.

The balſams of ſulphur have been ſtrongly recommended in coughs, conſumptions, and other diſorders of the breaſt and lungs: but the reputation which they have had in theſe caſes does not appear to have been built on any fair trial or experience of their virtues. They are manifeſtly hot, acrimonious, and irritating, and therefore ſhould be uſed with the utmoſt caution. They have frequently been found to injure the appetite, offend the ſtomach and viſcera, parch the body, and occaſion thirſt and febrile heats. The doſe of the ſimple balſam is from ten to forty drops: thoſe with eſſential oils are not given in above half theſe quantities. Externally, they are employed for cleanſing and healing foul running ulcers. Boerhaave conjectures that their uſe in theſe caſes gave occaſion to the virtues aſcribed to them when taken internally.

Chap. X. *Preparations of* Antimony.

Antimony is compoſed of a metal, united with ſulphur or common brimſtone.

If powdered antimony be expoſed to a gentle fire, the ſulphur exhales; the metallic part remaining in form of a white calx, reducible, by proper fluxes, into a whitiſh brittle metal, called *regulus*. This is readily diſtinguiſhed from the other bodies of that claſs, by its not being ſoluble in aquafortis; its proper menſtruum is aqua-regia.

If aqua-regia be poured on crude antimony, the metallic part will be diſſolved; and the ſulphur thrown out, partly to the ſides of the veſſel, and partly to the ſurface of the liquor, in the form of a greyiſh yellow ſubſtance. This, ſeparated and purified by ſublimation, appears on all trials the ſame with pure common brimſtone.

The metal freed from the ſulphur naturally blended with it, and afterwards fuſed with common brimſtone, reſumes the appearance and qualities of crude antimony.

The antimonial metal is a medicine of the greateſt power of any known ſubſtance; a quantity too minute to be ſenſible in the tendereſt balance is capable of producing violent effects, if taken diſſolved, or in a ſoluble ſtate. If given in ſuch a form as to be immediately miſcible with the animal fluids, it proves violently emetic; if ſo managed as to be more ſlowly acted on, cathartic; and in either caſe, if the doſe be extremely ſmall, diaphoretic. Thus, though vegetable acids extract ſo little from this metal, that the remainder ſeems to have loſt nothing of its weight, the tinctures prove in large doſes ſtrongly emetic, and in ſmaller ones powerfully diaphoretic. The regulus has been caſt into the form of pills, which acted as violent cathartics, though without ſuffering any ſenſible diminution of weight in their paſſage through the body; and this repeatedly for a great number of times.

This metal, diveſted of the inflammable principle which it has in common with other metallic bodies that are reducible to a calx, becomes indiſſoluble and inactive. The calx, nevertheleſs, urged with a ſtrong fire, melts into a glaſs, which is as eaſy of ſolution, and as violent in operation, as the regulus itſelf: the glaſs, thoroughly mixed with ſuch ſubſtances as prevent its ſolubility, as wax, reſin, and the like, is again rendered mild.

Vegetable acids, as has already been obſerved, diſſolve but an extremely minute portion of this metal: the ſolution nevertheleſs is powerfully emetic and cathartic. The nitrous and vitriolic acids only corrode it into a powder, to which they adhere ſo ſlightly as to be ſeparable in a conſiderable degree by water, and totally by fire, leaving the regulus in form of a calx ſimilar to that prepared by fire alone. The marine acid has a very different effect: this reduces the regulus into a violent corroſive; and though it difficultly unites, yet it adheres ſo very cloſely as not to be ſeparable by any ablution, nor by fire, the regulus ariſing along with it. The nitrous or vitriolic acids expel the marine, and thus reduce the corroſive into a calx ſimilar to the foregoing.

Sulphur remarkably abates the power of this menſtruum, hence crude antimony, in which the regulus appears to be combined with ſulphur, from one fourth to one-half its weight, proves altogether mild. If a part of the ſulphur be taken away by ſuch operations as do not deſtroy or calcine the metal, the remaining maſs becomes proportionally more active.

The ſulphur of antimony may be expelled by deflagration with nitre: the larger the quantity of nitre, to a certain point, the more of the ſulphur will be diſſipated, and the preparation will be the more active. If the quantity of nitre be more than ſufficient to conſume the ſulphur, the reſt of it, deflagrating with the inflammable principle of the regulus itſelf, renders it again mild.

The ſulphur of antimony is likewiſe abſorbed by fuſion by certain metals and by alkaline ſalts. Theſe laſt, when united with ſulphur, prove a menſtruum for all the metals (zinc excepted); and hence, if the fuſion be long continued, the regulus is taken up, and rendered ſoluble in water.

From theſe particulars with reſpect to antimony it may naturally be concluded, that it not only furniſhes us with a uſeful and active medicine, but that it may alſo be exhibited for medical purpoſes under a great variety of different forms, and that the effects of theſe will be conſiderably diverſified. And this has in reality been the caſe. For further information reſpecting antimony, and its uſes in medicine, we refer our readers to the articles Antimony, Materia Medica, and Chemistry. But although there is perhaps no preparation there mentioned, which is not fitted to ſerve ſome uſeful purpoſe; yet the colleges both of London and Edinburgh have now reſtricted the number of preparations in their pharmacopœias to a few only. And it is highly probable, that from the proper employment of them, every uſeful purpoſe to be anſwered by antimony may be accompliſhed.

Calcined antimony. L.

Take of antimony, powdered, eight ounces; nitre, powdered, two pounds. Mix them, and caſt the mixture by degrees into a red hot crucible. Burn the white matter about half an hour; and, when cold, powder it; after which waſh it with diſtilled water.

In the laſt edition of the London pharmacopœia this preparation had the name of *calx of antimony*; and it may be conſidered as at leaſt very nearly approaching to ſome other antimonials of the old pharmacopœias, particularly to the nitrated diaphoretic antimony, waſhed ditto, and ſtibiated nitre; none of which are now received as ſeparate formulas of our pharmacopœia; and indeed even the calx of antimony itſelf, at leaſt as thus prepared, has now no place in the Edinburgh pharmacopœia.

The calx of antimony, when freed by waſhing from the ſaline matter, is extremely mild, if not altogether inactive. Hoffman, Lemery, and others, aſſure us, that they have never experienced from it any ſuch effects as its uſual title imports: Boerhaave declares, that it is a mere metallic earth, entirely deſtitute of all medicinal virtue: and the committee of the London college admit that it has no ſenſible operation. The common doſe is from five grains to a ſcruple, or half a dram; though Wilſon relates, that he has known it given by half ounces, and repeated two or three times a day, for ſeveral days together.

Some report that this calx, by keeping for a length of time, contracts an emetic quality: from whence it has been concluded, that the powers of the reguline part are not entirely deſtroyed; that the preparation has the virtues of other antimonials which are given as alteratives; that is, in ſuch ſmall doſes as not to ſtimulate the primæ viæ; and that therefore diaphoretic antimony, or calcined antimony, as it is now more properly ſtyled, is

certainly among the mildeſt preparations of that mineral, and may be uſed for children, and ſimilar delicate conſtitutions, where the ſtomach and inteſtines are eaſily affected. The obſervations, however, from which theſe concluſions are drawn, do not appear to be well founded: Ludovici relates, that after keeping the powder for four years it proved as mild as at firſt: and the Straſburgh pharmacopœia, with good reaſon, ſuſpects, that where the calx has proved emetic, it had either been given in ſuch caſes as would of themſelves have been attended with this ſymptom (for the great alexipharmic virtues attributed to it have occaſioned it to be exhibited even in the more dangerous malignant fevers, and other diſorders which are frequently accompanied with vomiting); or that it had not been ſufficiently calcined, or perfectly freed from ſuch part of the regulus as might remain uncalcined. The uncalcined part being groſſer than the true calx, the ſeparation is effected by often waſhing with water, in the ſame manner as directed for ſeparating earthy powders from their groſſer parts.

It has been obſerved, that when diaphoretic antimony is prepared with nitre abounding with ſea-ſalt, of which all the common nitre contains ſome portion, the medicine has proved violently emetic. This effect is not owing to any particular quality of the ſea-ſalt, but to its quantity, by which the proportion of the nitre to the antimony is rendered leſs.

The *nitrum fibiatum*, as it was called, is produced by the deflagration of the ſulphur of the antimony with the nitre, in the ſame manner as the *ſal polychreſt*, from which it differs no otherwiſe than in retaining ſome portion of the antimonial calx.

Notwithſtanding the doubts entertained by ſome reſpecting the activity of the antimonium calcinatum, yet the London college have in our opinion done right in retaining it. For, while it is on all hands allowed that it is the mildeſt of our antimonials, there are ſome accurate obſervers who conſider it as by no means inefficacious. Thus, as Dr. Healde tells us, that he has been in the habit of employing it for upwards of 40 years, and is much deceived, if, when genuine, it be not productive of good effects.

Crocus of antimony.

Take of antimony, powdered; nitre, powdered, of each one pound; ſea ſalt, one ounce. Mix, and put them by degrees into a red-hot crucible, and melt them with an augmented heat. Pour out the melted matter; and, when cold, ſeparate it from the ſcoriæ. *L.*

Equal parts of antimony and nitre are to be injected by degrees into a red-hot crucible; when the detonation is over, ſeparate the reddiſh metallic matter from the whitiſh cruſt; beat it into a powder, and edulcorate it by repeated waſhings with hot water, till the water comes off inſipid. *E.*

Here the antimonial ſulphur is almoſt totally conſumed, and the metallic part left diveſted of its corrector. Theſe preparations, given from two to ſix grains, generally act as violent emetics, greatly diſordering the conſtitution. But the operation, like that of every preparation of antimony whoſe reguline part is not joined with an acid, muſt be liable to variations, according to the quantity and condition of the acid in the ſtomach. Their principal uſe is in maniacal caſes, as the baſis of ſome other preparations; and among the farriers, who frequently give to horſes an ounce or two a day, divided into different doſes, as an alterative: in theſe, and other quadrupeds, this medicine acts chiefly as a diaphoretic.

The chemiſts have been accuſtomed to make the crocus with a leſs proportion of nitre than what is directed above; and without any farther melting than what enſues from the heat which the matter acquires by deflagration, which, when the quantity is large, is very conſiderable: a little common ſalt is added to promote the fuſion. The mixture is put by degrees into an iron pot or mortar, ſomewhat heated, and placed under a chimney: when the firſt ladleful is in, a piece of lighted charcoal is thrown to it, which ſets the matter on fire; the reſt of the mixture is then added by little and little; the deflagration is ſoon over, and the whole appears in perfect fuſion: when cold, a conſiderable quantity of ſcoriæ is found on the ſurface, which ſcoriæ are eaſily knocked off with a hammer. The crocus prepared after this manner is of a redder colour than that of the former editions of the London pharmacopœia. And indeed the method now directed by the London college may be conſidered as founded on this: It differs principally from that of the Edinburgh college in the employment of the ſea-ſalt, by which the proceſs is much facilitated.

Muriated antimony. L.

Take of the crocus of antimony, powdered; vitriolic acid, each one pound; dry ſea ſalt, two pounds. Pour the vitriolic acid into a retort, adding by degrees the ſea-ſalt and crocus of antimony, previouſly mixed; then diſtil in a ſand-bath. Let the diſtilled matter be expoſed to the air ſeveral days, and then let the fluid part be poured off from the dregs.

Butter of antimony. E.

Take of crude antimony, one part; corroſive ſublimate of mercury, two parts. Grind them firſt ſeparately; then thoroughly mix them together, taking the utmoſt care to avoid the vapours. Put the mixture into a coated glaſs retort (having a ſhort wide neck), ſo as to fill one half of it: the retort being placed in a ſand-furnace, and a receiver adapted to it, give firſt a gentle heat, that only a dewy vapour may ariſe: the fire being then increaſed, an oily liquor will aſcend and congeal in the neck of the retort, appearing like ice, which is to be melted down by a live coal cautiouſly applied. This oily matter is to be rectified in a glaſs retort into a pellucid liquor.

The proceſs here directed by the Edinburgh college, and which is nearly the ſame with what ſtood in the former edition of the London pharmacopœia, is extremely dangerous, inſomuch that even the life of the operator, though tolerably verſed in common pharmacy, may be much endangered for want of due care. Boerhaave relates, that one, who from the title he gives him is not to be ſuppoſed inexpert in chemical operations, or unacquainted with the danger attending this, was ſuffocated for want of proper care to prevent the burſting of the retort. The fumes which ariſe, even upon mixing the antimony with the ſublimate, are highly noxious, and ſometimes iſſue ſo copiouſly and ſuddenly as very difficultly to be avoided. The utmoſt circumſpection therefore is neceſſary.

The cauſtic, or butter as it is called, appears to be a ſolution of the metallic part of the antimony in the marine acid of the ſublimate: the ſulphur of the antimony, and the mercury of the ſublimate, remain at the bottom of the retort united into an æthiops. This ſolution does not ſucceed with ſpirit of ſalt in its liquid ſtate, and cannot be effected, unleſs (as in the caſe of making ſublimate) either the acid be highly concentrated, and both the ingredients ſtrongly heated; or when the antimony is expoſed to the vapours of the acid diſtilled from the black calx of manganeſe. By this laſt proceſs a perfect ſolution of the regulus of the antimony in the muriatic acid is effected. Of this more ſimple, more ſafe, and leſs expenſive method of preparing muriated antimony, an account is given by Mr. Ruſſel in the Tranſactions of the Royal Society of Edinburgh.

Antimonial powder. L.

Take of antimony coarſely powdered, hartſhorn ſhavings, each two pounds; mix, and put them into a wide red hot iron pot, ſtirring conſtantly till the maſs acquires a grey colour. Powder the matter when cold, and put it into a coated crucible. Lute to it another crucible inverted, which

has a ſmall hole in its bottom: augment the fire by degrees to a red heat, and keep it ſo for two hours. Laſtly, reduce the matter, when cold, to a very fine powder.

In this preparation, the metallic part of the antimony in a ſtate of calx will be united with that part of the hartſhorn which is indeſtructible by the action of fire, viz. its abſorbent earth. If this powder be properly prepared, it is of a white colour. It is a mild antimonial preparation, and is given as an alterative from three to ſix grains for a doſe. In this quantity, however, it ſometimes creates nauſea, and even vomits. In larger doſes it proves emetic, and operates by ſtool.

Precipitated ſulphur of antimony. L.

Take of antimony, powdered, two pounds; water of pure kali, four pints; diſtilled water, three pints; mix, and boil them with a ſlow fire for three hours, conſtantly ſtirring, and adding the diſtilled water as it ſhall be wanted; ſtrain the hot ley through a double linen cloth; and into the liquor, whilſt yet hot, drop by degrees as much diluted vitriolic acid as is ſufficient to precipitate the ſulphur. Waſh off, with warm water, the vitriolated kali.

Golden ſulphur of antimony. E.

Boil, in an iron pot, four pounds of cauſtic ley diluted with three pints of water, and throw in by degrees two pounds of powdered antimony; keeping them continually ſtirring with an iron ſpatula for three hours, over a gentle fire, and occaſionally ſupplying more water. The liquor loaded with the ſulphur of antimony being then ſtrained through a woollen cloth, drop into it gradually, while it continues hot, ſo much ſpirit of nitre, diluted with an equal quantity of water, as ſhall be ſufficient to precipitate the ſulphur, which is afterwards to be carefully waſhed with hot water.

The foregoing preparations are not ſtrictly ſulphurs; they contain a conſiderable quantity of the metallic part of the antimony, which is reducible from them by proper fluxes. Theſe medicines muſt needs be liable to great variation in point of ſtrength; and in this reſpect they are, perhaps, the moſt precarious, though ſome have affirmed that they are the moſt certain, of the antimonial medicines. They prove emetic when taken on an empty ſtomach, in a doſe of four, five, or ſix grains; but at preſent they are ſcarcely preſcribed with this intention; being chiefly uſed as alterative deobſtruents, particularly in cutaneous diſorders.

Tartariſed antimony. L.

Take of crocus of antimony, powdered, one pound and an half; cryſtals of tartar, two pounds; diſtilled water, two gallons: boil in a glaſs veſſel about a quarter of an hour; filter through paper, and ſet aſide the ſtrained liquor to cryſtallize.

Emetic tartar. E.

Take of the butter of antimony what quantity you chooſe; pour it into warm water, in which ſo much of the purified vegetable fixed alkali has been previouſly diſſolved, that the antimonial powder may be precipitated, which, after being well waſhed, is to be dried. Then to five pounds of water add of this powder nine drams; of cryſtals of tartar, beat into a very fine powder, two ounces and a half; boil for a little, till the powders be diſſolved. Let the ſtrained ſolution be ſlowly evaporated in a glaſs veſſel to a pellicle, ſo that cryſtals may be formed.

We have here two modes of making the moſt common, and perhaps we may add the moſt uſeful, of all the antimonial preparations, long known in the ſhops under the name of *emetic tartar*. Theſe modes differ conſiderably from each other; but in both, the reguline part of the antimony is united with the acid of the tartar. It is perhaps difficult to ſay to which mode of preparation the preference is to be given; for on this ſubject the beſt chemiſts are ſtill divided in their opinion. The mode directed by the London college is nearly the ſame with that in former editions of their pharmacopœia, while that now adopted by the Edinburgh college, in which they have nearly followed the Pharmacopœia Roſſica, is of later date. That in both ways a good emetic tartar may be formed, is very certain: but in our opinion, when it is formed of the precipitate from the muriatic acid, or the *poudre d'Algarotti*, as it has been called, there is the leaſt chance of its being uncertain in its operation: and this method comes recommended to us on the authority of Bergman, Scheele, and ſome other of the firſt names in chemiſtry. Bergman adviſes, that the calx be precipitated by ſimple water, as being leaſt liable to variation; and this is the direction followed in the Pharmacopœia Roſſica. But when the calx is precipitated by an alkaline ley, as is directed by the Edinburgh college, it is more certainly freed from the muriatic acid, and will of courſe be milder.

In the after part of the proceſs, whether precipitate or crocus have been uſed, the quantity of the antimonial ought always to be ſome drams more than is abſolutely neceſſary for faturating the acid of tartar, ſo that no cryſtals may ſhoot which are not impregnated with the active metallic part of the antimony. And in order to ſecure an uniform ſtrength, ſome attention is neceſſary in collecting the cryſtals, as ſome may contain more metal than others. After they are all ſeparated from the liquor, they ought to be beat together in a glaſs mortar, into a fine powder, that the medicine may be of uniform ſtrength.

Emetic tartar is, of all the preparations of antimony, the moſt certain in its operation.

It will be ſufficient, in conſidering the medicinal effects of antimonials, that we ſhould obſerve, once for all, that their emetic property depends on two different conditions of the reguline part: the firſt is where the reguline part is only active, by being rendered ſo from meeting with an acid in the ſtomach: the ſecond is where the reguline part is already joined with an acid, rendering it active. It is obvious, that thoſe preparations, reducible to the firſt head, muſt always be of uncertain operation. Such then is the equal uncertainty in the chemical condition and medicinal effects of the croci, the hepata, and the calces; all of which proceſſes are different ſteps or degrees of freeing the reguline part from ſulphur and phlogiſton. It is equally plain, that the preparations coming under the ſecond head muſt be always conſtant and certain in their operation. Such a one is emetic tartar, the doſe and effects of which we can meaſure with great exactneſs.

The title of this medicine expreſſes its principal operation. It is one of the beſt of the antimonial emetics, acting more powerfully than the quantity of crocus contained in it would do by itſelf, though it does not ſo much ruffle the conſtitution. And indeed antimonials in general, when thus rendered ſoluble by vegetable acids, are more ſafe and certain in their effects than the violent preparations of that mineral exhibited by themſelves; the former never varying in their action from a difference in the food taken during their uſe, or other ſimilar circumſtances, which occaſioning more or leſs of the others to be diſſolved, make them operate with different degrees of force. Thus, crude antimony, where acid food has been liberally taken, has ſometimes proved violently emetic; whilſt in other circumſtances it has no ſuch effect.

The doſe of emetic tartar, when deſigned to produce the full effect of an emetic, is from two to four grains. It may likewiſe be advantageouſly given in much ſmaller doſes as a nauſeating and ſudorific medicine.

Vitrified antimony. L.

Take of powdered antimony, four ounces. Calcine it in a broad earthen veſſel, with a fire gradually raiſed, ſtirring with an iron rod until it no longer emits a ſulphureous ſmoke. Put this powder into a crucible, ſo as to fill two-thirds of it. A

cover being fitted on, make a fire under it, at firſt moderate, afterwards ſtronger, until the matter he melted. Pour out the melted glaſs.

Glaſs of antimony. E.

Strew antimony, beat into a coarſe powder like ſand, upon a ſhallow unglazed earthen veſſel, and apply a gentle heat underneath, that the antimony may be heated ſlowly; keeping it at the ſame time continually ſtirring to prevent it from running into lumps. White vapours of a ſulphureous ſmell will ariſe from it. If they ceaſe to exhale with the degree of heat firſt applied, increaſe the fire a little, ſo that vapours may again arife: go on in this manner, till the powder, when brought to a red heat, exhales no more vapours. Melt the calx in a crucible with an intenſe heat, till it aſſumes the appearance of melted glaſs: then pour it out on a heated braſs plate or diſh.

The calcination of antimony, in order to procure tranſparent glaſs, ſucceeds very ſlowly, unleſs the operator be weary and circumſpect in the management of it. The moſt convenient veſſel is a broad ſhallow diſh, or a ſmooth flat tile, placed under a chimney. The antimony ſhould be the purer ſort, ſuch as is uſually found at the apex of the cones: this, groſsly powdered, is to be evenly ſpread over the bottom of the pan, ſo as not to lie above a quarter of an inch thick on any part. The fire ſhould be at firſt no greater than is juſt ſufficient to raiſe a fume from the antimony, which is to be now and then ſtirred: when the fumes begin to decay, increaſe the heat, taking care not to raiſe it ſo high as to melt the antimony, or run the powder into lumps; after ſome time the veſſel may be made red-hot, and kept in this ſtate until the matter will not, upon being ſtirred, any longer fume. If this part of the proceſs be duly conducted, the antimony will appear in an uniform powder, without any lumps, and of a grey colour.

With this powder fill two-thirds of a crucible, which is to be covered with a tile, and placed in a wind-furnace. Gradually increaſe the fire till the calx be in perfect fuſion, when it is to be now and then examined by dipping a clean iron wire into it. If the matter which adheres to the end of the wire appears ſmooth and equally tranſparent, the vitrification is completed, and the glaſs may be poured out upon a hot ſmooth ſtone or copper plate, and ſuffered to cool ſlowly to prevent its cracking and flying in pieces. It is of a tranſparent yellowiſh red colour.

Cerated glaſs of antimony. E.

Take of yellow wax a dram; glaſs of antimony, reduced into powder, an ounce. Melt the wax in an iron veſſel, and throw into it the powdered glaſs: keep the mixture over a gentle fire for half an hour, continually ſtirring it; then pour it out on paper, and when cold grind it into powder.

The glaſs melts in the wax with a very gentle heat: after it has been about twenty minutes on the fire, it begins to change its colour, and in ten more comes near to that of Scotch ſnuff; which is a mark of its being ſufficiently prepared; the quantity ſet down above loſes about one dram of its weight in the proceſs.

This medicine was for ſome time much eſteemed in dyſenteries: ſeveral inſtances of its good effects in theſe caſes may be ſeen in the fifth volume of the Edinburgh Eſſays, from which the above remarks on the preparations are taken. The doſe is from two or three grains to twenty, according to the age and ſtrength of the patient. In its operation, it makes ſome perſons ſick and vomit; it purges almoſt every one: though it has ſometimes effected a cure without occaſioning any evacuation or ſickneſs. It is now, however, much leſs uſed than formerly.

Chap. XI. Preparations of Silver.

Nitrated ſilver. L.

Take of ſilver, one ounce; diluted nitrous acid, four ounces: Diſſolve the ſilver in the nitrous acid, in a glaſs veſſel, over a ſand-heat; then evaporate with a heat gently raiſed: afterwards melt the reſiduum in a crucible, that it may be poured into proper forms, carefully avoiding too great a heat.

Salt of ſilver, commonly called *lunar cauſtic.* E.

Take of pureſt ſilver, heat into plates, and cut into pieces, four ounces; weak nitrous acid, eight ounces; pureſt water, four ounces. Diſſolve the ſilver in a phial with a gentle heat, and evaporate the ſolution to dryneſs. Then put the maſs into a large crucible, and apply the heat, at firſt gently, but augment it by degrees till the maſs flows like oil; then pour it into iron moulds, previouſly heated, and greaſed with tallow.

Theſe proceſſes do not differ in any material particular. But the name of *nitrated ſilver* is preferable to the more indefinite one of *ſalt of ſilver*.

This preparation is a ſtrong cauſtic; and is frequently employed as ſuch for conſuming warts and other fleſhy excreſcences, keeping down fungous fleſh in wounds or ulcers, and other ſimilar uſes. It is rarely applied where a deep eſchar is required, as in the laying open of impoſthumations and tumors; for the quantity neceſſary for theſe purpoſes, liquefying by the moiſture of the ſkin, ſpreads beyond the limits within which it is intended to operate.

Chap. XII. Preparations of Iron.

Ammoniacal iron. L.

Take of iron filings, one pound; ſal ammoniac, two pounds. Mix, and ſublime. What remains at the bottom of the veſſel mix by rubbing together with the ſublimed matter, and again ſublime.

Martial flowers, commonly called *Ens Veneris.* E.

Take of colcothar of martial vitriol, waſhed and well dried; ſal-ammoniac, equal weights. Having mixed them well, ſublime.

Though the mode of preparation directed by the two colleges is here different, yet the preparation is fundamentally the ſame; and it is perhaps difficult to ſay which mode of preparation is to be preferred as the eaſieſt and beſt.

The name of *ens veneris* has by ſome been very improperly applied to this preparation, as it contains not a particle of copper. The proper *ens veneris* is prepared from the blue vitriol; but, as we ſhall ſoon ſee, is often not materially different from the *martial flowers*.

The ſucceſs of this proceſs depends principally on the fire being haſtily raiſed, that the ſal ammoniac may not ſublime before the heat be ſufficient to enable it to carry up a ſufficient quantity of the iron. Hence, glaſs veſſels are not ſo proper as earthen or iron ones: for, when the former are uſed, the fire cannot be raiſed quickly enough, without endangering the breaking of them. The moſt convenient veſſel is an iron pot; to which may be luted an inverted earthen jar, having a ſmall hole in its bottom, to ſuffer the elaſtic vapours which ariſe during the operation to eſcape. It is of advantage to thoroughly mix the ingredients together, moiſten them with a little water, and then gently dry them; and to repeat the pulverization, humectation, and exſiccation, two or three times, or oftener. If this method be followed, the ſal ammoniac may be increaſed to three times the quantity of the iron, or farther; and a ſingle ſublimation will often be ſufficient to raiſe flowers of a very deep orange colour.

This preparation is ſuppoſed to be highly aperient, and attenuating; though no otherwiſe ſo than the reſt of the chaly-

beates, or at moſt only by virtue of the ſaline matter joined to the iron. It has been found of ſervice in hyſterical and hypochondriacal caſes, and in diſtempers proceeding from a laxity and weakneſs of the ſolids, as the rickets. It may be conveniently taken in the form of a bolus, from two or three grains to ten: it is nauſeous in a liquid form (unleſs in ſpirituous tincture); and occaſions pills to ſwell and crumble, except ſuch as are made of the gums.

Ruſt of iron. L.

Take of iron-filings, one pound; expoſe them to the air, often moiſtening them with water, until they be corroded into ruſt; then powder them in an iron mortar, and waſh off with diſtilled water the very fine powder. But the remainder, which cannot by moderate rubbing be reduced into a powder capable of being eaſily waſhed off, muſt be moiſtened, expoſed to the air for a longer time, and again powdered and waſhed as before. Let the waſhed powder be dried.

The ruſt of iron is preferable as a medicine to the calces or croci, made by a ſtrong fire.

Tartarized iron. L.

Take of filings of iron, one pound; powdered cryſtals of tartar, two pounds. Mix them with diſtilled water into a thick paſte. Expoſe it to the air in an open earthen veſſel for eight days; then grind the matter, dried in a bath of ſand, to a very fine powder.

This is an uſeful preparation of iron, in which that metal is chiefly brought to a ſaline ſtate by means of the cream of tartar. It has now for the firſt time a place in the London pharmacopœia; but it had before been introduced into ſome of the foreign ones, particularly the pharmacopœia Genevenſis, under the title of *mars tartariſatus*; and indeed it is almoſt preciſely the ſame with the *mars ſolubilis* of the old editions of the Edinburgh pharmacopœia.

Vitriolated iron. L.

Take of filings of iron, vitriolic acid, each eight ounces; diſtilled water, three pints. Mix them in a glaſs veſſel; and when the effervescence has ceaſed, place the mixture for ſome time upon hot ſand; then pour off the liquor, ſtraining it through paper; and after due exhalation ſet it aſide to cryſtallize.

Vitriol of iron, or *ſalt of ſteel.* E.

Take of purified filings of iron, ſix ounces; vitriolic acid, eight ounces; water, two pounds and a half. Mix them; and when the effervescence ceaſes, let the mixture ſtand for ſome time upon warm ſand; then ſtrain the liquor through paper, and after due evaporation ſet it aſide to cryſtallize.

During the diſſolution of the iron an elaſtic vapour riſes, which on the approach of flame catches fire and explodes, ſo as ſometimes to burſt the veſſel. To this particular therefore the operator ought to have due regard. This vapour is alſo noxious to animal life. It is the inflammable air of Dr. Prieſtley.

The chemiſts are ſeldom at the trouble of preparing this ſalt according to the directions above given; but in its ſtead ſubſtitute common green vitriol, purified by ſolution in water, filtration, and cryſtallization.

The ſalt of ſteel is one of the moſt efficacious preparations of this metal; and not unfrequently made uſe of in cachectic and chlorotic caſes, for exciting the uterine purgations, ſtrengthening the tone of the viſcera, and deſtroying worms. It may be conveniently taken in a liquid form, largely diluted with water: Boerhaave directs it to be diſſolved in an hundred times its weight of water, and the ſolution to be taken in the doſe of twelve ounces on an empty ſtomach, walking gently after it. Thus managed, he ſays, it opens the body, proves diuretic, kills and expels worms, tinges the excrements black, or forms them into a matter like clay, ſtrengthens the fibres, and thus cures many different diſtempers. The quantity of vitriol in the above doſe of the ſolution is fifty-ſeven grains and a half; but in common practice, ſuch large doſes of this ſtrong chalybeate are never ventured on. Four or five grains, and in many caſes half a grain, are ſufficient for the intention in which chalybeate medicines are given. Very dilute ſolutions, as that of a grain of the ſalt in a pint of water, may be uſed as ſuccedanea to the natural chalybeate waters, and will in many caſes produce ſimilar effects.

Colcothar of vitriol. E.

Let calcined vitriol be urged with a violent fire till it becomes of a very red colour.

In this preparation, the iron, which had been brought to a ſaline ſtate by means of the acid of vitriol, is again deprived of that acid by the action of fire. It may be conſidered therefore as differing in nothing from the reſiduum which remains in the retort, when vitriolic acid is diſtilled from martial vitriol. The colcothar is very rarely employed by itſelf for medical purpoſes; but it is uſed in the preparation of ſome other chalybeates, particularly the martial flowers, when prepared according to the method directed by the Edinburgh college.

Chap. XIII. Preparations of Quickſilver.

We have already treated of mercury in various parts of our work as we found occaſion, and what we have already diſcuſſed it is unneceſſary to repeat. See Mercury, Chemistry, Materia Medica, Metallurgy, and Quickſilver. On the whole, it appears evident that there is no article which has been employed for medical purpoſes in a greater variety of forms. The colleges of London and Edinburgh have admitted into their pharmacopœias only a few of theſe; but from the ſelection they have made, there is reaſon to believe that every uſeful purpoſe for which mercury has been employed may be anſwered; and theſe purpoſes are both numerous and conſiderable. For it is at leaſt very generally allowed among intelligent practitioners, that there are few articles kept in the ſhops of our apothecaries which can be conſidered as ſo extenſively uſeful.

Mercury or quickſilver, in its crude ſtate, is a ponderous metallic fluid, totally volatile in a ſtrong fire, and calcinable by a weaker one (though very difficultly) into a red powdery ſubſtance. It diſſolves in the nitrous acid, is corroded by the vitriolic, but not acted on by the marine in its liquid ſtate: it nevertheleſs may be combined with this laſt ſkilfully applied in the form of fume. Quickſilver unites by trituration with earthy, unctuous, reſinous, and other ſimilar ſubſtances, ſo as to loſe its fluidity: triturated with ſulphur, it forms a black maſs, which by ſublimation changes into a beautiful red one.

For the general virtues of the mercurial preparations, ſee ſome of the articles above referred to, and Medicine. Here we ſhall only obſerve, that while in certain circumſtances they act as ſtimulants, and even as corroſives, to the parts to which they are applied; under a different management, when introduced into the habit, they ſeem to forward circulation through even the ſmalleſt and moſt remote veſſels of the body; and may be ſo managed as to promote all the excretions. But while they thus operate as a powerful ſtimulus to the ſanguiferous, and probably alſo to the lymphatic ſyſtem, they ſeem to exert but little influence on the nervous ſyſtem. By this means they prove eminently ſerviceable in ſome inveterate chronical diſorders, proceeding from obſtinate obſtructions of the glands. Crude mercury has no effect this way. Reſolved into fume, or divided into minute particles, and prevented from reuniting by the interpoſition of other ſubſtances, it operates very powerfully, unleſs the dividing body be ſulphur, which reſtrains its action. Combined with a ſmall quantity of the mineral acids, it acts

effectually, though in general mildly; with a larger, it proves violently corrosive.

Purified quicksilver. L.

Take of quicksilver, filings of iron, each four pounds. Rub them together, and distil from an iron vessel.

As in the distillation of quicksilver glass retorts are very liable to be broken, an iron one is here with propriety directed: and by the addition of the filings of iron, matters which might otherwise arise with the quicksilver will be more apt to be detained in the retort. But still this happens so readily, even merely with that degree of heat which is necessary to elevate the mercury, that it is very doubtful whether much advantage be obtained from this process; and accordingly it has now no place in the pharmacopœia of the Edinburgh college.

Acetated quicksilver. L.

Take of purified quicksilver, one pound; diluted nitrous acid, two pounds; water of kali, as much as is sufficient. Mix the quicksilver with the acid in a glass vessel, and dissolve it in a sand-bath; then drop in by degrees the water of kali, that the calx of quicksilver may be precipitated; wash this calx with plenty of distilled water, and dry it with a gentle heat. These things being done, take of the calx of quicksilver, above described, one pound; acetous acid, as much as is necessary to dissolve the calx. Mix them in a glass vessel; and the solution being completed, strain it through paper; then evaporate it till a pellicle appears, and set it aside to crystallize. Keep these crystals in a vessel close stopped.

Of all the saline preparations of mercury, it has long been the opinion of the best chemists, that those in which it was brought to a saline form, by means of acetous acid, would be the mildest; and such a preparation was conjectured to be the basis of a celebrated pill, prepared and sold by Mr. Keyser. It was, however, found to be a very difficult matter to imitate his pill, or to obtain a combination of mercury with the acetous acid: but not long since, the process for preparing these pills was published by authority at Paris, after being purchased by the French king. The process here described, though in some particulars much less operose than that of Mr. Keyser, yet nearly approaches to it, and furnishes us with the mildest of the saline mercurials.

Calcined quicksilver. L.

Take of purified quicksilver, one pound; expose the quicksilver, in a flat-bottomed glass cucurbit, to a heat of about 600 degrees in a sand-bath, till it becomes a red powder.

This preparation may now be made in a shorter time than by the process formerly directed in the London pharmacopœia, which in general required several months: for the access of air, without which calcination cannot be performed, was then very much excluded. Still, however, the process is a tedious one, and might perhaps be improved. A vessel might be so contrived, as to occasion a continual flux of air over the surface of the mercury.

This preparation is highly esteemed in venereal cases, and supposed to be the most efficacious and certain of all the mercurials. It may be advantageously given in conjunction with opiates: a bolus or pill, containing from half a grain to two grains of this calx, and a quarter or half a grain or more of opium, with the addition of some warm aromatic ingredient, may be taken every night. Thus managed, it acts mildly, though powerfully, as an alterative and diaphoretic: given by itself in larger doses, as four or five grains, it proves a rough emetic and cathartic.

Quicksilver with chalk. L.

Take of purified quicksilver, three ounces; powdered chalk, five ounces. Rub them together until the globules disappear.

In this preparation, as well as the two former, we have also the mercury in a state of calx; but in place of being brought to that state by the aid of fire or of acids, what may here be considered as calcination is effected by trituration.

Muriated quicksilver. L.

Take of purified quicksilver, vitriolic acid, each two pounds; dried sea-salt, three pounds and a half. Mix the quicksilver with the acid in a glass vessel, and boil in a sand-heat until the matter be dried. Mix it, when cold, with the sea-salt, in a glass vessel; then sublime in a glass cucurbit, with a heat gradually raised. Lastly, let the sublimed matter be separated from the scoriæ.

Sublimate corrosive mercury. E.

Take of quicksilver, weak nitrous acid, each four ounces; calcined sea-salt, calcined vitriol, of each five ounces. Dissolve the quicksilver in the nitrous acid, and evaporate the solution to a white and thoroughly dry mass; then add the sea-salt and vitriol. Having ground and mixed them well together, put the whole into a phial, one half of which they ought to fill; then sublime in sand, first with a gentle, but afterwards with an increased, heat.

The sublimate prepared by either of these methods is the same; they both consist only of mercury and the acid of the sea-salt united together.

The process, however, adopted by the London college is a better and more simple one than that of Edinburgh. In the former, the mercury, corroded by the vitriolic acid into a white mass, is mixed with about an equal quantity of sea-salt, and set to sublime; the vitriolic acid quits the mercury to unite with the basis of the sea-salt; and the acid of the sea-salt, now set at liberty, unites with the mercury, and sublimes with it into the compound required. The discovery of this method is generally attributed to Boulduc; though it is found also in Kunckel's *Laboratorium Chymicum*. When the process is conducted in this way, the residuous matter is a pure Glauber's salt, and the sublimate is also free of ferruginous matter; a greater or less quantity of which is very generally carried up along with the mercury when vitriol of iron is employed. Boulduc's method has therefore the advantage in this, that the proportion of mercury in a given quantity of sublimate must be less liable to variation.

Sublimate is a most violent corrosive. A solution of it in water, in the proportion of about a dram to a quart, is used for keeping down proud flesh, and cleansing foul ulcers; and a more diluted solution as a cosmetic, and for destroying cutaneous insects. But caution is requisite even in these external uses of it.

Dissolved in vinous spirit it is given internally in doses from a quarter of a grain to half a grain. This method of using it was brought into repute by Baron Van Swieten at Vienna, especially for venereal maladies; and several trials of it have also been made in this kingdom with success. Eight grains of the sublimate are dissolved in sixteen ounces of rectified spirit of wine or proof spirit; the rectified spirit dissolves it more perfectly, and seems to make the medicine milder in its operation than the proof-spirit of the original prescription of Van Swieten. Of this solution, from one to two spoonfuls, that is, from half an ounce to an ounce, are given twice a-day, and continued till all the symptoms are removed; observing to use a low diet, with plentiful dilution, otherwise the sublimate is apt to purge, and gripe severely. It generally purges more or less at the beginning, but afterwards seems to operate chiefly by urine and perspiration.

Sublimate consists of mercury united with a large quantity of marine acid. There are two general methods of destroying its corrosive quality, and rendering it mild: the one is, combining with it as much fresh mercury as the acid is capable of taking up; and the other, by separating a part of the acid by

means of alkaline ſalts and earths. On the firſt principle calomel is formed; on the latter, white precipitate.

Calomel. L.

Take of muriated quickſilver, one pound; purified quickſilver, nine ounces. Rub them together till the globules diſappear, and then ſublime the maſs. In the ſame manner repeat the ſublimation four times. Afterwards rub the matter into a very fine powder, and waſh it by pouring on boiling diſtilled water.

Sweet mercury. E.

Take of corroſive mercury ſublimate, reduced to a powder in a glaſs mortar, four ounces; pure quickſilver, three ounces and a half. Mix them well together, by long trituration in a glaſs or marble mortar, until the quickſilver ceaſes to appear. Put the powder into an oblong phial, of ſuch a ſize that only one-third of it may be filled; and ſet the glaſs in ſand, that the maſs may ſublime. After the ſublimation, break the glaſs; and the red powder which is found in its bottom, with the whitiſh one that ſticks about the neck, being thrown away, let the white mercury be ſublimated again three or four times, and reduced to a very fine powder.

The trituration of corroſive ſublimate with quickſilver is a very noxious operation; for it is almoſt impoſſible, by any care, to prevent the lighter particles of the former from riſing ſo as to affect the operator's eyes and mouth. It is nevertheleſs of the utmoſt conſequence, that the ingredients be perfectly united before the ſublimation is begun. It is neceſſary to pulverize the ſublimate before the mercury is added to it: but this may be ſafely performed with a little caution; eſpecially if during the pulverization the matter be now and then ſprinkled with a little ſpirit of wine: this addition does not at all impede the union of the ingredients, or prejudice the ſublimation: it will be convenient not to cloſe the top of the ſubliming veſſel with a cap of paper at firſt (as is uſually practiſed), but to defer this till the mixture begins to ſublime, that the ſpirit may eſcape.

The name of *calomel*, though for a conſiderable time baniſhed from our beſt pharmacopœias, is again reſtored by the London college. But we cannot help thinking, that they might eaſily have invented a name better expreſſing the conſtituent parts and nature of the preparation.

Calomel, or ſweet mercury, may be conſidered as one of the moſt uſeful of the mercurial preparations; and it may be eſtimated as holding an intermediate place between the acetated quickſilver, one of the mildeſt of the ſaline preparations, and the muriated quickſilver, or corroſive ſublimate, one of the moſt acrid of them.

Mild muriated quickſilver. L.

Take purified quickſilver, diluted nitrous acid, of each half a pound. Mix in a glaſs veſſel, and ſet it aſide until the quickſilver be diſſolved. Let them boil, that the ſalt may be diſſolved. Pour out the boiling liquor into a glaſs veſſel into which another boiling liquor has been put before, conſiſting of ſea-ſalt, four ounces; diſtilled water, eight pints. After a white powder has ſubſided to the bottom of the veſſel, let the liquor ſwimming at the top be poured off, and the remaining powder be waſhed till it becomes inſipid, with frequent affuſions of hot water; then dried on blotting-paper with a gentle heat.

This preparation had a place in former editions of the London and Edinburgh pharmacopœias under the name of *mercurius dulcis precipitatus*. But the proceſs as now given is ſomewhat altered, being that of Mr. Scheele of Sweden, who has recommended this as an eaſy and expeditious method of preparing ſweet mercury or calomel.

It appears from ſeveral teſts that this precipitate is equal in every reſpect to that prepared by the preceding proceſſes. It is leſs troubleſome and expenſive, and the operator is not expoſed to the noxious duſt ariſing from the triture of the quickſilver with the corroſive ſublimate, which neceſſarily happens by the common method. The powder is alſo finer than can be made from the common ſublimed ſweet mercury by any trituration whatever. The clear liquor ſtanding over the precipitate is a ſolution of cubic or rhomboidal nitre.

Red nitrated quickſilver. L.

Take of purified quickſilver, nitrous acid, each one pound; muriatic acid, one dram. Mix in a glaſs veſſel, and diſſolve the quickſilver in a ſand bath; then raiſe the fire until the matter be formed into red cryſtals.

The marine acid, in the menſtruum ordered, diſpoſes the mercurial calx to aſſume the bright ſparkling look admired in it; which, though perhaps no advantage to it as a medicine, ought nevertheleſs to be inſiſted on by the buyer as a mark of its goodneſs and ſtrength. As ſoon as the matter has gained this appearance, it ſhould be immediately removed from the fire, otherwiſe it will ſoon loſe it again.

This precipitate is, as its title imports, an eſcharotic; and with this intention is frequently employed by the ſurgeons with baſilicum and other dreſſings, for conſuming fungous fleſh in ulcers and the like purpoſes. It is ſubject to great uncertainty in point of ſtrength, more or leſs of the acid exhaling according to the degree and continuance of the fire. The beſt criterion of its ſtrength, as already obſerved, is its brilliant appearance; which is alſo the mark of its genuineneſs: if mixed with minium, which it is ſometimes ſaid to be, the duller hue will diſcover the abuſe. This admixture may be more certainly detected by means of fire: the mercurial part will totally evaporate, leaving the minium behind.

White calx of quickſilver. L.

Take of muriated quickſilver, ſal ammoniac, water of kali, each half a pound. Diſſolve firſt the ſal ammoniac, afterwards the muriatic quickſilver, in diſtilled water, and add the water of kali. Waſh the precipitated powder until it becomes inſipid.

White precipitate of mercury. E.

Diſſolve corroſive ſublimate mercury in a ſufficient quantity of hot water, and gradually drop into the ſolution ſome ſpirit of ſal ammoniac as long as any precipitation enſues. Waſh the precipitated powder with ſeveral freſh quantities of warm water.

Theſe preparations are uſed chiefly in ointments, with which intention their fine white colour is no ſmall recommendation to them. For internal purpoſes they are rarely employed, nor is it at all wanted: they are nearly ſimilar to ſweet mercury, but leſs certain in their effects.

A good deal of care is requiſite in the precipitation; for, if too large a quantity of the fixed alkaline ſolution be imprudently added, the precipitate will loſe the elegant white colour for which it is valued.

Quickſilver with ſulphur. L.

Take of purified quickſilver, flowers of ſulphur, each one pound. Rub them together until the globules diſappear.

This is one of the moſt inactive of the mercurial preparations. Some practitioners, however, have repreſented it as poſſeſſing extraordinary virtues; and moſt people imagine it a medicine of ſome efficacy. But what benefit is to be expected from it in the common doſes of eight or ten grains, or a ſcruple, may be judged from hence, that it has been taken in doſes of ſeveral drams, and continued for a conſiderable time, without producing any remarkable effect.

Red ſulphurated quickſilver. L.

Take of quickſilver, purified, forty ounces; ſulphur, eight ounces. Mix the quickſilver with the melted ſulphur; and if the mixture takes fire, extinguiſh it by covering the veſſel; afterwards reduce the maſs to powder, and ſublime it.

It has been cuſtomary to order a larger quantity of ſulphur than here directed: but ſmaller proportions anſwer better; for, the leſs ſulphur, the finer coloured is the cinnabar.

As ſoon as the mercury and ſulphur begin to unite, a conſiderable exploſion frequently happens, and the mixture is very apt to take fire, eſpecially if the proceſs be ſomewhat haſtily conducted. This accident the operator will have previous notice of, from the matter ſwelling up, and growing ſuddenly conſiſtent: as ſoon as this happens, the veſſel muſt be immediately cloſe covered.

During the ſublimation, care muſt be had that the matter riſe not into the neck of the veſſel, ſo as to block up and burſt the glaſs. To prevent this, a wide-necked bolt-head, or rather an oval earthen jar, coated, ſhould be choſen for the ſubliming veſſel. If the former be employed, it will be convenient to introduce at times an iron wire, ſomewhat heated, in order to be the better aſſured that the paſſage is not blocking up; the danger of which may be prevented by cautiouſly raiſing the veſſel higher from the fire.

If the ingredients were pure, no fæces will remain: in ſuch caſes, the ſublimation may be known to be over by introducing a wire as before, and feeling therewith the bottom of the veſſel, which will then be perfectly ſmooth: if any roughneſs or inequalities are perceived, either the mixture was impure, or the ſublimation is not completed: if the latter be the caſe, the wire will ſoon be covered over with the riſing cinnabar.

The preparers of cinnabar in large quantity employ earthen jars, which in ſhape pretty much reſemble an egg. Theſe are of different ſizes, according to the quantity intended to be made at one ſublimation, which ſometimes amounts to two hundred weight. The jar is uſually coated from the ſmall end almoſt to the middle, to prevent its breaking by the vehemence or irregularity of the fire. The greater part, which is placed uppermoſt, not being received within the furnace, has no occaſion for this defence. The whole ſecret with regard to this proceſs, is the management of the fire, which ſhould be ſo ſtrong as to keep the matter continually ſubliming to the upper part of the jar, without coming out at its mouth, which is covered with an iron plate; care ſhould alſo be taken to put into the ſubliming veſſel only ſmall quantities of the mixture at a time.

The principal uſe of cinnabar is as a pigment. It was formerly held in great eſteem as a medicine in cutaneous foulneſſes, gouty and rheumatic pains, epileptic caſes, &c. but of late it has loſt much of its reputation. It appears to be nearly ſimilar to the æthiops already ſpoken of.

Cinnabar is ſometimes uſed in fumigations againſt venereal ulcers in the noſe, mouth, and throat. Half a dram of it burnt, the fume being imbibed with the breath, has occaſioned a violent ſalivation. This effect is by no means owing to the medicine as cinnabar: when ſet on fire, it is no longer a mixture of mercury and ſulphur, but mercury reſolved into ſume, and blended in part with the volatile vitriolic acids; in either of which circumſtances this mineral, as we have already obſerved, has very powerful effects.

Vitriolated quickſilver. L.

Take of quickſilver purified, vitriolic acid, each one pound. Mix in a glaſs veſſel, and heat them by degrees until they unite into a white maſs, which is to be perfectly dried with a ſtrong fire. This matter, on the affuſion of a large quantity of hot diſtilled water, immediately becomes yellow, and falls to powder. Rub the powder carefully with this water in a glaſs mortar. After the powder has ſubſided, pour off the water; and, adding more diſtilled water ſeveral times, waſh the matter till it become inſipid.

Vitriolated quickſilver is a ſtrong emetic, and with this intention operates the moſt powerfully of all the mercurials that can be ſafely given internally. Its action, however, is not confined to the primæ viæ; it will ſometimes excite a ſalivation, if a purgative be not taken ſoon after it. Its chief uſe at preſent is in ſwellings of the teſticle from a venereal affection; and it ſeems not only to act as a mercurial, but alſo, by the ſevere vomiting it occaſions, to perform the office of a diſcutient, by accelerating the motion of the blood in the parts affected. It is ſaid likewiſe to have been employed with ſucceſs, in robuſt conſtitutions, againſt leprous diſorders and obſtinate glandular obſtructions: the doſe is from two grains to ſix or eight. It may be given in doſes of a grain or two as an alterative and diaphoretic, in the ſame manner as the calcined mercury already ſpoken of. Dr. Hope has found it the moſt convenient errhine he has had occaſion to employ.

The waſhings of vitriolated quickſilver are uſed by ſome externally for the cure of the itch and other cutaneous foulneſſes. In ſome caſes mercurial lotions may be proper, but they are always to be uſed with great caution: this is by no means an eligible one, as being extremely unequal in point of ſtrength; more or leſs of the mercury being diſſolved, as has been obſerved above, according to the degree of calcination. The pharmacopœia of Paris directs a mercurial waſh free from this inconvenience, under the title of *Aqua mercurialis*, or *Mercurius liquidus*. It is compoſed of one ounce of mercury, diſſolved in a ſufficient quantity of ſpirit of nitre, and diluted with 30 ounces of diſtilled water. In want of diſtilled water, rain water may be uſed; but of ſpring waters there are very few which will mix with the mercurial ſolution without growing turbid and precipitating a part of the mercury.

Chap. XIV. Preparations of Lead.

Lead readily melts in the fire, and calcines into a duſky powder; which, if the flame is reverberated on it, becomes at firſt yellow, then red, and at length melts in a vitreous maſs. This metal diſſolves eaſily in the nitrous acid, difficultly in the vitriolic, and in ſmall quantity in the vegetable acids; it is alſo ſoluble in expreſſed oil, eſpecially when calcined.

Lead and its calces, while undiſſolved, have no conſiderable effects as medicines. Diſſolved in oils, they are ſuppoſed to be (when externally applied) anti-inflammatory and deſiccative. Combined with vegetable acids, they are remarkably ſo; and, taken internally, prove a powerful though dangerous ſtyptic.

There are two preparations of lead, *red* and *white lead*, as they are commonly called, which are much more extenſively employed in other arts than in medicine, and of courſe they are prepared in large quantities. Theſe formerly ſtood among the preparations in our pharmacopœias; but they are now referred to the materia medica. We ſhall not therefore, on the preſent occaſion, make any further obſervations with reſpect to them, but ſhall here inſert from the old editions of the Edinburgh pharmacopœia the directions there given for preparing them.

Red lead.

Let any quantity of lead be melted in an unglazed earthen veſſel, and kept ſtirring with an iron ſpatula till it falls into powder, at firſt blackiſh, afterwards yellow, and at length of a deep red colour, in which laſt ſtate it is called *minium*; taking care not to raiſe the fire ſo high as to run the calx into a vitreous maſs.

The preparation of red lead is ſo troubleſome and tedious, as ſcarce ever to be attempted by the apothecary or chemiſt; nor indeed is this commodity expected to be made by them, the preparation of it being a diſtinct branch of buſineſs. The

makers melt large quantities of lead at once, upon the bottom of a reverberatory furnace built for this purpoſe, and ſo contrived that the flame acts on a large ſurface of the metal, which is continually changed by means of iron rakes drawn backwards and forwards, till the fluidity of the lead is deſtroyed; after which, the calx is only now and then turned. By barely ſtirring the calx, as above directed, in a veſſel over the fire, it acquires no redneſs; the reverberation of flame on the ſurface being abſolutely neceſſary for this effect. It is ſaid, that 20 pounds of lead gain in this proceſs five pounds; and that the calx, being reduced into lead again, is found one pound leſs than the original weight of the metal.

Theſe calces are employed in external applications, for abating inflammations, cleanſing and healing ulcers, and the like. Their effects, however, are not very conſiderable; nor are they perhaps of much further real uſe, than as they give conſiſtence to the plaſter, unguent, &c.

Ceruſe or white lead.

Put ſome vinegar into the bottom of an earthen veſſel, and ſuſpend over the vinegar very thin plates of lead, in ſuch a manner that the vapour which ariſes from the acid may circulate about the plates. Set the containing veſſel in the heat of horſe-dung for three weeks; if at the end of this time the plates be not totally calcined, ſcrape off the white powder, and expoſe them again to the ſteam of vinegar, till all the lead be thus corroded into powder.

The making of white lead is alſo become a trade by itſelf, and confined to a few perſons, who have large conveniences for this purpoſe. The general method which they follow is nearly the ſame with that above deſcribed. See the Philoſophical Tranſactions, N° 137.

In this preparation, the lead is ſo far opened by the acid, as to diſcover, when taken internally, the malignant quality of the metal; and to prove externally, when ſprinkled on running ſores, or ulcers, moderately cooling, drying, and aſtrictive.

Acetated ceruſe. L.

Take of ceruſe, one pound; diſtilled vinegar, one gallon and a half. Boil the ceruſe with the vinegar until the vinegar is ſaturated: then filter through paper; and, after proper evaporation, ſet it aſide to cryſtallize.

Ceruſe (eſpecially that ſort called *flake lead*, which is not, like the others, ſubject to adulteration) is much preferable either to minium or litharge, for making this preparation: for the corroſion which it has undergone from the ſteam of the vinegar diſpoſes it to diſſolve more readily. It ſhould be finely powdered before the vinegar be put to it; and during the digeſtion, or boiling, every now and then ſtirred up with a wooden ſpatula, to promote its diſſolution, and prevent its concreting into a hard maſs at the bottom.

This ſalt of lead is preferable to the pompous *extract* and *vegeto-mineral water* of Goulard, in which the lead is much leſs perfectly combined in a ſaline ſtate. It is ſometimes convenient to aſſiſt the ſolution of the ſugar of lead in water, by adding a portion of vinegar. The effects of the external application of lead ſeem to differ, from the ſtrength of the ſolution: thus, a very weak ſolution ſeems to diminiſh directly the action of the veſſels, and is therefore more peculiarly proper in active inflammations, as of the eyes; whereas a ſtrong ſolution operates as a direct ſtimulant, and is therefore more ſucceſsful in paſſive ophthalmia. Internally, it is a hazardous remedy.

Water of acetated litharge. L.

Take of litharge, two pounds and four ounces; diſtilled vinegar, one gallon. Mix, and boil to ſix pints, conſtantly ſtirring; then ſet it aſide. After the fæces have ſubſided, ſtrain.

This preparation may be conſidered as nearly the ſame with the extract and vegeto-mineral water of Mr. Goulard. And it is probably from the circumſtances of his preparations having come into a common uſe, that the London college have given this article a place in their pharmacopœia. It may, however, be a matter of doubt whether it be really entitled to a place. For, as we have already obſerved, every purpoſe to be anſwered by it may be better obtained from the employment of a ſolution of the acetated ceruſe in ſimple water. The acetated water of litharge is intended for external uſe only.

Chap. XV. Preparations of Tin.

Tin eaſily melts in the fire, and calcines into a duſky powder; which, by a further continuance of the heat, becomes white. A maſs of tin heated till it be juſt ready to melt, proves extremely brittle, ſo as to fall in pieces from a blow; and by dexterous agitation, into powder. Its proper menſtruum is aqua-regia; though the other mineral acids may alſo be made to diſſolve it, and the vegetable ones in ſmall quantity. It cryſtallizes with the vegetable and vitriolic acids; but, with the others, deliquates.

The virtues of this metal are little known. It has been recommended as an antihyſteric, antihectic, &c. At preſent it is chiefly uſed as an anthelmintic.

Powdered tin. L.

Take of tin, ſix pounds. Melt it in an iron veſſel, and ſtir it with an iron rod until a powder floats on the ſurface. Take off the powder, and, when cold, paſs it through a ſieve.

This preparation may be conſidered as nearly the ſame with the calx Jovis, which had a place in the former editions of the Edinburgh pharmacopœia; but from the late editions the calx has been expunged, and the filings or powder of tin has a place only in their liſt of the materia medica. But although ſeldom prepared by the apothecary himſelf, it is not unfrequently employed as a remedy againſt worms, particularly the flat kinds, which too often elude the force of other medicines. The general doſe is from a ſcruple to a dram; ſome confine it to a few grains. But Dr. Alſton aſſures us, in the Edinburgh Eſſays, that its ſucceſs chiefly depends on its being given in much larger quantities: he directs an ounce of the powder on an empty ſtomach, mixed with four ounces of molaſſes; next day, half an ounce; and the day following, half an ounce more; after which a cathartic is adminiſtered: he ſays the worms are uſually voided during the operation of the purge, but that pains in the ſtomach occaſioned by them are removed almoſt immediately upon taking the firſt doſe of the tin.

This practice is ſometimes ſucceſsful in the expulſion of tænia, but by no means ſo frequently as Dr. Alſton's obſervations would lead us to hope.

Chap. XVI. Preparations of Zinc and Copper.

Calcined zinc. L.

Take of zinc, broken into ſmall pieces, eight ounces. Caſt the pieces of zinc, at ſeveral times, into an ignited, large, and deep crucible, placed leaning, or half upright, putting on it another crucible in ſuch a manner that the air may have free acceſs to the burning zinc. Take out the calx as ſoon as it appears, and ſeparate its white and lighter part by a fine ſieve.

Flowers of zinc. E.

Let a large crucible be placed in a furnace, in an inclined ſituation, only half upright: when the bottom of the veſſel is moderately red, put a ſmall piece of zinc, about the weight of two drams, into it. The zinc ſoon flames, and is at the ſame time converted into a ſpongy calx, which is to be raked from the ſurface of the metal with an iron ſpatula, that the combuſtion may proceed the more ſpeedily: when the zinc

ceaſes to flame, take the calx out of the crucible. Having put in another piece of zinc, the operation may be repeated as often as you pleaſe. Laſtly, the calx is to be prepared like antimony.

Theſe flowers, as uſed externally, are preferable for medicinal purpoſes to tutty, and the more impure ſublimates of zinc, which are obtained in the braſs works; and likewiſe to calamine, the natural ore of this metal; which contains a large quantity of earth, and frequently a portion of heterogeneous metallic matter. But beſides being applied externally, they have alſo of late been uſed internally. The flowers of zinc, in doſes from one to ſeven or eight grains, have been much celebrated of late years in the cure of epilepſy and ſeveral ſpaſmodic affections: and there are ſufficient teſtimonies of their good effects, where tonic remedies in thoſe affections are proper.

White vitriol. E.

Take of zinc, cut into ſmall pieces, three ounces; vitriolic acid, five ounces; water, twenty ounces: having mixed the acid and water, add the zinc, and when the ebulition is finiſhed ſtrain the liquor; then after proper evaporation ſet it apart in a cold place, that it may ſhoot into cryſtals.

This ſalt is an elegant white vitriol. It differs from the common white vitriol, and the ſalt of vitriol of the ſhops, only in being purer, and perfectly free from any admixture of copper, or ſuch other foreign metallic bodies as the others generally contain.

Purified vitriolated zinc. L.

Take of white vitriol, one pound; vitriolic acid, one dram; boiling diſtilled water, three pints. Mix, and filter through paper. After a proper evaporation, ſet it aſide in a cold place to cryſtallize.

Although the Edinburgh college have given a formula for the preparations of white vitriol, yet their direction is very rarely followed by any of the apothecaries or chemiſts, who in general purchaſe it as obtained from the Goſlar mines. When, however, it is got in this way, it is often a very impure ſalt, and requires that purification which is here directed, and which is by no means neceſſary for the white vitriol artificially prepared, in the manner above directed. But by this proceſs, the ordinary white vitriol, in its common ſtate of impurity, will be freed from thoſe impregnations of earthy and other matters which it often contains. And in this purified ſtate it anſwers many uſeful purpoſes, not only externally but internally; and particularly in doſes from ten grains to half a dram, it operates almoſt inſtantly as an emetic, and is at the ſame time perfectly ſafe. By employing it internally, in ſmaller doſes, we may obtain, and perhaps even more effectually, all the tonic power of the zinc; and ſome think it in every caſe preferable to the calx of zinc.

Ammoniacal copper. E.

Take of blue vitriol, two parts; volatile ſal ammoniac, three parts; rub them together in a glaſs mortar, until they unite, after the effervescence ceaſes, into an uniform violet-coloured maſs, which muſt be firſt dried on blotting paper, and afterwards by a gentle heat. The product muſt be kept in a glaſs phial, well cloſed with a glaſs ſtopper.

This preparation has been thought ſerviceable in epilepſies; but from its frequent want of ſucceſs, and the diſagreeable conſequences with which its uſe is ſometimes attended, it has not lately been much preſcribed. It is employed by beginning with doſes of half a grain, twice a day, and increaſing them gradually to as much as the ſtomach will bear. Dr. Cullen ſometimes increaſed the doſe to five grains.

Chap. XVII. Simple Diſtilled Waters.

The effluvia which exhale into the air from many vegetables, particularly from thoſe of the odorous kind, conſiſt apparently of principles of great ſubtility and activity, capable of ſtrongly and ſuddenly affecting the brain and nervous ſyſtem, eſpecially in thoſe whoſe nerves are of great ſenſibility; and likewiſe of operating in a ſlower manner on the ſyſtem of the groſſer veſſels. Thus Boerhaave obſerves, that in hyſterical and hypochondriacal perſons, the fragrant odour of the Indian hyacinth excites ſpaſms, which the ſtrong ſcent of rue relieves; that the effluvia of the walnut-tree occaſion headachs, and make the body coſtive; that thoſe of poppies procure ſleep; and that the ſmell of bean-bloſſoms, long continued, diſorders the ſenſes. Lemery relates, from his own knowledge, that ſeveral perſons were purged by ſtaying long in a room where damaſk roſes were drying.

Some of the chemiſts have indulged themſelves in the pleaſing ſurvey of theſe preſiding ſpirits, as they are called, of vegetables; their peculiar nature in the different ſpecies of plants; their exhalation into the atmoſphere by the ſun's heat, and diſperſion by winds; their rendering the air of particular places medicinal, or otherwiſe, according to the nature of the plants that abound. They have contrived alſo different means for collecting theſe fugitive emanations, and concentrating and condenſing them into a liquid form; employing either the native moiſture of the ſubject, or an addition of water, as a vehicle or matrix for retaining them.

The proceſs which has been judged moſt analogous to that of nature, is the following. The ſubject freſh gathered at the ſeaſon of its greateſt vigour, with the morning dew on it, is laid lightly and unbruiſed in a ſhallow veſſel, to which is adapted a low head with a recipient; under the veſſel a live coal is placed, and occaſionally renewed, ſo as to keep up an uniform heat, no greater than that which obtains in the atmoſphere in ſummer, viz. about 85 degrees of Fahrenheit's thermometer. In this degree of heat, there ariſes exceeding ſlowly an inviſible vapour, which condenſes in the head into dewy drops, and falls down into the receiver; and which has been ſuppoſed to be the very ſubſtance that the plant would have ſpontaneouſly emitted in the open air.

But on ſubmitting many kinds of odoriferous vegetables to this proceſs, the liquors obtained by it have been found to be very different from the natural effluvia of the reſpective ſubjects: they have had very little ſmell, and no remarkable taſte. It appeared, that a heat equal to that of the atmoſphere is incapable of raiſing in cloſe veſſels thoſe parts of vegetables which they emit in the open air. It may therefore be preſumed, that in this laſt caſe ſome other cauſe concurs to the effect: that it is not the ſun's heat alone which raiſes and impregnates the air with the odorous principles of vegetables, but that the air itſelf, or the watery humidity with which it abounds, acting as a true ſolvent, extracts and imbibes them; ſo that the natural effluvia of a plant may be conſidered as an infuſion of the plant made in air. The purgative virtue of the damaſk roſe, and the aſtringency of the walnut-tree, which, as above obſerved, are in ſome degree communicated to the air, may be totally extracted by infuſion both in watery and ſpirituous menſtrua, but never riſe in diſtillation with any degree of heat: and the volatile odours of aromatic herbs, which are diffuſed through the atmoſphere in the loweſt warmth, cannot be made to diſtil without a heat much greater than is ever found to obtain in a ſhaded air.

We apprehend that the effluvia ariſing from growing vegetables are chiefly exhaled by the living energy of the plant: the odorous matter is a real ſecretion, which cannot be performed independently of active veſſels; and it as reaſonable to allow the ſame powers for the exhalation of theſe effluvia, as for the tranſpiration of their watery parts.

The above proceſs, therefore, and the theory on which it is built, appear to be faulty in two points: 1. In ſuppoſing that

all theſe principles, which naturally exhale from vegetables, may be collected by diſtillation; whereas there are many which the air extracts in virtue of its ſolvent power; ſome are alſo incapable of being collected in a viſible and inelaſtic form; and ſome are artificially ſeparable by ſolvents only. 2. In employing a degree of heat inſufficient for ſeparating even thoſe parts which are truly exhalable by heat.

The foregoing method of diſtillation is commonly called *diſtillation by the cold ſtill*; but thoſe who have practiſed it have generally employed a conſiderable heat. A ſhallow leaden veſſel is filled with the freſh herbs, flowers, &c. which are heaped above it; ſo that when the head is fitted on, this alſo may be filled a conſiderable way. A little fire is made under the veſſel, ſufficient to make the bottom much hotter than the hand can bear, care being only taken not to heat it ſo far as to endanger ſcorching any part of the ſubject. If the bottom of the veſſel be not made ſo hot as to have this effect on the part contiguous to it, it is not to be feared that the heat communicated to the reſt of the included matter will be ſo great as to do it any injury. By this management, the volatile parts of ſeveral odorous plants, as mint, are effectually forced over; and if the proceſs has been ſkilfully managed, the diſtilled liquor proves richly impregnated with the native odour and flavour of the ſubject, without having received any kind of diſagreeable impreſſion from the heat uſed.

This proceſs has been chiefly practiſed in private families; the ſlowneſs of the diſtillation, and the attendance and care neceſſary for preventing the ſcorching of ſome part of the plant, ſo as to communicate an ungrateful burnt flavour to the liquor, rendering it inconſiſtent with the diſpatch requiſite in the larger way of buſineſs.

Another method has therefore been had recourſe to, viz. by the common ſtill, called, in diſtinction from the foregoing, the *hot ſtill*. Here a quantity of water is added to the plant to prevent its burning; and the liquor is kept nearly of a boiling heat, or made to boil fully, ſo that the vapour riſes plentifully into the head, and paſſing thence into a ſpiral pipe or worm placed in a veſſel of cold water, is there condenſed, and runs out in drops quickly ſucceeding each other, or in a continued ſtream. The additional water does not at all weaken the produce; for the moſt volatile parts of the ſubject riſe firſt, and impregnate the liquor that firſt diſtils: as ſoon as the plant has given over its virtue ſufficiently, which is known by examining from time to time the liquor that runs from the noſe of the worm, the diſtillation is to be ſtopped.

This is the method of diſtillation commonly practiſed for the officinal waters. It is accompanied with one imperfection, affecting chiefly thoſe waters whoſe principal value conſiſts in the delicacy of their flavour; this being not a little injured by the boiling heat uſually employed, and by the agitation of the odorous particles of the ſubject with the water. Sometimes alſo a part of the plant ſticks to the ſides of the ſtill, and is ſo far ſcorched as to give an ungrateful taint to the liquor.

There is another method of managing this operation, which has been recommended for the diſtillation of the more volatile eſſential oils, and which is equally applicable to that of the waters. In this way, the advantages of the foregoing methods are united, and their inconveniences obviated. A quantity of water being poured into the ſtill, and the herbs or flowers placed in a baſket over it, there can be no poſſibility of burning; the water may be made to boil, but ſo as not to riſe up into the baſket, which would defeat the intention of this contrivance. The hot vapour of the water paſſing lightly through all the interſtices of the ſubject matter, imbibes and carries over the volatile parts unaltered in their native flavour. By this means the diſtilled waters of all thoſe ſubſtances whoſe oils are of the moſt volatile kind are obtained in the utmoſt perfection, and with ſufficient diſpatch; for which laſt intention the ſtill may be filled quite up to the head.

In the diſtillation of eſſential oils, the water, as was obſerved in the foregoing ſection, imbibes always a part of the oil. The diſtilled liquors here treated of, are no other than water thus impregnated with the eſſential oil of the ſubject; whatever ſmell, taſte, or virtue is here communicated to water, or obtained in the form of a watery liquor, being found in a concentrated ſtate in the oil. The eſſential oil, or ſome part of it, more attenuated and ſubtilized than the reſt, is the direct principle on which the title of *ſpiritus rector*, or preſiding ſpirit, has been beſtowed.

All thoſe vegetables, therefore, which contain an eſſential oil will give over ſome virtue to water by diſtillation; but the degree of the impregnation of the water which a plant is capable of ſaturating with its virtue, are by no means in proportion to the quantity of its oil. The oil ſaturates only the water that comes over at the ſame time with it: if there be more oil than is ſufficient for this ſaturation, the ſurplus ſeparates, and concretes in its proper form, not miſcible with the water that ariſes afterwards. Some odoriferous flowers, whoſe oil is in ſo ſmall quantity that ſcarcely any viſible mark of it appears unleſs fifty or a hundred pounds or more are diſtilled at once, give nevertheleſs as ſtrong an impregnation to water as thoſe plants which abound moſt with oil.

Many have been of opinion that diſtilled waters may be more and more impregnated with the virtues of the ſubject, and their ſtrength increaſed to any aſſigned degree, by *cohobation*, that is, by rediſtilling them a number of times from freſh parcels of the plant. Experience, however, ſhows the contrary; a water ſkilfully drawn in the firſt diſtillation, proves on every repeated one not ſtronger but more diſagreeable. Aqueous liquors are not capable of imbibing above a certain quantity of the volatile oil of vegetables; and this they may be made to take up by one as well as by any number of diſtillations: the oftener the proceſs is repeated, the ungrateful impreſſion which they generally receive from the fire, even at the firſt time, becomes greater and greater. Thoſe plants which yield at firſt waters ſufficiently ſtrong, are not proper ſubjects for this proceſs, ſince their virtue may be obtained much more advantageouſly by others.

General Rules for the Diſtillation *of the* Officinal Simple Waters.

1. Where they are directed freſh, ſuch only muſt be employed: but ſome are allowed to be uſed dry, as being eaſily procurable in this ſtate at all times of the year, though rather more elegant waters might be obtained from them while they are green.

When freſh and juicy herbs are to be diſtilled, thrice their weight of water will be fully ſufficient; but dry ones require a much larger quantity. In general, there ſhould be ſo much water, that, after all intended to be diſtilled has come over, there may be liquor enough left to prevent the matter from burning to the ſtill.

Plants differ ſo much, according to the ſoil and ſeaſon of which they are the produce, and likewiſe according to their own age, that it is impoſſible to fix the quantity of water to be drawn from a certain weight of them to any invariable ſtandard. The diſtillation may always be continued as long as the liquor runs well flavoured off the ſubject, and no longer.

2. The diſtillation may be performed in an alembic with a refrigeratory, the junctures being luted.
3. If the herbs are of prime goodneſs, they muſt be taken in the weights preſcribed: but when freſh ones are ſubſtituted for dry, or when the plants themſelves are the produce of unfavourable ſeaſons, and weaker than ordinary, the quan-

tities are to be varied according to the diſcretion of the artiſt.

After the odorous water, alone intended for uſe, has come over, an acidulous liquor ariſes, which has ſometimes extracted ſo much from the copper head of the ſtill as to prove emetic. To this are owing the anthelmintic virtues attributed to certain diſtilled waters.

4. In a preceding edition of the Edinburgh pharmacopœia, ſome vegetables were ordered to be ſlightly fermented with the addition of yeſt previouſly to the diſtillation.

The principle on which this management is founded, is certainly juſt; for the fermentation ſomewhat opens and unlocks their texture, ſo as to make them part with more in the ſubſequent diſtillation than could be drawn over from them without ſome aſſiſtance of this kind. Thoſe plants, however, which require this treatment, are not proper ſubjects for ſimple waters to be drawn from, their virtues being obtainable to better advantage by other proceſſes.

5. If any drops of oil ſwim on the ſurface of the water, they are to be carefully taken off.

6. That the waters may keep the better, about a 20th part their weight of proof-ſpirit may be added to each after they are diſtilled.

A great number of diſtilled waters were formerly kept in the ſhops, and are ſtill retained in foreign pharmacopœias. The faculty of Paris direct, in the laſt edition of their *Codex Medicamentarius*, no leſs than 125 different waters, and 130 different ingredients in one ſingle water. Nearly one half of theſe preparations have ſcarcely any virtue or flavour from the ſubject, and many of the others are inſignificant.

The colleges of London and Edinburgh have rejected theſe oſtentatious ſuperfluities, and given an elegant and compendious ſet of waters, ſufficient for anſwering ſuch purpoſes as theſe kinds of preparations are applied to in practice. Diſtilled waters are employed chiefly as grateful diluents, as ſuitable vehicles for medicines of greater efficacy, or for rendering diſguſtful ones more acceptable to the palate and ſtomach; few are depended on, with any intention of conſequence, by themſelves.

There is too great a ſimilarity in the preparation of theſe, and the proceſs in each depends upon a principle too ſimple and obvious, to require a ſeparate account of the diſtilled waters employed by apothecaries.

Chap. XVIII. Distilled Spirits.

The flavours and virtues of diſtilled waters are owing, as was obſerved in the preceding chapter, to their being impregnated with a portion of the eſſential oil of the ſubject from which they are drawn. Spirit of wine, conſidered as a vehicle for theſe oils, has this advantage above water, that it is their proper menſtruum, and keeps all the oil that riſes with it perfectly diſſolved into an uniform limpid liquor.

Nevertheleſs, many ſubſtances which, on being diſtilled with water, impart to it their virtues in great perfection, if treated in the ſame manner with ſpirit of wine, ſcarcely give it any ſmell or taſte. This difference proceeds from hence, that ſpirit is not ſuſceptible of ſo great a degree of heat as water. Liquids in general, when made to boil, have received as great a heat as they are capable of ſuſtaining: now, if the extent of heat between freezing and boiling water, as meaſured by thermometers, be taken for a ſtandard, ſpirit of wine will be found to boil with leſs than four-fifths of that heat, or above one-fifth leſs than the heat of boiling water. It is obvious, therefore, that ſubſtances may be volatile enough to riſe with the heat of boiling water, but not with that of boiling ſpirit.

Thus, if cinnamon, for inſtance, be committed to diſtillation with a mixture of ſpirit of wine and water, or with a pure proof-ſpirit, which is no other than a mixture of about equal parts of the two; the ſpirit will riſe firſt, clear, colourleſs, and tranſparent, and almoſt without any taſte of the ſpice; but as ſoon as the more ponderous watery fluid begins to riſe, the oil comes over freely with it, ſo as to render the liquor highly odorous, ſapid, and of a milky hue.

The proof-ſpirits uſually met with in the ſhops are accompanied with a degree of ill flavour; which, though concealed by means of certain additions, plainly diſcovers itſelf in diſtillation. This nauſeous reliſh does not begin to riſe till after the purer ſpirituous part has come over; which is the very time that the virtues of the ingredients begin alſo moſt plentifully to diſtil: and hence the liquor receives an ungrateful taint. To this cauſe principally is owing the general complaint, that the cordials of the apothecary are leſs agreeable than thoſe of the ſame kind prepared by the diſtiller; the latter being extremely curious in rectifying or purifying the ſpirits (when deſigned for what he calls fine goods) from all ill flavour.

Spirit of vitriolic æther. L.

Take of rectified ſpirit of wine, vitriolic acid, each one pound. Pour by a little at a time the acid on the ſpirit, and mix them by ſhaking; then from a retort through a tubulated receiver, to which another recipient is fitted, diſtil the ſpirit of vitriolic æther till ſulphureous vapours begin to riſe.

Vinous vitriolic acid, commonly called *dulcified ſpirit of vitriol.* E.

Take of vitriolic æthereal liquor, one part: rectified ſpirit of wine, two parts. Mix them.

The laſt of theſe proceſſes is a very ready and convenient method of preparing the dulcified ſpirit of vitriol, which only differs from æther by the acid being more predominant, and leſs intimately combined.

In the firſt proceſs, a good deal of caution is requiſite in mixing the two liquors. Some direct the ſpirit of wine to be put firſt into the retort, and the oil of vitriol to be poured upon it all at once; a method of procedure by no means adviſable, as a violent heat and ebullition always enſue, which not only diſſipate a part of the mixture, but hazard alſo the breaking of the veſſel, to the great danger of the operator. Others put the oil of vitriol into the retort firſt: then, by means of a funnel with a long pipe that may reach down to the ſurface of the acid, pour in the ſpirit of wine: if this be done with ſufficient caution, the vinous ſpirit ſpreads itſelf on the ſurface of the oil of vitriol, and the two liquors appear diſtinct. On ſtanding for a week or two, the vinous ſpirit is gradually imbibed, without any commotion, and the veſſel may then be ſafely ſhaken to complete the mixture: but if the ſpirit be poured in too haſtily at firſt, or if the veſſel be moved before the two liquors have in ſome degree incorporated, the ſame effect enſues as in the foregoing caſe. The only ſecure way is, to add the oil of vitriol to the ſpirit of wine by a little quantity at a time, waiting till the firſt addition be incorporated before another quantity is put in: by this management, the heat that enſues is inconſiderable, and the mixture is effected without any inconvenience.

The diſtillation ſhould be performed with an equable and very gentle heat, and not continued ſo long as till a black froth begins to appear: for before this time a liquor will ariſe of a very different nature from the ſpirits here intended. The ſeveral products are moſt commodiouſly kept apart by uſing a tubulated receiver, ſo placed, that its pipe may convey the matter which ſhall come over into a phial ſet underneath. The juncture of the retort and recipient is to be luted with a paſte made of linſeed meal, and further ſecured by a piece of wet bladder; the lower juncture may be cloſed only with ſome ſoft wax, that the phial may be occaſionally removed with eaſe.

The true dulcified ſpirit ariſes in thin ſubtile vapours, which condenſe on the ſides of the recipient in ſtraight ſtriæ. It is colourleſs as water, very volatile, inflammable, of an extremely fragrant ſmell, in taſte ſomewhat aromatic.

After the fire has been kept up for ſome time, white fumes ariſe; which either form irregular ſtriæ, or are collected into large round drops like oil: on the firſt appearance of theſe, the phial, or the receiver, if a common one is uſed, muſt be taken away. If another be ſubſtituted, and the diſtillation continued, an acid liquor comes over, of an exceeding pungent ſmell, like the fumes of burning brimſtone. At length a black froth begins haſtily to ariſe, and prevents carrying the proceſs further.

On the ſurface of the ſulphureous ſpirit is found ſwimming a ſmall quantity of oil, of a light yellow colour, a ſtrong, penetrating, and very agreeable ſmell. This oil ſeems to be nearly of the ſame nature with the eſſential oils of vegetables. It readily and totally diſſolves in rectified ſpirit of wine, and communicates to a large quantity of that menſtruum the taſte and ſmell of the aromatic or dulcified ſpirit.

The matter remaining after the diſtillation is of a dark blackiſh colour, and ſtill highly acid. Treated with freſh ſpirit of wine, in the ſame manner as before, it yields the ſame production; till at length all the acid that remains unvolatilized being ſaturated with the inflammable oily matter of the ſpirit, the compound proves a bituminous ſulphureous maſs; which, expoſed to the fire in open veſſels, readily burns, leaving a conſiderable quantity of fixed aſhes; but in cloſe ones it explodes with violence; with fixed alkaline ſalt it forms a compound nearly ſimilar to one compoſed of alkalis and ſulphur.

The new names adopted by the London and Edinburgh colleges for this fluid are expreſſive of its compoſition; the one employing the term of *ſpiritus ætheris vitriolici*, the other of *acidum vitriolicum vinoſum*: the old term of *ſpiritus vitrioli dulcis* is leſs properly fitted to diſtinguiſh it from other fluids, and to convey a juſt idea of its nature.

Dulcified ſpirit of vitriol has been for ſome time greatly eſteemed, both as a menſtruum and a medicine. It diſſolves ſome reſinous and bituminous ſubſtances more readily than ſpirit of wine alone, and extracts elegant tinctures from ſundry vegetables. As a medicine, it promotes perſpiration and the urinary ſecretion, expels flatulencies, and in many caſes abates ſpaſmodic ſtrictures, eaſes pains, and procures ſleep. The doſe is from ten to eighty or ninety drops in any convenient vehicle. It is not eſſentially different from the celebrated anodyne liquor of Hoffman; to which it is, by the author himſelf, not unfrequently directed as a ſuccedaneum.

Of this fluid, however, or at leaſt of an article ſtill more nearly reſembling it, we ſhall afterwards have occaſion to ſpeak, when we treat of the vinous ſpirit of vitriolic æther.

Vitriolic æther. L.

Take of the ſpirit of vitriolic æther, two pounds; water of pure kali, one ounce. Shake them together, and diſtil, with a gentle heat, fourteen ounces by meaſure.

The preparation of this ſingular fluid, now received into public pharmacopœias, was formerly confined to a few hands; for, though ſeveral proceſſes have been publiſhed for obtaining it, the ſucceſs of moſt of them is precarious, and ſome of them accompanied alſo with danger to the operator. The principal difficulty conſiſts in the firſt part of the diſtillation.

It has been uſual to direct the heat to be kept up till a black froth begins to appear: but if it is managed in the manner here directed, the quantity of æther which the liquor can afford will be formed and drawn off before this ſulphureous froth appears. The uſe of the cauſtic alkali is to engage any uncombined vitriolic acid which may be preſent in the firſt diſtilled liquor. If a mild alkali were employed for this purpoſe, the ſeparation of its air by the acid might endanger the burſting of the veſſels. This laſt is indeed an inconvenience which attends the whole of this proceſs. It might in a great meaſure be obviated by employing a range of receivers ſuch as the adopter deſcribed in the firſt part of this work.

The æther, or æthereal ſpirit, is the lighteſt, moſt volatile and inflammable of all known liquids. It is lighter than the moſt highly rectified ſpirit of wine, in the proportion of about 7 to 8: a drop, let fall on the hand, evaporates almoſt in an inſtant, ſcarcely rendering the part moiſt. It does not mix, or only in a ſmall quantity, with water, ſpirit of wine, alkaline lixivia, volatile alkaline ſpirits, or acids; but it is a powerful diſſolvent for oils, balſams, reſins, and other analogous ſubſtances: it is the only known ſubſtance capable of diſſolving the elaſtic gum; it has a fragrant odour, which, in conſequence of the volatility of the fluid, is diffuſed through a large ſpace. It has often been found to give eaſe in violent headachs, by being applied externally to the part; and to relieve the toothach, by being laid on the affected jaw. It has been given alſo internally, with benefit, in hooping-coughs, hyſterical caſes, in aſthma, and indeed in almoſt every ſpaſmodic affection, from a few drops to the quantity of half an ounce, in a glaſs of wine or water; which ſhould be ſwallowed as quickly as poſſible, as the æther ſo ſpeedily exhales.

Spirit of nitrous æther. L.

Take of rectified ſpirit of wine, two pints; nitrous acid, half a pound. Mix them, by pouring in the acid on the ſpirit, and diſtil with a gentle heat one pound ten ounces.

Vinous acid of nitre, commonly called *dulcified ſpirit of nitre.* E.

Take of rectified ſpirit of wine, three pounds; nitrous acid, one pound. Pour the ſpirit into a capacious phial, placed in a veſſel full of cold water, and add the acid by degrees, conſtantly agitating them. Let the phial be ſlightly covered, and laid by for ſeven days in a cool place; then diſtil the liquor with the heat of boiling water, into a receiver kept cool with water or ſnow, till no more ſpirit comes over.

By allowing the acid and rectified ſpirit to ſtand for ſome time, the union of the two is not only more complete, but the danger alſo of the veſſels giving way to the ebullition and heat conſequent on their being mixed, is in a great meaſure prevented. By fixing the degree of heat to the boiling point, the ſuperabundant acid matter is left in the retort, being too ponderous to be raiſed by that degree of heat.

Here the operator muſt take care not to invert the order of mixing the two liquors, by pouring the vinous ſpirit into the acid; for, if he ſhould, a violent effervеſcence and heat would enſue, and the matter be diſperſed in highly noxious red fumes. The moſt convenient and ſafe method of performing the mixture ſeems to be, to put the inflammable ſpirit into a large glaſs bottle with a narrow mouth, placed under a chimney, and to pour into it the acid, by means of a glaſs funnel, in very ſmall quantities at a time; ſhaking the veſſel as ſoon as the effervеſcence enſuing upon each addition ceaſes, before a freſh quantity is put in: by this means the glaſs will be heated equally, and be prevented from breaking. During the action of the two ſpirits upon each other, the veſſel ſhould be lightly covered: if cloſe ſtopped, it will burſt; and if left entirely open, ſome of the more valuable parts will exhale. Lemery directs the mixture to be made in an open veſſel; by which unſcientifical procedure, he uſually loſt, as he himſelf obſerves, half his liquor; and we may preſume, that the remainder was not the medicine here intended.

Several methods have been contrived for obviating the incon-

veniences arising from the elastic fluid and violent explosions produced on the mixture of the nitrous acid and rectified spirit of wine: for preparing the nitrous æther they are absolutely necessary, and might perhaps be conveniently used for making the dulcified spirit. The method we judge to be the best, is that employed by Dr. Black. On two ounces of the strong acid put into a phial, the doctor pours, slowly and gradually, about an equal quantity of water; which, by being made to trickle down the sides of the phial, floats on the surface of the acid without mixing with it: he then adds, in the same cautious manner, three ounces of highly rectified spirit of wine, which in its turn floats on the surface of the water. By this means the three fluids are kept separate on account of their different specific gravities, and a stratum of water is interposed between the acid and spirit. The phial is now set in a cool place: the acid gradually ascends, and the spirit descends through the water, this last acting as a boundary to restrain their violent action on each other. By this method a quantity of nitrous æther is formed, without the danger of producing elastic vapours or explosion.

For the preparation of the dulcified spirit, the liquors, when mixed together, should be suffered to rest for some time as above directed, that the fumes may entirely subside, and the union be in some measure completed. The distillation should be performed with a very slow and well regulated fire; otherwise the vapour will expand with so much force as to burst the vessels. Wilson seems to have experienced the justness of this observation, and hence directs the juncture of the retort and receiver not to be luted, or but slightly: if a tubulated recipient with a sufficiently long pipe be used, and the distillation performed with the heat of a water-bath, the vessels may be luted without any danger: this method has likewise another advantage, as it ascertains the time when the operation is finished: examining the distilled spirit every now and then with alkaline salts, as directed above, is sufficiently troublesome; while in a water-bath we may safely draw over all that will rise; for this heat will elevate no more of the acid than what is dulcified by the vinous spirit.

Dulcified spirit of nitre has been long held, and not undeservedly, in great esteem. It quenches thirst, promotes the natural secretions, expels flatulencies, and moderately strengthens the stomach: it may be given from 20 drops to a dram, in any convenient vehicle. Mixed with a small quantity of spirit of hartshorn, the volatile aromatic spirit, or any other alkaline spirit, it proves a mild yet efficacious diaphoretic, and often remarkably diuretic; especially in some febrile cases, where such a salutary evacuation is wanted. A small proportion of this spirit added to malt spirits, gives them a flavour approaching to that of French brandy.

Spirit of ammonia. L.

Take of proof spirit, three pints; sal ammoniac, four ounces; pot-ash, six ounces. Mix, and distil with a slow fire one pint and a half.

Vinous spirit of sal ammoniac. E.

Take of quicklime, 16 ounces; sal ammoniac, eight ounces; rectified spirit of wine, 32 ounces. Having slightly bruised and mixed the quicklime and ammoniacal salt, put them into a glass retort; then add the spirit, and distil in the manner directed for the volatile caustic alkali, till all the spirit has passed over.

This spirit has lately come much into esteem, both as a medicine and a menstruum. It is a solution of volatile salt in rectified spirit of wine; for, though proof-spirit be used, its phlegmatic part does not rise in the distillation, and serves only to facilitate the action of the pure spirit upon the ammoniacal salt. Rectified spirit of wine does not dissolve volatile alkaline salts by simple mixture: on the contrary, it precipitates them, as has been already observed, when they are previously dissolved in water: but, by the present process, a considerable proportion of the volatile alkali is combined with the spirit. It might perhaps, for some purposes, be more advisable to use with this intention the volatile spirit made with quicklime; for this may be mixed at once with rectified spirit of wine, in any proportion, without the least danger of any separation of the volatile alkali.

The name here employed by the London college, particularly when put in contradistinction to the water of ammonia, conveys a clear idea of the article, and is, we think, preferable to that employed by the Edinburgh college.

As a menstruum, the spirit of ammonia is employed to dissolve essential oils, thus forming the volatile aromatic spirit, or *compound spirit of ammonia*, as it is now called by the London college, which again is employed in making the tinctures of guaiac, valerian, &c.

The chief medical virtues which the spirit of ammonia possesses, when exhibited by itself, are those of the volatile alkali.

Fetid spirit of ammonia.

Take of proof-spirit, six pints; sal ammoniac, one pound; asafœtida, four ounces; pot-ash, one pound and a half. Mix them, and draw off by distillation five pints, with a slow fire. *L.*

Take of vinous spirit of sal ammoniac, eight ounces; asafœtida, half an ounce. Digest in a close vessel 12 hours; then distil off with the heat of boiling water eight ounces. *E.*

This spirit, the last formula of which is in our opinion the best, as being most easily prepared without any risk of being injured in the preparation, is designed as an antihysteric, and is undoubtedly a very elegant one. Volatile spirits, impregnated for these purposes with different fetids, have been usually kept in the shops; the ingredient here made choice of is the best calculated of any for general use, and equivalent in virtue to them all. The spirit is pale when newly distilled, but acquires a considerable tinge in keeping.

Compound spirit of aniseed. L.

Take aniseed, angelica-seed, of each, bruised, half a pound; proof-spirit, one gallon; water, sufficient to prevent an empyreuma. Draw off one gallon by distillation.

This compound spirit is now directed to be prepared by the London college in the same manner as in their former edition. It has no place in the Edinburgh pharmacopœia; but it may justly be considered as a very elegant aniseed-water. The angelica-seeds greatly improve the flavour of the anise. It is often employed with advantage, particularly in cases of flatulent colic; but it has been alleged to be sometimes too frequently used with this intention as a domestic medicine, especially by old ladies: for, unless it be prudently and cautiously employed, it may soon be attended with all the pernicious consequences of dram-drinking.

A spirit is drawn, in much the same way, from a variety of aromatic substances not necessary to be detailed here.

Chap. XIX. Decoctions and Infusions.

Water, the direct menstruum of gums and salts, extracts readily the gummy and saline parts of vegetables. Its action, however, is not limited to these; the resinous and oily principles being, in most vegetables, so intimately blended with the gummy and saline, as to be in part taken up along with them: some of the resinous cathartics, and most of the aromatic herbs, as well as bitters and astringents, yield to water the greatest part of their smell, taste, and medicinal virtue. Even of the pure essential oils, and odorous resins of vegetables, separated from the other principles, water imbibes a part of the flavour; and by

the artificial admixture of gummy or ſaline matter, the whole ſubſtance of the oil or reſin is made ſoluble in water.

Of pure ſalts, water diſſolves only certain determinate quantities: by applying heat, it is generally enabled to take up more than it can do in the cold, and this in proportion to the degree of heat; but as the liquor cools, this additional quantity ſeparates, and the water retains no more than it would have diſſolved without heat. With gummy ſubſtances, on the other hand, it unites unlimitedly, diſſolving more and more of them till it loſes its fluidity. Heat expedites the action of the water, but cannot enable it to take up more than it would do by allowing it longer time in the cold. The active parts extracted from moſt vegetables by water, and oils and reſins made ſoluble in water by the artificial admixture of gum, partake of this property of pure gums, being ſoluble without ſaturation.

It has been imagined, that vegetables in a freſh ſtate, while their oily, reſinous, and other active parts are already blended with a watery fluid, would yield their virtues to water more freely and more plentifully than when their native moiſture has been diſſipated by drying. Experience, however, ſhows, that dry vegetables in general give out more than freſh ones, water ſeeming to have little action upon them in their recent ſtate. If, of two equal quantities of mint, one be infuſed freſh in water, and the other dried, and then infuſed in the like quantity of water for the ſame length of time, the infuſion of the dry herb will be remarkably the ſtrongeſt: and the caſe appears to be the ſame in all the vegetables that have been tried.

In all the preparations deſcribed in this chapter, it is to be underſtood that the ſubjects muſt be moderately and newly dried, unleſs when they are expreſsly ordered to be taken freſh; in which caſe it is to be judged that their virtues are deſtroyed or impaired by drying.

The native colours of many vegetables are communicated to water along with their medicinal matter; many impart a colour different from their own; and others, though of a beautiful and deep colour themſelves, give ſcarcely any to the menſtruum. Of the firſt kind are the yellow and red flowers; of the ſecond, the leaves of moſt plants; of the third, ſome of the blue flowers, as thoſe of cyanus and larkſpur. Acid liquors change the infuſions of moſt flowers, the yellow ones excepted, to a red; and alkalis, both fixed and volatile, to a green.

From animal ſubſtances water extracts the gelatinous and nutritious parts; whence glues, jellies, broths, &c.; and along with theſe, it takes up principles of more activity, as the acrid matter of cantharides. It diſſolves alſo ſome portion of calcined calcareous earths, both of the animal and of the mineral kingdom, but has no action on any other kind of earthy matter.

The effect of boiling differs from that of infuſion in ſome material particulars. One of the moſt obvious differences is, that as the eſſential oils of vegetables, in which their ſpecific odours reſide, are volatile in the heat of boiling water, they exhale in the boiling along with the watery ſteam, and thus are loſt to the remaining decoction; whereas both in cold and ſometimes in hot infuſions they are preſerved; although in the latter they are by no means perfectly ſo. Odorous ſubſtances, and thoſe in general whoſe virtues depend on their volatile parts, are therefore unfit for this treatment. The ſoluble parts of theſe may, nevertheleſs, be united in this form with thoſe bodies of a more fixed nature, by boiling the latter till their virtues be ſufficiently extracted, and then infuſing the former in this decoction.

The extraction of the virtue of the ſubject is uſually promoted or accelerated by a boiling heat; but this rule is leſs general than it is commonly ſuppoſed to be. We have already obſerved, that Peruvian bark gives out its virtue more perfectly by cold infuſion than by coction. In ſome caſes, boiling occaſions a manifeſt diſunion of the principles of the ſubject: thus, when almonds are triturated with cold water, their oil, blended with the mucilaginous or other ſoluble matter of the almond, unites with the water into a milky liquor called *an emulſion*: but, on boiling them in water, the oil ſeparates and riſes to the ſurface; and if the moſt perfect emulſion be made to boil, a like ſeparation happens.

This alſo appears to take place, though in a leſs evident manner, in boiling ſundry other vegetables; thus tobacco, aſarum and ipecacuanha loſe their active powers by boiling: nor does it appear that this change is effected merely by the diſcharge of volatile parts. From ſome late experiments, it has been found that the diſtilled water of ipecacuanha was infinitely leſs emetic than the infuſion from which it was diſtilled, and that the boiling liquor gradually aſſumes a black colour, indicating ſome kind of decompoſition of parts: the ſame circumſtances probably take place in boiling tobacco, aſarum, and perhaps all vegetables whatever; though, from their not producing ſuch ſenſible operations on the living body, they cannot be ſo clearly diſcovered as in ipecacuanha, tobacco, or aſarum. The experiments we allude to were made by Dr. Irving, when a ſtudent in the college of Edinburgh; and they gained him the prize given by the Harveian Society of that place, for the beſt experimental inquiry concerning ipecacuanha.

It is for the abovementioned reaſons that we think many of the infuſions ſhould be made with cold water: it is, however, to be acknowledged, that this is not always abſolutely neceſſary, and in extemporaneous practice it may be often very inconvenient: it is, however, proper to point out the advantages to be expected from this more tedious, but much more complete and elegant, method.

Vinegar extracts the virtues of ſeveral medicinal ſubſtances in tolerable perfection: but at the ſame time its acidity makes a remarkable alteration in them, or ſuperadds a virtue of a different kind; and hence it is more rarely employed with this intention than purely aqueous or ſpirituous menſtrua. Some drugs, however, for particular purpoſes, vinegar excellently aſſiſts, or coincides with, as ſquills, garlic, ammoniac, and others: and in many caſes where this acid is itſelf principally depended on, it may be advantageouſly impregnated with the flavour of certain vegetables: moſt of the odoriferous flowers impart to it their fragrance, together with a fine purpliſh or red colour: violets, for inſtance, if freſh parcels of them are infuſed in vinegar in the cold for a little time, communicate to the liquor a pleaſant flavour, and deep purpliſh red colour. Vinegar, like other acids, added to watery infuſions or decoctions, generally precipitates a part of what the water had diſſolved.

The ſubſtances from which decoctions and infuſions are uſually prepared are univerſally known, as well as the manner of preparing them; we ſhall, however, introduce a few of the more compound deſcription.

Decoction of ſarſaparilla. L.

Take of the root of ſarſaparilla, ſliced, ſix ounces; diſtilled water, eight pints. Macerate for two hours, with a heat of about 195°; then take out the root, and bruiſe it; return the bruiſed root to the liquor, and again macerate it for two hours. Then, the liquor being boiled to four pints, preſs it out, and ſtrain.

This decoction is an article in very common uſe, particularly in venereal affections. And there can be little doubt, that by this proceſs the medical powers of the ſarſaparilla are fully extracted. But it has of late been much queſtioned, whether this article be in any degree entitled to the high character which was once given of it. Some, as we have already obſerved, are even diſpoſed to deny its poſſeſſing any medical property whatever: but the general opinion is, that it has ſomewhat of a diaphoretic effect; and this effect is more readily obtained when it is exhibited under the form of decoction than under any other.

Compound decoction of ſarſaparilla. L.

Take of the root of ſarſaparilla, ſliced and bruiſed, ſix ounces; bark of the root of ſaſſafras, raſpings of guaiacum-wood, liquorice root, bruiſed, of each one ounce; bark of the root of mezereon, three drams; diſtilled water, ten pints. Macerate, with a gentle heat, for ſix hours; then boil it down to five pints, adding, towards the end, the bark of the root of mezereon, and ſtrain the liquor.

This compound decoction is an elegant mode of preparing an article once highly celebrated under the title of the *Liſbon diet drink*. That formula, for a long time after its firſt introduction into Britain, was kept a ſecret; but an account of the method of preparation was at length publiſhed in the Phyſical and Literary Eſſays of Edinburgh, by Dr. Donald Monro. And of the formula there given, which is in many reſpects an unchemical one, the preſent may juſtly be conſidered as an improvement. Even in its original form, but ſtill more in the preſent ſtate, there can be no doubt, that it furniſhes us with a very uſeful medicine, particularly in thoſe obſtinate ulcers originating from venereal infection, which reſiſt the power of mercury. And it is highly probable, that its good effects principally depend on the impregnation it receives from the mezereon. Perhaps, however, even thus improved, it is more complicated and expenſive than is neceſſary: at leaſt we are inclined to think that every advantage derived from it may with equal eaſe and certainty be obtained from impregnating with the mezereon, in the manner here directed, a ſimple decoction of the guaiacum, bardana, or althæa, without having recourſe to ſeveral articles, or employing one ſo expenſive as the ſarſaparilla.

Compound infuſion of gentian. L.

Take of the root of gentian, one dram; freſh outer rind of lemons, half an ounce; dried outer rind of Seville oranges, one dram and a half. Boiling water, 12 ounces, by meaſure. Macerate for an hour, and ſtrain.

Bitter infuſion. E.

Take of gentian root, half an ounce; dried peel of Seville oranges, one dram; coriander ſeeds, half a dram; proof-ſpirit, four ounces; water, one pound. Firſt pour on the ſpirit, and three hours thereafter add the water; then macerate without heat for a night, and ſtrain.

Theſe formulæ do not materially differ. That of the London college is the moſt expeditious mode of preparation; but that of the Edinburgh college poſſeſſes other advantages, which are in our opinion more than ſufficient to outweigh that circumſtance.

In the former edition of the Edinburgh pharmacopœia the water was directed to be boiling: this was at leaſt unneceſſary, and was probably liable to the objections obſerved againſt decoctions. The proof-ſpirit is alſo an uſeful addition to the bitter infuſion, as it now ſtands in the Edinburgh pharmacopœia: beſides that it aſſiſts in extracting the reſinous parts, and preſerving the infuſion from fermentation, it communicates an agreeable pungency to the liquor. To anſwer in ſome meaſure theſe intentions, it was formerly directed to add to the filtrated liquor a quantity of aromatic water. This was certainly a piece of very bad pharmacy; for, beſides that the ſpirit in this preparation, when diluted with the water of the infuſion, was now no longer able to retain the ſuſpended matter, it would alſo diſpoſe the infuſion to part with its proper extractive matter; and in this way the reſinous matter of the aromatic water, and the gummy parts of the bitter infuſion, would both in ſome degree ſeparate to the bottom of the veſſel. By the formula now laid down, the infuſion contains the different principles of the ingredients in a manner more nearly approaching to their natural and entire ſtate.

Simple infuſion of ſenna. L.

Take of ſenna, an ounce and a half; ginger, powdered, one dram; boiling diſtilled water, one pint. Macerate them for an hour in a covered veſſel; and the liquor being cold, ſtrain it.

This, although a ſimple, is a very elegant infuſion of ſenna, the ginger acting as a uſeful corrigent. But if the ſenna were employed to the quantity of a dram and a half or two drams only, with the ſame menſtruum, in place of the quantity here ordered, it would be a no leſs uſeful medicine, and might be employed for one doſe, as it is beſt when freſh. Of the preſent infuſion, an ounce or two is a ſufficient doſe.

Tartarized infuſion of ſenna. L.

Take of ſenna, one ounce and a half; coriander ſeeds, bruiſed, half an ounce; cryſtals of tartar, two drams; diſtilled water, one pint. Diſſolve the cryſtals of tartar by boiling in the water; then pour the water, as yet boiling, on the ſenna and ſeeds. Macerate for an hour in a covered veſſel, and ſtrain when cold.

In the laſt edition of the London pharmacopœia this had the name of *infuſum ſennæ commune*.

Formerly an alkaline ſalt was uſed in the infuſion of ſenna inſtead of the acid one here directed. The firſt was ſuppoſed to promote the operation of the medicine, by ſuperadding a degree of purgative virtue of its own, and by enabling the water to extract ſomewhat more from the capital ingredient than it would be capable of doing by itſelf; while acids were alleged to have rather a contrary effect. Experience, however, has ſufficiently ſhown, that alkaline ſalts increaſe the offenſiveneſs of the ſenna, while cryſtals of tartar conſiderably improve the colour of the infuſion, and likewiſe render the taſte to ſome perſons leſs diſagreeable. Soluble tartar ſhould ſeem a good ingredient to theſe kinds of compoſitions, as it not only improves the taſte, but promotes the purgative virtue of the medicine: this addition alſo renders the infuſion leſs apt to gripe, or occaſion flatulencies.

Infuſion of rhubarb. E.

Take of rhubarb, half an ounce; boiling water, eight ounces; ſpirituous cinnamon water, one ounce. Macerate the rhubarb in a glaſs veſſel with the boiling water for a night; then having added the cinnamon water, ſtrain the liquor.

In this infuſion cold water might perhaps be employed with advantage; we alſo object to the ſpirituous cinnamon-water on the ſame grounds as we did before to the aromatic water in the bitter infuſion of the former edition of the Edinburgh pharmacopœia. This, however, appears to be one of the beſt preparations of rhubarb when deſigned as a purgative; water extracting its virtue more effectually than either vinous or ſpirituous menſtrua. In this reſpect rhubarb differs from moſt of the other vegetable cathartics; and we think the London college might have given it a place in their pharmacopœia as well as the wine or tincture of rhubarb.

Vinegar of ſquills.

Take of ſquills, dried, one pound; vinegar, ſix pints; proof-ſpirit, half a pint. Macerate the ſquills in the vinegar, with a gentle heat, in a glaſs veſſel, for four-and twenty hours; then preſs out the liquor, and ſet it by that the faeces may ſubſide: laſtly, pour off the liquor, and add to it the ſpirit. *L.*

Take of dried root of ſquills, two ounces; diſtilled vinegar, two pounds and a half; rectified ſpirit of wine, three ounces. Macerate the ſquills with the vinegar eight days; then preſs out the vinegar, to which add the ſpirit; and when the faeces have ſubſided, pour off the clear liquor. *E.*

Vinegar of ſquills is a medicine of great antiquity; we find in a treatiſe attributed to Galen, an account of its preparation, and of many particular virtues then aſcribed to it. It is a very powerful ſtimulant, aperient, and what is called an attenuant of tenaceous juices; and hence it is frequently uſed with,

great ſucceſs, in diſorders of the breaſt occaſioned by a load of thick phlegm, and for promoting urine in hydropic caſes. The doſe of this medicine is from a dram to half an ounce: where crudities abound in the firſt paſſages, it may be given at firſt in a larger doſe, to evacuate them by vomiting. It is moſt conveniently exhibited along with cinnamon, or other agreeable aromatic waters, which prevent the nauſea it would otherwiſe, even in ſmall doſes, be apt to occaſion.

Chap. XX. Medicated Wines.

The original intention of medicated wines was, that medicines which were to be continued for a length of time might be taken in the moſt familiar and agreeable form; by this means a courſe of remedies was complied with, notwithſtanding the repugnance and averſion which the ſick often manifeſt to thoſe directly furniſhed from the ſhops; and hence the inferior ſort of people had their medicated ales. Nevertheleſs, as vinous liquors excellently extract the virtues of ſeveral ſimples, and are not ill fitted for keeping, they have been employed as officinal menſtrua alſo; and ſubſtances of the greateſt efficacy are truſted in this form. As compounds of water and inflammable ſpirit, they take up ſuch parts of vegetables and animals as are ſoluble in thoſe liquors; though moſt of them abound at the ſame time with a mucilaginous or viſcous ſubſtance, which renders them leſs effectual menſtrua than purer mixtures of water and ſpirit. They contain likewiſe a ſubtile acid, which ſomewhat further obſtructs their action on certain vegetable and animal matters; but enables them, in proportion to its quantity, to diſſolve ſome bodies of the metallic kind, and thus impregnate themſelves with the corroborating virtues of ſteel, the alterative and emetic powers of antimony, and the noxious qualities of lead.

To all the medicated wines, after they have been ſtrained, you may add about one-twentieth their quantity of proof ſpirit, to preſerve them from fermentation. They may be conveniently kept in the ſame kind of glaſs bottles that wines generally are for common uſes, which ſhould likewiſe be corked with the ſame care.

Wine of aloes. L.

Take of ſocotorine aloes, eight ounces; white canella, commonly called *winter's bark*, two ounces; Spaniſh white wine, ſix pints; proof-ſpirit, two pints. Powder the aloes and white canella ſeparately; when mixed, pour on them the wine and ſpirit: afterwards digeſt for fourteen days, now and then ſhaking them; laſtly, ſtrain. It will not be amiſs to mix white ſand, cleanſed from impurities, with the powder, in order to prevent the moiſtened aloes from getting into lumps.

Aloetic wine, or ſacred tincture. E.

Take of ſocotorine aloes, one ounce; leſſer cardamom ſeeds, ginger, each one dram; Spaniſh white wine, two pounds. Digeſt for ſeven days, ſtirring now and then, and afterwards ſtrain.

This medicine has long been in great eſteem, not only as a cathartic, but likewiſe as a ſtimulus; the wine diſſolving all that part of the aloes in which theſe qualities reſide, a portion only of the leſs active reſinous matter being left. The aromatic ingredients are added to warm the medicine, and ſomewhat alleviate the ill flavour of the aloes: white canella, or cloves, are ſaid, among numerous materials that have been tried, to anſwer this end the moſt ſucceſsfully; hence the introduction of the former of theſe into the formula of the London college.

The ſacred tincture appears from long experience to be a medicine of excellent ſervice in languid phlegmatic habits, not only for cleanſing the primæ viæ, but likewiſe for ſtimulating the ſolids, warming the habit, promoting or exciting the uterine purgations, and the hæmorrhoidal flux. The doſe, as a purgative, is from one to two ounces or more. It may be introduced into the habit, ſo as to be productive of excellent effects as an alterant, by giving it in ſmall doſes, at proper intervals: thus managed, it does not for a conſiderable time operate remarkably by ſtool; but at length proves purgative, and occaſions a lax habit of much longer continuance than that produced by the other common cathartics.

Wine of antimony. L.

Take of vitrified antimony, powdered, one ounce; Spaniſh white wine, a pint and a half. Digeſt for twelve days, frequently ſhaking the veſſel, and filter the wine through paper.

Antimonial wine. E.

Take of glaſs of antimony, finely powdered, one ounce; Spaniſh white wine, fifteen ounces. Macerate for three days, ſtirring them now and then, and afterwards ſtrain the liquor through paper.

However carefully the ſettling and decantation are performed, the filtration of the wine through paper appears to be neceſſary, leſt ſome of the finer parts of the glaſs ſhould chance to remain ſuſpended in ſubſtance. It is not here, as in moſt other wines and tinctures, where the matter left undiſſolved by the menſtruum is of little conſequence; the antimonial glaſs, after the action of the wine, continues as virulent as ever, and capable of impregnating freſh parcels of the liquor as ſtrongly as the firſt, and this, in appearance, inexhauſtibly. After thirty repeated infuſions, it has been found ſcarce ſenſibly diminiſhed in weight.

The antimonial wine poſſeſſes the whole virtues of that mineral, and may be ſo doſed and managed as to perform all that can be effected by any antimonial preparation; with this advantage, that as the active part of the antimony is here already diſſolved and rendered miſcible with the animal fluids, its operation is more certain. Given from ten to fifty or ſixty drops, it generally acts as an alterative and diaphoretic; in larger doſes, as a diuretic and cathartic; while three or four drams prove for the moſt part violently emetic. It has been chiefly uſed with this laſt intention, in ſome maniacal and apoplectic caſes; and hence it gained the name of *emetic wine*.

The quantity of the reguline part muſt, however, vary according to the proportions of the acid matter in different wines, and the operation of the medicine muſt be thereby leſs certain in degree; the vitrum is preferable to the crocus for making this preparation. See the different preparations of *Antimony*.

Wine of tartarized antimony. L.

Take of tartarized antimony, two ſcruples; boiling diſtilled water, two ounces; Spaniſh white wine, eight ounces; diſſolve the tartarized antimony in the boiling diſtilled water, and add the wine.

Wine of antimonial tartar. E.

Take of antimonial tartar, commonly called *emetic tartar*, twenty-four grains; and diſſolve it in a pound of Spaniſh white wine.

Watery ſolutions of emetic tartar, on ſtanding, precipitate a part which is leſs completely in a ſaline ſtate; by this means, and eſpecially if the ſolution be not ſhaken before uſing it, the doſe of that medicine is ſomewhat ambiguous: in the above formula, the acid matter of the wine increaſes the ſaline ſtate of the antimony, and therefore its ſolubility, whereby the operation of the medicine is more certain, and in many caſes more powerful. From the certainty of its effects, this preparation might be very convenient in large hoſpitals or armies, where great numbers of the ſick, and inaccurate nurſing, frequently occaſion an uncertain or dangerous practice.

In the formula employed by the Edinburgh college, each ounce of the wine contains two grains of the tartarized antimony; but in that of the London college, each ounce of the menſtruum contains four grains: hence, while an ounce of the one may be employed for exciting full vomiting, the ſame quantity

of the other would be too ſtrong a doſe. It is much to be regretted, that, in articles of this active nature, the proportions employed by the two colleges ſhould differ ſo conſiderably: and it would perhaps have been better, had the London college adopted the proportions employed by that of Edinburgh, as they have followed them in adopting this formula.

Wine of iron. L.

Take of filings of iron, four ounces; Spaniſh white wine, four pints. Digeſt for a month, often ſhaking the veſſel, and then ſtrain.

This formula of the London pharmacopœia is now not only ſimplified, but improved, when compared with their former *vinum chalybeatum*: for the cinnamon and other articles which were then conjoined with the iron, were certainly rather prejudicial than otherwiſe; but at the ſame time, Rheniſh wine, formerly employed, is perhaps to be conſidered as a better menſtruum than the Spaniſh wine now directed. It may ſtill, however, be juſtly conſidered as a good chalybeate; and we think the Edinburgh college have done wrong in rejecting the formula from their pharmacopœia.

Wine of ipecacuanha. L.

Take of the root of ipecacuanha, bruiſed, two ounces; Spaniſh white wine, two pints. Digeſt for ten days, and ſtrain.

Wine, or tincture, of ipecacuanha. E.

Take of ipecacuanha, in powder, one ounce; Spaniſh white wine, fifteen ounces. After three days maceration, let the tincture be filtrated for uſe.

Both theſe wines are very mild and ſafe emetics, and equally ſerviceable in dyſenteries alſo with the ipecacuanha in ſubſtance; this root yielding nearly all its virtues to the Spaniſh white wine here ordered, as it does a good ſhare of them even to aqueous liquors. The common doſe is an ounce, more or leſs, according to the age and ſtrength of the patient. The college of Edinburgh added formerly a ſcruple of cochineal, which imparts a fine red colour to the liquor: this article is now omitted, on a complaint that the red colour of the matters evacuated ſometimes alarmed the patient, as if it proceeded from a diſcharge of blood.

Wine of rhubarb. L.

Take of ſliced rhubarb, two ounces and a half; leſſer cardamom-ſeeds, bruiſed and huſked, half an ounce; ſaffron, two drams; Spaniſh white wine, two pints; proof-ſpirit, eight ounces. Digeſt for ten days, and ſtrain.

Rhubarb-wine. E.

Take of rhubarb, two ounces; white canella, one dram; proof-ſpirit, two ounces; Spaniſh white wine, fifteen ounces. Macerate for ſeven days, and ſtrain.

By aſſiſting the ſolvent power of the menſtruum, the proof-ſpirit in the above formulæ is a very uſeful addition. This is a warm, cordial, laxative medicine. It is uſed chiefly in weakneſs of the ſtomach and bowels, and ſome kinds of looſeneſſes, for evacuating the offending matter, and ſtrengthening the tone of the viſcera. It may be given from half a ſpoonful to three or four ſpoonfuls or more, according to the circumſtances of the diſorder, and the purpoſes it is intended to anſwer.

Chap. XXI. Tinctures.

Rectified ſpirit of wine is the direct menſtruum of the reſins and eſſential oils of vegetables, and totally extracts theſe active principles from ſundry vegetable matters, which yield them to water either not at all, or only in part. It diſſolves likewiſe the ſweet ſaccharine matter of vegetables; and generally thoſe parts of animal bodies in which their peculiar ſmell and taſte reſide.

The virtues of many vegetables are extracted almoſt equally by water and rectified ſpirit; but in the watery and ſpirituous tinctures of them there is this difference, that the active parts in the watery extractions are blended with a large proportion of inert gummy matter, on which their ſolubility in this menſtruum in a great meaſure depends, while rectified ſpirit extracts them almoſt pure from gum. Hence, when the ſpirituous tinctures are mixed with watery liquors, a part of what the ſpirit had taken up from the ſubject generally ſeparates and ſubſides, on account of its having been freed from that matter which, being blended with it in the original vegetable, made it ſoluble in water. This, however, is not univerſal; for the active parts of ſome vegetables, when extracted by rectified ſpirit, are not precipitated by water, being almoſt equally ſoluble in both menſtrua.

Rectified ſpirit may be tinged by vegetables of all colours except blue: the leaves of plants in general, which give out but little of their natural colour to watery liquors, communicate to ſpirit the whole of their green tincture, which for the moſt part proves elegant, though not very durable.

Fixed alkaline ſalts deepen the colour of ſpirituous tinctures; and hence they have been ſuppoſed to promote the diſſolving power of the menſtruum, though this does not appear from experience: in the trials that have been made to determine this affair, no more was found to be taken up in the deep-coloured tinctures than in the paler ones, and often not ſo much: if the alkali be added after the extraction of the tincture, it will heighten the colour as much as when mixed with the ingredients at firſt. Nor does the addition of theſe ſalts make tinctures uſeleſs only, but likewiſe prejudicial, as they in general injure the flavour of aromatics, and ſuperadd a quality ſometimes contrary to the intention of the medicine. Volatile alkaline ſalts, in many caſes, promote the action of the ſpirits. Acids generally weaken it; unleſs when the acid has been previouſly combined with the vinous ſpirit into a compound of new qualities, called *dulcified ſpirit.*

Tincture of aloes. L.

Take of ſocotorine aloes, powdered, half an ounce; extract of liquorice, an ounce and a half; diſtilled water, proof-ſpirit, of each eight ounces. Digeſt in a ſand-bath, now and then ſhaking the veſſel, until the extract be diſſolved, and then ſtrain.

In this ſimple tincture all the active parts of the aloes, whether of a gummy or reſinous nature, are ſuſpended in the menſtruum. The extract of liquorice ſerves both to promote the ſuſpenſion and to cover the taſte of the aloes; and in theſe caſes where we wiſh for the operation of the aloes alone, without the aid either of an adjuvans or corrigens, this is perhaps one of the beſt formulæ under which aloes can be exhibited in a fluid ſtate.

Compound tincture of aloes. L.

Take of tincture of myrrh, two pints; ſaffron, ſocotorine aloes, of each three ounces. Digeſt for eight days, and ſtrain.

This medicine is highly recommended, and not undeſervedly, as a warm ſtimulant and aperient. It ſtrengthens the ſtomach and other viſcera, cleanſes the firſt paſſages from tenacious phlegm, and promotes the natural ſecretions in general. Its continued uſe has frequently done much ſervice in cachectic and icteric caſes, uterine obſtructions, and other ſimilar diſorders; particularly in cold pale phlegmatic habits. Where the patient is of a hot bilious conſtitution and florid complexion, this warm ſtimulating medicine is leſs proper, and ſometimes prejudicial. The doſe may be from twenty drops to a tea-ſpoonful or more, two or three times a-day, according to the purpoſes which it is intended to anſwer.

Tincture of aſafœtida. L.

Take of aſafœtida, four ounces; rectified ſpirit of wine, two pints. Digeſt with a gentle heat for ſix days, and ſtrain.

Fœtid tincture. E.

Take of aſafœtida, two ounces; vinous ſpirit of ſal ammoniac, one pound. Macerate for ſix days in a cloſe ſhut veſſel, and ſtrain.

Of theſe two formulæ, the laſt is perhaps moſt generally uſeful. The vinous ſpirit of ſal ammoniac is not only a more powerful menſtruum than the rectified ſpirit of wine, but alſo coincides with the general virtues of the remedy.

This tincture poſſeſſes the virtues of the aſafœtida itſelf; and may be given from ten drops to fifty or ſixty. It was firſt propoſed to be made with proof-ſpirit; this diſſolves more of the aſafœtida than a rectified one; but the tincture proves turbid; and therefore rectified ſpirit, which extracts a tranſparent one, is very juſtly preferred where ardent ſpirit is to be employed: and with this menſtruum we can at leaſt exhibit the aſafœtida in a liquid form to a greater extent.

Tincture of balſam of Peru. L.

Take of balſam of Peru, four ounces; rectified ſpirit of wine, one pint. Digeſt until the balſam be diſſolved.

The whole of the Peruvian balſam is diſſolved by ſpirit of wine: this therefore may be conſidered as a good method of freeing it from its impurities; while at the ſame time it is thus reduced to a ſtate under which it may be readily exhibited: but at preſent it is very little employed, unleſs in compoſition, either under this or any other form.

Tincture of balſam of Tolu.

Take of balſam of Tolu, one ounce and a half; rectified ſpirit of wine, one pint. Digeſt until the balſam be diſſolved, and ſtrain. *L.*

Take of balſam of Tolu, an ounce and a half; rectified ſpirit of wine, one pound. Digeſt until the balſam be diſſolved, and then ſtrain the tincture. *E.*

This ſolution of balſam of Tolu poſſeſſes all the virtues of the balſam itſelf. It may be taken internally, with the ſeveral intentions for which that valuable balſam is proper, to the quantity of a tea-ſpoonful or two, in any convenient vehicle. Mixed with the plain ſyrup of ſugar, it forms an elegant balſamic ſyrup.

Compound tincture of benzoin. L.

Take of benzoin, three ounces; ſtorax ſtrained, two ounces; balſam of Tolu, one ounce; ſocotorine aloes, half an ounce; rectified ſpirit of wine, two pints. Digeſt with a gentle heat for three days, and ſtrain.

The compound tincture of benzoin, or traumatic balſam, ſtands highly recommended, externally, for cleanſing and healing wounds and ulcers, for diſcuſſing cold tumors, allaying gouty, rheumatic, and other old pains and aches; and likewiſe internally, for warming and ſtrengthening the ſtomach and inteſtines, expelling flatulencies, and relieving colic complaints. Outwardly, it is applied cold on the part with a feather; inwardly, a few drops are taken at a time, in wine or any other convenient vehicle.

Tincture of the Spaniſh fly.

Take of bruiſed cantharides, two drams; cochineal, powdered, half a dram; proof-ſpirit, one pint and a half. Digeſt for eight days, and ſtrain. *L.*

Take of cantharides, one dram; proof-ſpirit, one pound. Digeſt for four days, and ſtrain through paper. *E.*

Theſe tinctures poſſeſs the whole virtues of the fly, and are the only preparations of it deſigned for internal uſe: tinctures being by far the moſt commodious and ſafe form for the exhibition of this active drug. The two tinctures are ſcarcely different in virtue from each other. The cochineal is uſed only as a colouring ingredient: the gum-guaiacum, camphor, and eſſential oil of juniper-berries, which were formerly added, however well adapted to the intentions of cure, could be of little conſequence in a medicine limited to ſo ſmall a doſe. If any additional ſubſtances ſhould be thought requiſite for promoting the effect of the cantharides, whether as a diuretic, as a detergent in ulcerations of the urinary paſſages, or as a ſpecific reſtringent of ſeminal gleets and the fluor albus, they are more advantageouſly joined extemporaneouſly to the tincture, or interpoſed by themſelves at proper intervals. The uſual doſe of theſe tinctures is from ten to twenty drops; which may be taken in a glaſs of water, or any other more agreeable liquor, twice a day; and increaſed by two or three drops at a time, according to the effect.

The tincture of cantharides has of late been highly celebrated as a ſucceſsful remedy in diabetic caſes; and in ſome inſtances of this kind, its uſe has been puſhed to a very conſiderable extent, without giving riſe to any ſtrangurious affections. But we have not found it productive of a change for the better in any of thoſe caſes of diabetes in which we have had occaſion to try it.

Various aromatic and other tinctures are in uſe in the ſhop, and the preparation is conducted upon principles ſimilar to the foregoing; we ſhall therefore confine ourſelves to a few of the moſt important.

Tincture of colomba. L.

Take of colomba-root, powdered, two ounces and a half; proof-ſpirit, two pints. Digeſt for eight days, and ſtrain.

The colomba readily yields its active qualities to the menſtruum here employed; and accordingly, under this form, it may be advantageouſly employed againſt bilious vomitings, and thoſe different ſtomach ailments, in which the colomba has been found uſeful; but where there does not occur ſome objection to its uſe in ſubſtance, that form is in general preferable to the tincture, which is now for the firſt time introduced into the London pharmacopœia.

Tincture of Peruvian bark.

Take of Peruvian bark, powdered, four ounces; proof-ſpirit, two pints. Digeſt with a gentle heat for eight days, and ſtrain. *L.*

Take of Peruvian bark, four ounces; proof-ſpirit, two pounds and a half. Digeſt for ten days, and ſtrain. *E.*

A medicine of this kind has been for a long time pretty much in eſteem, and uſually kept in the ſhops, though but lately received into the pharmacopœias. Some have employed highly-rectified ſpirit of wine as a menſtruum; which they have taken care fully to ſaturate, by digeſtion on a large quantity of the bark. Others have thought of aſſiſting the action of the ſpirit by the addition of a little fixed alkaline ſalt, which does not however appear to be of any advantage; and others have given the preference to the vitriolic acid, which was ſuppoſed, by giving a greater conſiſtence to the ſpirit, to enable it to ſuſtain more than it would be capable of doing by itſelf; at the ſame time that the acid improves the medicine by increaſing the roughneſs of the bark. This laſt tincture, and that made with rectified ſpirit, have their advantages; though, for general uſe, that above directed is the moſt convenient of any, the proof-ſpirit extracting nearly all the virtues of the bark. It may be given from a tea-ſpoonful to half an ounce, or an ounce, according to the different purpoſes it is intended to anſwer.

Compound tincture of Peruvian bark. L.

Take of Peruvian bark, powdered, two ounces; exterior peel of Seville oranges, dried, one ounce and a half; Virginian ſnake-root, bruiſed, three drams; ſaffron, one dram; cochi-

neal, powdered, two ſcruples; proof-ſpirit, twenty ounces. Digeſt for fourteen days, and ſtrain.

This has been for a conſiderable time celebrated under the title of *Huxham's tincture of bark*.

The ſubſtances here joined to the bark, in ſome caſes, promote its efficacy in the cure of intermittents, and not unfrequently are abſolutely neceſſary. In ſome ill habits particularly where the viſcera and abdominal glands are obſtructed, the bark, by itſelf, proves unſucceſsful, if not injurious; while, given in conjunction with ſtimulating ſtomachics and deobſtruents, it more rarely fails of the due effect. Orange-peel and Virginian ſnake-root are among the beſt additions for this purpoſe, to which it is thought by ſome neceſſary to join chalybeate medicines alſo.

As a corroborant and ſtomachic, it is given in doſes of two or three drams; but when employed for the cure of intermittents, it muſt be taken to a greater extent. For this purpoſe, however, it is rarely employed, unleſs with thoſe who are averſe to the uſe of the bark in ſubſtance, or whoſe ſtomachs will not retain it under that form.

Tincture of muriated iron. L.

Take of the ruſt of iron, half a pound; muriatic acid, three pounds; rectified ſpirit of wine, three pints. Pour the muriatic acid on the ruſt of iron in a glaſs veſſel; and ſhake the mixture now and then during three days. Set it by that the fæces may ſubſide; then pour off the liquor: evaporate this to one pint, and, when cold, add to it the vinous ſpirit.

Tincture of iron. E.

Take of the ſcales of iron, purified and powdered, three ounces; muriatic acid, as much as is ſufficient to diſſolve the powder. Digeſt with a gentle heat; and the powder being diſſolved, add of rectified ſpirit of wine as much as will make up of the whole liquor two pounds and a half.

Of theſe two formulæ, that of the Edinburgh college is, in our opinion, in ſeveral reſpects entitled to the preference. The ſcales are much fitter for giving a proper ſolution than the ruſt. The ſtrength of the muriatic acid is ſo variable, that the quantity is left to the judgment of the operator. If the acid be ſuperabundant, the ſolution is of a green colour; if it be fully ſaturated with the iron, it is more or leſs of a reddiſh or yellow colour; and this ſerves as a pretty accurate criterion. As the muriatic acid combines leſs intimately with rectified ſpirit than any of the foſſil acids, ſo the after-proceſs of dulcification ſcarcely, if at all, impairs the ſolvent power of the acid; though, when the dulcification happens to be more than uſually complete, a ſmall quantity of ferruginous matter is ſometimes precipitated on adding the rectified ſpirit to the ſolution. But as the rectified ſpirit increaſes the volatility of the acid, ſo, if it was added at firſt, we ſhould loſe much more of the menſtruum by the heat employed during the digeſtion. When this tincture is well prepared, it is of a yelloviſh-red colour; if the acid be ſuperabundant, it is more or leſs of a greeniſh hue; and if the rectified ſpirit has been impregnated with the aſtringent matter of oak galls, it aſſumes an inky colour.

All the tinctures of iron are no other than real ſolutions of the metal made in acids, and combined with vinous ſpirits. The tinctures here directed differ from each other only in ſtrength, the acid being the ſame in both. In our former pharmacopœias, there was a tincture from the matter which remains after the ſublimation of the martial flowers; which, though it appears to be a good one, is now expunged as ſuperfluous. Some have recommended dulcified ſpirit of nitre as a menſtruum; but though this readily diſſolves the metal, it does not keep it ſuſpended. The marine is the only acid that can be employed for this purpoſe.

Theſe tinctures are greatly preferable to the calces or croci of iron, as being not only more ſpeedy, but likewiſe more certain in their operation. The latter, in ſome caſes, paſs off through the inteſtinal tube with little effect; while the tinctures ſcarce ever fail. From ten to twenty drops of either of the tinctures may be taken two or three times a day, in any proper vehicle; though it is ſometimes adviſable to extend the doſe of any tinctures of iron ſo far as the half of theſe quantities, eſpecially with the tincture in ſpirit of ſalt, which is exceedingly ſtrong of the iron.

Tincture of gum-guaiacum. L.

Take of gum-guaiacum, four ounces; compound ſpirit of ammonia, a pint and a half. Digeſt for three days, and ſtrain.

Volatile elixir of guaiacum. E.

Take of gum-guaiacum, four ounces; balſam of Peru, two drams; diſtilled oil of ſaſſafras, half a dram; vinous ſpirit of ſal ammoniac, a pound and a half. Macerate for ſix days in a cloſe veſſel, and ſtrain.

In the laſt of theſe formulæ, the vinous ſpirit of ſal ammoniac is leſs acrimonious than the menſtruum directed by the London college; and the balſam of Peru, and diſtilled oil of ſaſſafras, are uſeful additions, by increaſing the permanence of its operation as a general ſtimulant, or more particularly as a diaphoretic.

Theſe are very elegant and efficacious tinctures; the volatile ſpirit excellently diſſolving the gum, and at the ſame time promoting its medicinal virtue. In rheumatic caſes, a tea or even table ſpoonful, taken every morning and evening in any convenient vehicle, particularly in milk, has proved of ſingular ſervice.

Tincture of jalap.

Take of powdered jalap-root, eight ounces; proof-ſpirit, two pints. Digeſt with a gentle heat for eight days, and ſtrain. *L.*

Take of jalap, in coarſe powder, three ounces; proof-ſpirit, fifteen ounces. Digeſt them for eight days, and ſtrain the tincture. *E.*

Rectified ſpirit of wine was formerly ordered for the preparation of this tincture; but rectified ſpirit diſſolving little more than the pure reſinous parts of the jalap, rendered the uſe of the medicine ſomewhat leſs commodious than that of the tincture prepared with proof-ſpirit. Moſt of the tinctures made in rectified ſpirit, diluted with water ſo as to be fit for taking, form a turbid white mixture. Many of them are ſafely taken in this form, without any further addition: but the cathartic ones are never to be ventured on without an admixture of ſyrup or mucilage to keep the reſin united with the liquor; for, if it ſeparates in its pure undivided ſtate, it never fails to produce violent gripes.

Some have preferred to the tinctures of jalap, a ſolution in ſpirit of wine of a known quantity of the reſin extracted from the root; and obſerve, that this ſolution is more certain in ſtrength than any tincture that can be drawn from the root directly. For, as the purgative virtue of jalap reſides in its reſin, and as all jalap appears from experiment not to be equally reſinous, ſome ſorts yielding five, and others not three, ounces of reſin from ſixteen; it follows, that although the root be always taken in the ſame proportion to the menſtruum, and the menſtruum always exactly of the ſame ſtrength, it may, nevertheleſs, according to the degree of goodneſs of the jalap, be impregnated with different quantities of reſin, and conſequently prove different in degree of efficacy. Though this objection againſt the tincture does not reach ſo far as ſome ſeem to ſuppoſe, it certainly behoves the apothecary to be careful in the choice of the root. The inferior ſorts may be employed for making reſin of jalap, which they yield in as great perfection, though not in ſo large quantity, as the beſt. Neumann thinks even the worm-eaten jalap as good for that purpoſe as any other.

Tincture of myrrh.

Take of myrrh, bruiſed, three ounces; proof-ſpirit, a pint and a half; rectified ſpirit of wine, half a pint. Digeſt with a gentle heat for eight days, and ſtrain. *L.*

Take of myrrh, three ounces; proof-ſpirit, two pounds and a half. After digeſtion for ten days, ſtrain off the tincture. *E.*

The pharmaceutical writers in general have been of opinion, that no good tincture can be drawn from myrrh by ſpirit of wine alone, without the aſſiſtance of fixed alkaline ſalts. But it appears from proper experiments, that theſe ſalts only heighten the colour of the tincture, without enabling the menſtruum to diſſolve any more than it would by itſelf. Rectified ſpirit extracts, without any addition, all that part of the myrrh in which its peculiar ſmell and taſte reſide, viz. the reſin: and proof-ſpirit diſſolves almoſt the whole of the drug, except its impurities: hence the combination of theſe two directed by the London college is perhaps preferable to either by itſelf.

Tincture of myrrh is recommended internally for warming the habit, attenuating viſcid juices, ſtrengthening the ſolids, opening obſtructions, particularly thoſe of the uterine veſſels, and reſiſting putrefaction. Boerhaave greatly eſteems it in all languid caſes proceeding from ſimple inactivity; in thoſe female diſorders which are occaſioned by an aqueous, mucous, ſluggiſh indiſpoſition of the humours, and a relaxation of the veſſels; in the fluor albus, and all diſeaſes ariſing from a like cauſe. The doſe is from fifteen drops to forty or more. The medicine may doubtleſs be given in theſe caſes to advantage; though, with us, it is more commonly uſed externally for cleanſing foul ulcers and promoting the exfoliation of carious bones.

Tincture of opium. L.

Take of hard purified opium, powdered, ten drams; proof-ſpirit, one pint. Digeſt for ten days, and ſtrain.

Tincture of opium, commonly called *liquid laudanum.* E.

Take of opium, two ounces; ſpirituous cinnamon-water, one pound and a half. Digeſt four days, and ſtrain off the tincture.

Theſe are very elegant liquid opiates; the menſtruum in the laſt diſſolves nearly the whole ſubſtance of the opium, and effectually covers its ill flavour. It were to be wiſhed that the ſhops were furniſhed with a liquid opiate, in which the proportion of menſtruum was ſtill much larger, ſo as to admit of the doſe being determined by weight or meaſure; the method by drops ſeeming too precarious for a medicine of ſo powerful a kind.

Camphorated tincture of opium. L.

Take of hard purified opium, flowers of benzoin, each one dram; camphor, two ſcruples; eſſential oil of aniſeed, one dram; proof-ſpirit, two pints. Digeſt for three days.

Paregoric elixir. E.

Take of flowers of benzoin, Engliſh ſaffron, each three drams; opium, two drams; eſſential oil of aniſeeds, half a dram; vinous ſpirit of ſal ammoniac, ſixteen ounces. Digeſt for four days in a cloſe veſſel, and ſtrain.

Theſe two, though differing not merely in name, may yet be conſidered as agreeing very nearly in their nature.

The moſt material differences in the laſt formula from the firſt are the ſubſtitution of the vinous ſpirit of ſal ammoniac for the proof-ſpirit, and a larger proportion of opium: the vinous ſpirit of ſal ammoniac is not only, perhaps, a more powerful menſtruum, but in moſt inſtances coincides with the virtues of the preparation; but as the opium is the ingredient on which we place the principal dependence, ſo its proportion is increaſed, in order that we may give it in ſuch a doſe as that the acrimony of the menſtruum ſhall not prove hurtful to the ſtomach.

The London formula is taken from Le Mort, with the omiſſion of three unneceſſary ingredients, honey, liquorice, and alkaline ſalt. It was originally called *elixir aſthmaticum*, which name it does not ill deſerve. It contributes to allay the tickling which provokes frequent coughing; and at the ſame time is ſuppoſed to open the breaſt, and give greater liberty of breathing: the opium procures (as it does by itſelf) a temporary relief from the ſymptoms; while the other ingredients tend to remove the cauſe, and prevent their return. It is given to children againſt the chincough, &c. from five drops to twenty; to adults, from twenty to a hundred. In the London formula, half an ounce by meaſure contains about a grain of opium; but in the Edinburgh formula the proportion of opium is larger.

Tincture of rhubarb.

Take of rhubarb, ſliced, two ounces; leſſer cardamom ſeeds, huſked and bruiſed, half an ounce; ſaffron, two drams; proof-ſpirit, two pints. Digeſt for eight days, and ſtrain. *L.*

Compound tincture of rhubarb. L.

Take of rhubarb ſliced, two ounces; ginger powdered, ſaffron, each two drams; liquorice-root, bruiſed, half an ounce; diſtilled water, one pint; proof-ſpirit, twelve ounces. Digeſt for fourteen days, and ſtrain.

The foregoing tinctures of rhubarb are deſigned as ſtomachics and corroborants, as well as purgatives: ſpirituous liquors excellently extract thoſe parts of the rhubarb in which the two firſt qualities reſide, and the additional ingredients conſiderably promote their efficacy. In weakneſs of the ſtomach, indigeſtion, laxity of the inteſtines, diarrhœas, colic, and other ſimilar complaints, theſe medicines are frequently of great ſervice: the ſecond is alſo, in many caſes, an uſeful addition to the Peruvian bark, in the cure of intermittents, particularly in cachectic habits, where the viſcera are obſtructed; with theſe intentions, a ſpoonful or two may be taken for a doſe, and occaſionally repeated.

Compound tincture of ſavin. L.

Take of extract of ſavin, one ounce; tincture of caſtor, one pint; myrrh, half a pint. Digeſt till the extract of ſavin be diſſolved, and then ſtrain.

This preparation had a place in the laſt edition of the Edinburgh pharmacopœia, under the title of *Elixir myrrhæ compoſitum.*

This preparation is improved from one deſcribed in ſome former diſpenſaries under the name of *uterine elixir.* It is a medicine of great importance in uterine obſtructions, and in hypochondriacal caſes; though, poſſibly, means might be contrived of ſuperadding more effectually the virtues of ſavin to a tincture of myrrh and caſtor. It may be given from five drops to twenty or thirty, or more, in pennyroyal water, or any other ſuitable vehicle.

Tincture of ſquill. L.

Take of ſquills, freſh dried, four ounces; proof-ſpirit, two pints. Digeſt for eight days, and pour off the liquor.

For extracting the virtues of ſquills, the menſtruum which has hitherto been almoſt ſolely employed is vinegar. There are, however, caſes in which ardent ſpirit may be more proper; and by the menſtruum here directed its virtues are fully extracted. Hence it is with propriety that the London college have introduced this form, as well as the vinegar and oxymel. But, in general, the purpoſes to be anſwered by ſquills may be better obtained by employing it in ſubſtance than in any other form.

Tincture of ſenna. L.

Take of ſenna, one pound; caraway-ſeeds, bruiſed, one ounce and a half; leſſer cardamom-ſeeds, huſked and bruiſed, half

an ounce; raiſins, ſtoned, ſixteen ounces; proof-ſpirit, one gallon. Digeſt for fourteen days, and ſtrain.

Compound tincture of ſenna, commonly called *Elixir of health*. E.

Take of ſenna leaves, two ounces; jalap root, one ounce; coriander-ſeeds, half an ounce; proof-ſpirit, two pounds and a half. Digeſt for ſeven days, and to the ſtrained liquor add four ounces of ſugarcandy.

Both theſe tinctures are uſeful carminatives and cathartics, eſpecially to thoſe who have accuſtomed themſelves to the uſe of ſpirituous liquors; they oftentimes relieve flatulent complaints and colics, where the common cordials have little effect: the doſe is from one to two ounces. Several preparations of this kind have been offered to the public under the name of *Daffy's elixir*: the two above are equal to any, and ſuperior to moſt of them. The laſt in particular is a very uſeful addition to the caſtor oil, in order to take off its mawkiſh taſte: and as coinciding with the virtues of the oil, it is therefore much preferable to brandy, ſhrub, and ſuch like liquors, which otherwiſe are often found neceſſary to make the oil ſit on the ſtomach.

Chap. XXII. Mixtures.

Camphorated mixture. L.

Take of camphor, one dram; rectified ſpirit of wine, ten drops; double-refined ſugar, half an ounce; boiling diſtilled water, one pint. Rub the camphor firſt with the ſpirit of wine, then with the ſugar; laſtly, add the water by degrees, and ſtrain the mixture.

While camphor is often exhibited in a ſolid ſtate, it is frequently alſo advantageous to employ it as diffuſed in watery fluids. And with this intention the preſent formula is perhaps one of the moſt ſimple, the union being effected merely by the aid of a ſmall quantity of ſpirit of wine and a little ſugar. But perhaps the more common form of emulſion in which the union is effected, by triturating the camphor with a few almonds, is not to be conſidered as inferior to this; for the unctuous quality of the almonds ſerves in a conſiderable degree to cover the pungency of the camphor without diminiſhing its activity. Camphor under the preſent form, as well as that of emulſion, is very often uſeful in fevers, taken to the extent of a table ſpoonful every three or four hours.

Chalk mixture. L.

Take of prepared chalk, one ounce; double-refined ſugar, ſix drams; gum-arabic, powdered, two ounces; diſtilled water, two pints. Mix them.

Chalk-drink. E.

Take of prepared chalk, one ounce; pureſt refined ſugar, half an ounce; mucilage of gum-arabic, two ounces. Rub them together, and add by degrees, water, two pounds and a half; ſpirituous cinnamon water, two ounces.

Theſe two preparations agree pretty much both in their name and in their nature. But of the two formulæ that of the Edinburgh college is moſt agreeable to the palate, from containing a proportion of cinnamon water, by which the diſagreeable taſte of the chalk is taken off.

In the former edition of the Edinburgh pharmacopœia, a preparation of this kind ſtood among the decoctions, and the chalk was directed to be boiled with the water and gum: by the preſent formula, the chalk is much more completely ſuſpended by the mucilage and ſugar; which laſt gives alſo to the mixture an agreeable taſte. It is proper to employ the fineſt ſugar, as the redundant acid in the coarſer kinds might form with the chalk a kind of earthy ſalt. It would perhaps have been more proper to have added an aromatic, by ſuſpending the entire powder of cinnamon, or its oil, by means of the mucilage and ſugar. The method here directed is, however, leſs exceptionable in this than many other preparations, as the precipitated matter of the ſpirituous water will probably be inviſcated in the ſaccharine and mucilaginous matter. This is a very elegant form of exhibiting chalk, and is an uſeful remedy in diſeaſes ariſing from, or accompanied with, acidity in the primæ viæ It is frequently employed in diarrhœa proceeding from that cauſe. The mucilage not only ſerves to keep the chalk uniformly diffuſed, but alſo improves its virtues by ſheathing the internal ſurface of the inteſtines. The doſe of this medicine requires no nicety. It may be taken to the extent of a pound or two in the courſe of a day.

Muſk mixture. L.

Take of muſk, two ſcruples; gum-arabic, powdered, double-refined ſugar, of each a dram; roſe-water, ſix ounces by meaſure. Rub the muſk firſt with the ſugar, then with the gum, and add the roſe-water by degrees.

This had formerly the name of *julepum e moſcho*, and was intended as an improvement upon the hyſteric julep with muſk of Bates. Orange-flower-water is directed by that author; and indeed this more perfectly coincides with the muſk than roſe-water: but, as the former is difficultly procurable in perfection, the latter is here preferred. The julep appears turbid at firſt: on ſtanding a little time, it depoſits a brown powder, and becomes clear, but at the ſame time loſes great part of its virtue. This inconvenience may be prevented by thoroughly grinding the muſk with gum-arabic before the addition of the water: by means of the gum, the whole ſubſtance of the muſk is made to remain ſuſpended in the water. Volatile ſpirits are in many caſes an uſeful addition to muſk, and likewiſe enable water to keep ſomewhat more of the muſk diſſolved than it would otherwiſe retain.

Ammoniacum milk. L.

Take of ammoniacum, two drams; diſtilled water, half a pint. Rub the gum-reſin with the water, gradually poured on, until it becomes a milk. In the ſame manner may be made a milk of aſafœtida, and of the reſt of the gum-reſins.

The ammoniacum milk is uſed for attenuating tough phlegm, and promoting expectoration, in humoural aſthmas, coughs, and obſtructions of the viſcera. It may be given to the quantity of two ſpoonfuls twice a-day.

The lac aſafœtida is employed in ſpaſmodical, hyſterical, and other nervous affections; and it is alſo not unfrequently uſed under the form of injection. It anſwers the ſame purpoſes as aſafœtida in ſubſtance.

Compound ſpirit of vitriolic æther. L.

Take of ſpirit of vitriolic æther, two pounds; oil of wine, three drams. Mix them.

This is ſuppoſed to be, if not preciſely the ſame, at leaſt very nearly, the celebrated mineral anodyne liquor of Hoffman; as we learn from his own writings, that the liquor which he thus denominated was formed of dulcified ſpirit of vitriol and the aromatic oil which ariſes after it; but he does not tell us in what proportions theſe were combined. It has been highly extolled as an anodyne and antiſpaſmodic medicine; and with theſe intentions it is not unfrequently employed in practice.

Compound ſpirit of ammonia. L.

Take of ſpirit of ammonia, two pints; eſſential oil of lemon, nutmeg, of each two drams. Mix them.

This differs almoſt only in name from the following:

Volatile aromatic ſpirit, commonly called *volatile oily ſpirit*, and *ſaline aromatic ſpirit*. E.

Take of vinous ſpirit of ſal ammoniac, eight ounces; diſtilled oil of roſemary, one dram and a half; diſtilled oil of lemon-peel, one dram. Mix them, that the oils may be diſſolved.

By the method here directed, the oils are as completely diſſolved as when diſtillation is employed.

Volatile ſalts, thus united with aromatics, are not only more agreeable in flavour, but likewiſe more acceptable to the ſtomach, and leſs acrimonious than in their pure ſtate. Both the foregoing compoſitions turn out excellent ones, provided the oils are good, and the diſtillation ſkilfully performed. The doſe is from five or ſix drops to ſixty or more.

Medicines of this kind might be prepared extemporaneouſly, by dropping any proper eſſential oil into the dulcified ſpirit of ſal ammoniac, which will readily diſſolve the oil without the aſſiſtance of diſtillation. But it is perhaps preferable that they ſhould be kept in the ſhops ready mixed.

Succinated ſpirit of ammonia. L.

Take of alcohol, one ounce; water of pure ammonia, four ounces by meaſure; rectified oil of amber, one ſcruple; ſoap, ten grains. Digeſt the ſoap and oil of amber in the alcohol till they be diſſolved; then add the water of pure ammonia, and mix them by ſhaking.

This compoſition is extremely penetrating, and has lately come into eſteem, particularly for ſmelling to in lowneſſes and faintings, under the name of *eau de luce*. It has been hitherto brought from France. It is not quite limpid, for the oil of amber diſſolves only imperfectly in the ſpirit: if the volatile ſpirit be not exceedingly ſtrong, ſcarcely any of the oil will be imbibed.

The *eau de luce* is not only uſed with the view of making an impreſſion on the noſe, but is taken internally in the ſame caſes. It has likewiſe of late been celebrated as a remedy for the bite of the rattleſnake, when uſed internally, and aplied externally to the wounded part.

Chap. XXIII. Syrups.

Syrups are ſaturated ſolutions of ſugar, made in water, or watery or vinous infuſions, or in juices. They were formerly conſidered as medicines of much greater importance than they are thought to be at preſent. Syrups and diſtilled waters were for ſome ages uſed as the great alteratives; inſomuch that the evacuation of any peccant humour was never attempted till by a due courſe of theſe it had firſt been ſuppoſed to be regularly prepared for expulſion. Hence aroſe the exuberant collection of both, which we meet with in pharmacopœias, and like errors have prevailed in each. As multitudes of diſtilled waters have been compounded from materials unfit to give any virtue over the helm; ſo numbers of ſyrups have been prepared from ingredients, which in this form cannot be taken in ſufficient doſes to exert their virtues; for two-thirds of a ſyrup conſiſt of ſugar, and greateſt part of the remaining third is an aqueous fluid.

Syrups are at preſent chiefly regarded as convenient vehicles for medicines of greater efficacy; and uſed for ſweetening draughts and juleps, for reducing the lighter powders into boluſes, pills, or electuaries, and other ſimilar purpoſes. Some likewiſe may not improperly be conſidered as medicines themſelves; as thoſe of ſaffron, buckthorn berries, and ſome others.

To the chapter on *Syrups* the London college in their pharmacopœia have premiſed the following general obſervations.

In the making of ſyrups, where neither the weight of the ſugar nor the manner in which it ſhould be diſſolved are preciſely directed, this is the rule:

Take of double-refined ſugar, twenty-nine ounces; any kind of liquor, one pint. Diſſolve the ſugar in the liquor in a water-bath; then ſet it aſide for twenty-four hours; take off the ſcum, and pour off the ſyrup from the fæces if there be any.

The following are the general rules which have commonly been given with reſpect to the preparation of ſyrups:

I. All the rules laid down for making decoctions are likewiſe to be obſerved in the decoctions for ſyrups. Vegetables, both for decoctions and infuſions, ought to be dry, unleſs they are expreſsly ordered otherwiſe.

II. In both the London and Edinburgh pharmacopœias, only the pureſt or double-refined ſugar is allowed.

In the ſyrups prepared by boiling, it has been cuſtomary to perform the clarification with whites of eggs after the ſugar had been diſſolved in the decoction of the vegetable. This method is apparently injurious to the preparation; ſince not only the impurities of the ſugar are thus diſcharged, but a conſiderable part likewiſe of the medicinal matter, which the water had before taken up from the ingredients, is ſeparated along with them. Nor indeed is the clarification and deſpumation of the ſugar, by itſelf, very adviſable; for its purification by this proceſs is not ſo perfect as might be expected: after it has undergone this proceſs, the refiners ſtill ſeparate from it a quantity of oily matter, which is diſagreeable to weak ſtomachs. It appears therefore moſt eligible to employ fine ſugar for all the ſyrups; even the purgative ones (which have been uſually made with coarſe ſugar, as ſomewhat coinciding with their intention) not excepted; for, as purgative medicines are in general ungrateful to the ſtomach, it is certainly improper to employ an addition which increaſes their offenſiveneſs.

III. Where the weight of the ſugar is not expreſſed, twenty-nine ounces are to be taken in every pint of liquor. The ſugar is to be reduced into powder, and diſſolved in the liquor by the heat of a water-bath, unleſs ordered otherwiſe.

Although in the formula of ſeveral of the ſyrups, a double weight of ſugar to that of the liquor is directed, yet leſs will generally be ſufficient. Firſt, therefore, diſſolve in the liquor an equal weight of ſugar, then gradually add ſome more in powder, till a little remains undiſſolved at the bottom, which is to be afterwards incorporated by ſetting the ſyrup in a water-bath.

The quantity of ſugar ſhould be as much as the liquor is capable of keeping diſſolved in the cold: if there is more, a part of it will ſeparate, and concrete into cryſtals or candy; if leſs, the ſyrup will be ſubject to ferment, eſpecially in warm weather, and change into a vinous or ſour liquor. If, in cryſtallizing, only the ſuperfluous ſugar be ſeparated, it would be of no inconvenience; but when part of the ſugar has candied, the remaining ſyrup is found to have an under proportion, and is as ſubject to fermentation as if it had wanted ſugar at firſt.

IV. Copper-veſſels, unleſs they be well tinned, ſhould not be employed in the making of acid ſyrups, or ſuch as are compoſed of the juices of fruits.

The confectioners, who are the moſt dexterous people at theſe kinds of preparations, to avoid the expence of frequently new-tinning their veſſels, rarely make uſe of any other than copper ones untinned, in the preparation even of the moſt acid ſyrups, as of oranges and lemons. Nevertheleſs, by taking due care that their coppers be well ſcoured and perfectly clean, and that the ſyrup remain no longer in them than is abſolutely neceſſary, they avoid giving it any ill taſte or quality from the metal. This practice, however, is by no means to be recommended to the apothecary.

V. The ſyrup, when made, is to be ſet by till next day; if any ſaccharine cruſt appears upon the ſurface, it is to be taken off.

As the making of ſyrups is ſo ſimple a proceſs, we ſhall here give only a very few examples.

Syrup of orange-peel.

Take of freſh outer-rind of Seville oranges, eight ounces; boiling diſtilled water, five pints. Macerate for twelve hours in a cloſe veſſel; and in the ſtrained liquor diſſolve double-refined ſugar to make a ſyrup. *L.*

In making this ſyrup, it is particularly neceſſary that the ſugar be previouſly powdered, and diſſolved in the infuſion with as gentle a heat as poſſible, to prevent the exhalation of the volatile parts of the peel. With theſe cautions, the ſyrup proves

a very elegant and agreeable one, poſſeſſing great ſhare of the fine flavour of the orange peel.

Syrup of the white poppy. L.

Take of the heads of white poppies, dried, and the ſeeds taken out, three pounds and a half; double-refined ſugar, ſix pounds; diſtilled water, eight gallons. Slice and bruiſe the heads, then boil them in the water, to three gallons, in a water-bath, ſaturated with ſea-ſalt, and preſs out the liquor. Reduce this by boiling to about the meaſure of four pints, and ſtrain it while hot, firſt through a ſieve, then through a thin woollen cloth, and ſet it aſide for twelve hours, that the fæces may ſubſide. Boil the liquor, poured off from the fæces, to three pints, and diſſolve the ſugar in it that it may be made a ſyrup.

Syrup of white poppies, or of *meconium*, commonly called *diacodium.* E.

Take of white poppy heads, dried, and freed from the ſeeds, two pounds; boiling-water, thirty pounds; pureſt ſugar, four pounds. Macerate the bruiſed heads in the water for a night; next boil till only one-third part of the liquor remain; then ſtrain it, expreſſing it ſtrongly. Boil the ſtrained liquor to the conſumption of one-half, and ſtrain again; laſtly, add the ſugar, and boil to a ſyrup. It may alſo be made by diſſolving, in two pounds and a half of ſimple ſyrup, one dram of the extract of white poppies.

This ſyrup, impregnated with the opiate matter of the poppy heads, is given to children in doſes of two or three drams; to adults from half an ounce to an ounce and upwards, for eaſing pain, procuring reſt, and anſwering the other intentions of mild opiates. Particular care is requiſite in its preparation, that it may be always made, as nearly as poſſible, of the ſame ſtrength; and accordingly the colleges have been very minute in their deſcription of the proceſs.

Syrup of buckthorn.

Take of the juice of ripe and freſh buckthorn berries, one gallon; ginger, bruiſed, one ounce; all-ſpice, powdered, one ounce and a half; double refined ſugar, ſeven pounds. Set by the juice for ſome days, that the fæces may ſubſide; and ſtrain. Macerate the ginger and all-ſpice in a pint of the ſtrained juice for four hours, and ſtrain. Boil away the reſt of the juice to three pints; then add that part of the juice in which the ginger and all-ſpice have been macerated; and, laſtly, the ſugar, that it may be made a ſyrup. *L.*

Take of juice of the ripe buckthorn berries, depurated, ſeven pounds and a half; white ſugar, three pounds and a half. Boil them to the conſiſtence of a ſyrup. *E.*

Both theſe preparations, in doſes of three or four ſpoonfuls, operate as briſk cathartics. The principal inconveniences attending them are, their being very unpleaſant, and their occaſioning a thirſt and dryneſs of the mouth and fauces, and ſometimes violent gripes. Theſe effects may be prevented by drinking freely of water-gruel, or other warm liquids, during the operation. The ungrateſulneſs of the buckthorn is endeavoured to be remedied in the firſt of the above preſcriptions by the addition of aromatics, which, however, are ſcarcely ſufficient for that purpoſe. The ſecond alſo had formerly an aromatic material for the ſame intention, a dram of the eſſential oil of cloves; which being found ineffectual is now rejected.

Syrup of balſam of Tolu. L.

Take of the balſam of Tolu, eight ounces; diſtilled water, three pints. Boil for two hours. Mix with the liquor, ſtrained after it is cold, the double-refined ſugar, that it may be made a ſyrup.

Balſamic ſyrup. E.

Take of ſimple ſyrup, juſt made, and warm from the fire, two pounds; tincture of balſam of Tolu, one ounce. When the ſyrup has grown almoſt cold, ſtir into it the tincture, by little at a time, agitating them well together till perfectly united.

This laſt method of making the balſamic ſyrup was dropt in one of the preceding editions of the Edinburgh pharmacopœia, on a complaint that the ſpirit ſpoiled the taſte of the ſyrup; which it did in a great degree when the tincture was drawn with malt ſpirits, the naufeous oil which all the common malt ſpirits are accompanied with communicating that quality; and this was particularly the caſe when the ſpirituous part was evaporated from the ſyrup, as was directed in the former edition of the Edinburgh pharmacopœia. Particular care therefore ſhould be taken that the ſpirit employed for making the tincture be perfectly clean, and well rectified from all ill flavour.

The intention of the contrivers of the two foregoing proceſſes ſeems to have been ſomewhat different. In the firſt, the more ſubtile and fragrant parts of the balſam are extracted from the groſſer reſinous matter, and alone retained in the ſyrup: the other ſyrup contains the whole ſubſtance of the balſam in larger quantity. They are both moderately impregnated with the agreeable flavour of the balſam.

In ſome pharmacopœias a ſyrup of this kind is prepared from a tincture of balſam of Peru, with roſe-water, and a proper quantity of ſugar.

Syrup of violets.

Take of the freſh petals of the violet, two pounds; boiling diſtilled water, five pints. Macerate for 24 hours; afterwards ſtrain the liquor, without preſſing, through thin linen. Add refined ſugar, that it may be made a ſyrup. *L.*

Take of freſh violets, one pound; boiling water, four pounds; pureſt ſugar, ſeven pounds and a half. Macerate the violets in the water for 24 hours in a glaſs, or at leaſt a glazed earthen veſſel, cloſe covered; then ſtrain without expreſſion, and to the ſtrained liquor add the ſugar powdered, and make into a ſyrup. *E.*

This ſyrup is of a very agreeable flavour; and in the quantity of a ſpoonful or two proves to children gently laxative. It is apt to loſe, in keeping, the elegant blue colour, for which it is chiefly valued: and hence ſome have been induced to counterfeit it with materials whoſe colour is more permanent. This abuſe may be readily diſcovered, by adding to a little of the ſuſpected ſyrup any acid or alkaline liquor. If the ſyrup be genuine, the acid will change its blue colour to a red, and the alkali will change it to a green; but, if counterfeit, theſe changes will not happen. It is obvious, from this mutability of the colour of the violet, that the preſcriber would be deceived if he ſhould expect to give any blue tinge to acidulated or alkalized juleps or mixtures by the addition of the blue ſyrup.

Chap. XXIV. Medicated Honeys.

The more fixed parts of vegetables, diſſolved in watery liquors, may be thence transferred into honey, by mixing the honey with the watery decoction or juice of the plant, and boiling them together till the aqueous part has exhaled, and the honey remains of its original conſiſtence. Honey has not probably, however, any very peculiar advantage over ſugar, and it is liable to many inconveniences which ſugar is free from: in particular, it is much more liable to run into fermentation, and in many conſtitutions produces gripes, and often violent effects. The Edinburgh college have therefore rejected the whole of the oxymels from their laſt edition of the pharmacopœia. And the number of preparations with honey in moſt of the foreign pharmacopœias is now much diminiſhed. Still, however, there are ſeveral much employed by practitioners of eminence, and of courſe retained in the London pharmacopœia.

Honey of roſes. L.

Take of dried red roſe buds, with the heels cut off, four ounces;

boiling diſtilled water, three pints; clarified honey, five pounds. Macerate the roſe leaves in the water for ſix hours; then mix the honey with the ſtrained liquor, and boil the mixture to the thickneſs of a ſyrup.

This preparation is not unfrequently uſed as a mild cooling detergent, particularly in gargariſms for ulcerations and inflammations of the mouth and tonſils. The roſe-buds here uſed ſhould be haſtily dried: the deſign of doing ſo is, that they may the better preſerve their aſtringency.

Oxymel of verdegriſe. L.

Take of prepared verdegriſe, one ounce; vinegar, ſeven ounces; clarified honey, fourteen ounces. Diſſolve the verdegriſe in the vinegar, and ſtrain it through linen; then add the honey, and boil the whole to a proper thickneſs.

This is an improvement of what was formerly known in our pharmacopœias under the title of *mel Ægyptiacum*; which, however, was, as then prepared, very uncertain with reſpect to ſtrength. It is uſed only externally for cleanſing foul ulcers, and keeping down fungous fleſh. It is alſo often ſerviceable in venereal ulcerations of the mouth and tonſils. But there is ſome danger from its application to places from the ſituation of which it is apt to be ſwallowed; for even a ſmall quantity of verdegriſe paſſing into the ſtomach may be productive of diſtreſſing, if not deleterious, effects.

Oxymel of ſquills. L.

Take of clarified honey, three pounds; vinegar of ſquills, two pints. Boil them in a glaſs veſſel, with a ſlow fire, to the thickneſs of a ſyrup.

The honey was formerly employed for this preparation unclarified, and the ſcum, which in ſuch caſes ariſes in the boiling, taken off: by this means the impurities of the honey were diſcharged; but ſome of the medicinal parts of the ſquills, with which the vinegar was impregnated, were alſo ſeparated. For this reaſon the college of London have now judiciouſly ordered the honey for all theſe kinds of preparations to be previouſly clarified by itſelf.

Oxymel of ſquills is an uſeful aperient, detergent, and expectorant, and of great ſervice in humoral aſthmas, coughs, and other diſorders where thick phlegm abounds. It is given in doſes of two or three drams, along with ſome aromatic water, as that of cinnamon, to prevent the great naufea which it would otherwiſe be apt to excite. In large doſes it proves emetic.

Chap. XXV. Powders.

This form receives ſuch materials only as are capable of being ſufficiently dried to become pulveriſable without the loſs of their virtue. There are many ſubſtances, however, of this kind, which cannot be conveniently taken in powder: bitter, acrid, fetid drugs are too diſagreeable; emollient and mucilaginous herbs and roots are too bulky; pure gums cohere, and become tenacious in the mouth; fixed alkaline ſalts liquefy on expoſing the compoſition to the air; and volatile alkalis exhale. Many of the aromatics, too, ſuffer a greater loſs of their odorous principle when kept in powder; as in that form they no doubt expoſe a much larger ſurface to the air.

The doſe of powders, in extemporaneous preſcription, is generally about half a dram: it rarely exceeds a whole dram, and is not often leſs than a ſcruple. Subſtances which produce powerful effects in ſmaller doſes are not truſted to this form, unleſs their bulk be increaſed by additions of leſs efficacy; thoſe which require to be given in larger ones are better fitted for other forms.

The uſual vehicle for taking the lighter powders is any agreeable thin liquid. The ponderous powders, particularly thoſe prepared from metallic ſubſtances, require a more conſiſtent vehicle, as ſyrups; for from thin ones they ſoon ſubſide. Reſinous ſubſtances likewiſe are moſt commodiouſly taken in thick liquors; in thin ones they are apt to run into lumps, which are not eaſily again ſoluble.

General Rules *for making* Powders.

I. Particular care ought to be taken that nothing carious, decayed, or impure, be mixed in the compoſition of powders: the ſtalks and corrupted parts of plants are to be ſeparated.

II. The dry aromatics ought to be ſprinkled, during their pulverization, with a few drops of any proper water.

III. The moiſter aromatics may be dried with a very gentle heat before they are committed to the mortar.

IV. Gums, and ſuch other ſubſtances as are difficultly pulverizable, ſhould be pounded along with the drier ones, that they may paſs the ſieve together.

V. No part ſhould be ſeparated for uſe until the whole quantity put into the mortar has paſſed the ſieve, and the ſeveral ſiftings mixed together; for thoſe parts of the ſubject which are firſt powdered may prove different, at leaſt in degree of efficacy, from the reſt.

VI. Powders of aromatics are to be prepared only in ſmall quantities at a time, and kept in glaſs veſſels very cloſely ſtopped.

If powders are long kept, and not carefully ſecured from the air, their virtue is in a great meaſure deſtroyed, although the parts in which it conſiſts ſhould not in other circumſtances prove volatile. Thus, though the virtues of ipecacuanha are ſo fixed as to remain entire even in extracts made with proper menſtrua, yet, if the powdered root be expoſed for a long time to the air, it loſes its emetic quality.

Aloetic powder. L.

Take of ſocotorine aloes, one pound; white canella, three ounces. Rub them ſeparately to powder, and then mix them.

This compoſition has long been known in the ſhops under the title of *hiera picra*. It furniſhes us with an uſeful aloetic purgative, the canella operating as a good corrigent for the aloes. But it is more frequently employed as the baſis of electuaries or pills, or of a tincture which was for a long time diſtinguiſhed by the appellation of *ſacred tincture*.

Aloetic powder with iron. L.

Take of ſocotorine aloes, powdered, an ounce and a half; myrrh, powdered, two ounces; dry extract of gentian, vitriolated iron, of each, in powder, one ounce. Mix them.

In this powder we have an aloetic and chalybeate conjoined. It conſiſts of nearly the ſame articles which formerly entered the compoſition of the *pilulæ ecphracticæ chalybeatæ*, as they were called; and it is perhaps more frequently employed when brought to the form of pills by means of ſyrups than in powder: but in either way it is an uſeful medicine, and is particularly employed with advantage in caſes of obſtructed menſtruation.

Aloetic powder with guaiacum. L.

Take of ſocotorine aloes, one ounce and a half; gum guaiacum, one ounce; aromatic powder, half an ounce. Rub the aloes and gum guaiacum ſeparately to powder; then mix all the ingredients together.

In the guaiacum, as well as the aloes, we have a warm gummi-reſinous purgative; and both are corrected, as well as more minutely divided, from their combination with the aromatics. This therefore furniſhes us with an uſeful purgative: but when taken only in ſmall doſes, its chief effect is that of promoting perſpiration. It is, however, more frequently employed in the form of pills than in the ſtate of powder; and indeed it conſiſts of nearly the ſame ingredients which conſtituted the *pilulæ aromaticæ* of the former edition of the London pharmacopœia.

Aromatic powder. L.

Take of cinnamon, two ounces; ſmaller cardamom ſeeds

huſked, ginger, long pepper, of each one ounce. Rub them together to a powder.

Aromatic powder, or *aromatic ſpices*. E.

Take of nutmegs, leſſer cardamom ſeeds, ginger, each two ounces. Beat them together into a powder, to be kept in a phial well ſhut.

Both theſe compoſitions are agreeable, hot, ſpicy medicines; and as ſuch may be uſefully taken in cold phlegmatic habits and decayed conſtitutions, for warming the ſtomach, promoting digeſtion, and ſtrengthening the tone of the viſcera. The doſe is from ten grains to a ſcruple and upwards. The firſt is conſiderably the warmeſt. This principally ariſes from the quantity of long pepper which it contains. But it is perhaps to be doubted whether from this article any advantage be derived; and a powder not inferior to either might, we think, be formed, by ſubſtituting caſſia for the cinnamon employed by the one college, or the nutmegs by the other.

Compound powder of aſarabacca. L.

Take of the dry leaves of aſarabacca, ſweet marjoram, Syrian herb maſtich, dry flowers of lavender, each one ounce. Powder them together.

Powder of ceruſe. L.

Take of ceruſe, five ounces; ſarocoll, one ounce and a half; tragacanth, half an ounce. Rub them together into powder.

This compoſition is the *trochiſci albi* of Rhazes brought back to its original ſimplicity with regard to the ingredients, and without the needleſs trouble of making it into troches. It is employed for external purpoſes, as in collyria, lotions, and injections, for repelling acrimonious humours, and in inflammations.

Compound powder of contrayerva. L.

Take of contrayerva, powdered, five ounces; compound powder of crabs claws, one pound and a half. Mix them.

This powder was formerly directed to be made up into balls with water, and was then called *lapis contrayervæ*; a piece of trouble now laid aſide as needleſs, for it was neceſſary to reduce the balls into powder again before they could be uſed. Nor did that form contribute, as has been imagined, to their preſervation; for it is ſcarcely to be ſuppoſed that the powder will loſe more by being kept for a reaſonable length of time in a cloſe ſtopt glaſs, than the balls will in the humectation with water, and exſiccation in the air, before they are fit for being put by to keep. This medicine has much better claim to the title of an alexipharmac and ſudorific than the foregoing compoſitions. The contrayerva by itſelf proves very ſerviceable in low fevers, where the *vis vitæ* is weak, and a diaphoreſis to be promoted. It is poſſible that the crabs claws are of no farther ſervice than as they divide this powerful ingredient, and make it ſit more eaſily on the ſtomach.

Compound powder of chalk. L.

Take of prepared chalk, half a pound; cinnamon, four ounces; tormentil, gum-arabic, of each three ounces; long pepper, half an ounce. Powder them ſeparately, and mix them.

The addition of the aromatics in the above formula coincides with the general intention of the remedy, which is indicated for weakneſs and acidity in the ſtomach; and in looſeneſs from acidity.

Compound powder of chalk with opium. L.

Take of compound powder of chalk, eight ounces; hard purified opium, powdered, one dram and a half. Mix them.

From the addition of the opium, this remedy becomes ſtill more powerful than the above in reſtraining diarrhœa.

Compound powder of ipecacuanha. L.

Take ipecacuanha and hard purified opium, of each, powdered, one dram; vitriolated kali, powdered, one ounce. Mix them.

This powder is one of the moſt certain ſudorifics that we know of; and, as ſuch, was recommended by Dr. Dover as an effectual remedy in rheumatiſm. Modern practice confirms its reputation, not only in rheumatiſm, but alſo in dropſy and ſundry other diſeaſes, where it is often difficult by other means to produce a copious ſweat. The doſe is from five to ten or twelve grains, according as the patient's ſtomach and ſtrength can bear it. It is convenient to avoid much drinking immediately after taking it, otherwiſe it is very apt to be rejected by vomiting before any other effects are produced.

Compound powder of myrrh. L.

Take of myrrh, dried ſavin, dried rue, Ruſſian caſtor, of each one ounce. Rub them together into a powder.

This is a reformation of the troches of myrrh, a compoſition contrived by Rhazes againſt uterine obſtructions. It may be taken in any convenient vehicle, or made into boluſes, from a ſcruple to a dram or more, two or three times a day.

Opiate powder. L.

Take of hard purified opium, powdered, one dram; burnt and prepared hartſhorn, nine drams. Mix them.

The hartſhorn is here intended merely to divide the opium, and to give it the form of powder, although it may perhaps have alſo ſome influence in rendering the opium more active, from deſtroying acid in the ſtomach. But whether in this way it has any effect or not, there can be no doubt that it is a very convenient formula for the exhibition of opium in powder; which on ſome occaſions is preferable to its being given either in a liquid form or in that of pills. As ten grains of this powder contain preciſely one of the opium, the requiſite doſe may be eaſily adapted to the circumſtances of the caſe. It is often ſucceſsfully employed as a ſweating powder; and has not, like Dover's powder, the effect of inducing ſickneſs or vomiting.

Powder of ſcammony with aloes. L.

Take of ſcammony, ſix drams; hard extract of jalap ſocotorine aloes, of each an ounce and a half; ginger, half an ounce. Powder them ſeparately, and mix them.

In this formula, the combination of ſcammony, jalap and aloes furniſhes a very active purgative, which, with ſome intentions at leaſt, may be preferable to either of the preceding. Take from five to ten grains, it will operate as a purgative, even in caſes of obſtinate coſtiveneſs.

Powder of ſcammony with calomel. L.

Take of ſcammony, half an ounce; calomel, double-refined ſugar, of each two drams. Rub them ſeparately to a powder, and then mix them.

In this formula, we have the ſcammony in a more ſimple ſtate, united with ſuch a proportion of calomel as muſt very conſiderably aid its purgative power. And accordingly it may be employed with advantage, both in caſes of obſtinate coſtiveneſs and in dropſical affections, where a conſiderable diſcharge is required from the ſyſtem.

Compound powder of ſenna. L.

Take ſenna, cryſtals of tartar, of each two ounces; ſcammony, half an ounce; ginger, two drams. Rub the ſcammony by itſelf, rub the reſt together into a powder, and then mix them all.

This powder is given as a cathartic, in the doſe of two ſcruples or a dram. The ſpice is added, not only to divide, but to warm the medicine, and make it ſit eaſier on the ſtomach. The ſcammony is uſed as a ſtimulus to the ſenna; the quantity of the latter neceſſary for a doſe, when not aſſiſted by ſome more powerful material, being too bulky to be conveniently taken in this form.

The compoſition of this medicine is now conſiderably ſimplified by the rejection both of cinnamon and cloves, as the ginger alone is found fully to anſwer the intention in view.

Compound powder of tragacanth. L.

Take of tragacanth powdered, gum-arabic, ſtarch, each an ounce and a half; double-refined ſugar, three ounces. Rub them together into a powder.

This compoſition is ſomewhat ſimplified by the rejection of the marſhmallow, and liquorice-root, which formerly entered it. But this has not probably produced any diminution of its medical properties. It operates as a mild emollient; and hence becomes ſerviceable in hectic caſes, tickling coughs, ſtrangury, ſome kinds of alvine fluxes, and other diſorders proceeding from a thin acrimonious ſtate of the humours, or an abraſion of the mucus of the inteſtines; they ſoften, and give a greater degree of conſiſtency to the former, and defend the latter from being irritated or excoriated by them. All the ingredients coincide in theſe general intentions. The doſe is from half a dram to two or three drams, which may be frequently repeated.

Chap. XXVI. Troches.

Troches and lozenges are compoſed of powders made up with glutinous ſubſtances into little cakes, and afterwards dried. This form is principally uſed for the more commodious exhibition of certain medicines, by fitting them to diſſolve ſlowly in the mouth, ſo as to paſs by degrees into the ſtomach; and hence theſe preparations have generally a conſiderable proportion of ſugar or other materials grateful to the palate. Some powders have likewiſe been reduced into troches, with a view to their preparation; though poſſibly for no very good reaſons: for the moiſtening, and afterwards drying them in the air, muſt on this account be of greater injury than any advantage accruing from this form can counterbalance.

General Rules *for making* Troches.

1. The three firſt rules laid down for making powders, are alſo to be obſerved in the powders for troches.
2. If the maſs proves ſo glutinous as to ſtick to the fingers in making up, the hands may be anointed with any convenient ſweet or aromatic oil; or elſe ſprinkled with powder of ſtarch, or of liquorice, or with flour.
3. In order to thoroughly dry the troches, put them on an inverted ſieve, in a ſhady airy place, and frequently turn them.
4. Troches are to be kept in glaſs veſſels, or in earthen ones well glazed.

Troches of ſtarch. L.

Take of ſtarch, an ounce and a half; liquorice, ſix drams; florentine orris, half an ounce; double refined ſugar, one pound and a half. Rub theſe to powder, and, by the help of tragacanth diſſolved in water, make troches. They may be made, if ſo choſen, without the orris.

White pectoral troches. E.

Take of pureſt ſugar, one pound; gum arabic, four ounces; ſtarch, one ounce; flowers of benzoin, half a dram. Having beat them all into a powder, make them into a proper maſs with roſe-water, ſo as to form troches.

Theſe compoſitions are very agreeable pectorals, and may be uſed at pleaſure. They are calculated for ſoftening acrimonious humours, and allaying the tickling in the throat which provokes coughing.

Although not only the name but the compoſition alſo in the London and Edinburgh pharmacopœias be ſomewhat different, yet their effects are very much the ſame.

Troches of liquorice. L.

Take of extract of liquorice, double-refined ſugar, each ten ounces; tragacanth, powdered, three ounces. Make troches by adding water.

Black pectoral troches. E.

Take of extract of liquorice, gum arabic, each four ounces; white ſugar, eight ounces. Diſſolve them in warm water, and ſtrain: then evaporate the mixture over a gentle fire till it be of a proper conſiſtence for being formed into troches.

Theſe compoſitions are deſigned for the ſame purpoſes as the white pectoral troches above deſcribed. In foreign pharmacopœias there are ſome other troches of this kind, under the titles of *Trochiſci bechici flavi* and *rubri*; the firſt are coloured with ſaffron, the latter with bole armenic. The diſſolving and ſtraining the extract of liquorice and gum arabic, as now ordered in the laſt of the above preſcriptions, is a conſiderable improvement; not only as they are by that means more uniformly mixed than they can well be by beating, but likewiſe as they are thereby purified from the heterogeneous matters of which both thoſe drugs have commonly no ſmall admixture.

Troches of nitre.

Take of purified nitre, powdered, four ounces; double refined ſugar, powdered, one pound; tragacanth, powdered, ſix ounces. With the addition of water, make troches. *L.*

Take of nitre, purified, three ounces; double-refined ſugar, nine ounces. Make them into troches with mucilage of gum tragacanth. *E.*

This is a very agreeable form for the exhibition of nitre; though, when the ſalt is thus taken without any liquid (if the quantity be conſiderable), it is apt to occaſion uneaſineſs about the ſtomach, which can only be prevented by large dilution with aqueous liquors. The troches of nitre have been ſaid to be employed with ſucceſs in ſome caſes of difficult deglutition.

Troches of chalk. L.

Take of chalk, prepared, four ounces; crabs claws, prepared, two ounces; cinnamon, half an ounce: double-refined ſugar, three ounces. Theſe being rubbed to powder, add mucilage of gum arabic, and make troches.

Troches of magneſia. L.

Take of burnt magneſia, four ounces; double-refined ſugar, two ounces; ginger, powdered, one ſcruple. With the addition of mucilage of gum arabic make troches.

Theſe compoſitions are calculated againſt that uneaſy ſenſation at the ſtomach, improperly called the *heartburn*; in which they often give immediate relief, by abſorbing and neutralizing the acid juices that occaſion this diſorder. The abſorbent powders here uſed are of the moſt powerful kind. The former has in general the effect of binding, the latter of opening, the belly; and from this circumſtance the practitioner will be determined in his choice, according to the nature of the caſe which he may have occaſion to treat.

Chap. XXVII. Pills.

To this form are peculiarly adapted thoſe drugs which operate in a ſmall doſe, and whoſe naufeous and offenſive taſte or ſmell requires them to be concealed from the palate.

Pills diſſolve the moſt difficultly in the ſtomach, and produce the moſt gradual and laſting effects, of all the internal forms. This is in ſome caſes of great advantage, in others it is a quality not at all deſirable: and ſometimes may even be of dangerous conſequence, particularly with regard to emetics; which, if they paſs the ſtomach undiſſolved, and afterwards exert themſelves in the inteſtines, operate there as violent cathartics. Hence emetics are among us ſcarcely ever given in pills; and hence to the reſinous and difficultly ſoluble ſubſtances, ſaponaceous ones ought to be added, to promote their ſolution.

Gummy reſins, and inſpiſſated juices, are ſometimes ſoft enough to be made into pills without addition: where any moiſture is requiſite, ſpirit of wine is more proper than ſyrups or conſerves, as it unites more readily with them, and does not ſenſibly increaſe their bulk. Light dry powders require ſyrup or mucilages; and the more ponderous, as the mercurial and other metallic preparations, thick honey, conſerve or extracts.

Light powders require about half their weight of ſyrup, of honey about three fourths their weight, to reduce them into a due conſiſtence for forming pills. Half a dram of the maſs will make ſix or ſeven pills of a moderate ſize.

General Rules *for making* Pills.

1. Gums and inſpiſſated juices are to be firſt ſoftened with the liquid preſcribed; then add the powders, and continue beating them all together till they be perfectly mixed.
2. The maſſes for pills are beſt kept in bladders, which ſhould be moiſtened now and then with ſome of the ſame kind of liquid that the maſs was made up with, or with ſome proper aromatic oil.

Pills of aloes. L.

Take of ſocotorine aloes, powdered, one ounce; extract of gentian, half an ounce; ſyrup of ginger, as much as is ſufficient. Beat them together.

Aloetic pills. E.

Take of ſocotorine aloes, in powder, thick extract of gentian, each two ounces; make them into a maſs with ſimple ſyrup.

Theſe pills have been much uſed as warming and ſtomachic laxatives: they are very well ſuited for the coſtiveneſs ſo often attendant on people of ſedentary lives. Like other preparations of aloes, they are alſo uſed in jaundice, and in certain caſes of obſtructed menſes. They are ſeldom uſed for producing full purging; but if this be required, a ſcruple or half a dram of the maſs may be made into pills of a moderate ſize for one doſe.

Pills of aloes with myrrh. L.

Take of ſocotorine aloes, two ounces; myrrh, ſaffron, of each one ounce; ſyrup of ſaffron, as much as is ſufficient. Rub the aloes and myrrh ſeparately to powder; afterwards beat them all together.

The common pills, vulgarly called *Rufus's pills.* E.

Take of ſocotorine aloes, two ounces; myrrh, one ounce; ſaffron, half an ounce. Beat them into a maſs with a proper quantity of ſyrup.

Theſe pills have long continued in practice, without any other alteration than in the ſyrup with which the maſs is made up, and in the proportion of ſaffron. The virtues of this medicine may be eaſily underſtood from its ingredients. Theſe pills, given to the quantity of half a dram or two ſcruples, prove conſiderably cathartic; but they anſwer much better purpoſes in ſmaller doſes as laxatives or alteratives.

Gum pills.

Take of galbanum, opopanax, myrrh, ſagapenum, each one ounce; aſafœtida, half an ounce; ſyrup of ſaffron, as much as is ſufficient. Beat them together. *L.*

Take of aſafœtida, galbanum, myrrh, each one ounce; rectified oil of amber, one dram. Beat them into a maſs with ſimple ſyrup. *E.*

Theſe pills are deſigned for antihyſterics and emmenagogues, and are very well calculated for anſwering thoſe intentions; half a ſcruple, a ſcruple, or more, may be taken every night or oftener. The fetid pills of our former pharmacopœia were conſiderably purgative: the purgative ingredients are now omitted, as the phyſician may eaſily, in extemporaneous preſcription, compound theſe pills with cathartic medicines, in ſuch proportions as particular caſes ſhall require.

Quickſilver pills. L.

Take purified quickſilver, extract of liquorice having the conſiſtence of honey, of each two drams; liquorice finely powdered, one dram. Rub the quickſilver with the extract of liquorice until the globules diſappear; then, adding the liquorice powder, mix them together.

Mercurial pills. E.

Take of quickſilver, honey, each one ounce; crumb of bread, two ounces. Grind the quickſilver with the honey in a glaſs mortar till the globules diſappear, adding occaſionally a little ſimple ſyrup; then add the crumb of bread, and beat the whole with water into a maſs, which is to be immediately divided into four hundred and eighty equal pills.

The quickſilver was formerly directed to be ground with reſin of guaiacum and Caſtile ſoap. The former was ſuppoſed to coincide with the virtues of the mercury, and the latter was uſed chiefly to divide the globules of mercury. For this laſt intention Dr. Saunders found that honey, the ſubſtance here ordered by the Edinburgh college, is of all he tried the moſt effectual: but we would ſuppoſe with this gentleman, that ſomething farther is done in this proceſs than the mere diviſion of the mercurial globules, and that part of the quickſilver is as it were amalgamated with the honey, or brought to a ſtate ſimilar to that in Plenck's ſolution. The ſame effect will take place when the pills are prepared with extract of liquorice now directed by the London college.

The mercurial pill is one of the beſt preparations of mercury, and may in general ſuperſede moſt other forms of this medicine. It is neceſſary to form the maſs immediately into pills, as the crumb ſoon becomes too hard for that purpoſe. Soap was undoubtedly a very improper medium for triturating the mercury; it is not only too hard for that purpoſe, but, when the preparation entered the ſtomach, the alkaline part of the ſoap being engaged by the acid in that viſcus, the mercury would in all probability be immediately ſeparated. The honey and bread can only be changed by the natural powers of digeſtion, and can never oppreſs the ſtomach. The doſe of the pills is from two to four or ſix in the day, according to the effects we wiſh to produce.

Plummer's pill. E.

Take of ſweet mercury, precipitated ſulphur of antimony, each ſix drams; extract of gentian, white Spaniſh ſoap, each two drams. Let the mercury be triturated with the ſulphur till they be thoroughly mixed, then add the extract, and form a maſs with ſimple ſyrup.

Theſe pills were recommended to the attention of the public about fifty years ago by Dr. Plummer, whoſe name they ſtill bear. He repreſented them in a paper which he publiſhed in the Edinburgh Medical Eſſays, as a very uſeful alterative; and on his authority they were at one time much employed; but they are now leſs extenſively uſed than formerly. And although they ſtill retain a place in the Edinburgh pharmacopœia, yet it is probable that every purpoſe to be anſwered by them may be more effectually obtained from the common mercurial pill, or from calomel in a more ſimple ſtate.

Opium pills. L.

Take of hard purified opium, powdered, two drams: extract of liquorice, one ounce. Beat them until they are perfectly united.

Thebaic, commonly called *Paſtile pills.* E.

Take of opium, half an ounce; extract of liquorice, two ounces; Caſtile ſoap, an ounce and a half; Jamaica pepper, one ounce. Soften the opium and extract ſeparately with proof-ſpirit, and, having beat them into a pulp, mix them; then

add the ſoap, and the pepper beat into a powder; and laſtly, having beat them well together, form the whole into a maſs.

Theſe two compoſitions, though differing in ſeveral particulars, may yet be conſidered as fundamentally very much the ſame. The firſt is a ſimple opiate; in which every five grains of the maſs contains one of opium; and in the opium alone can we ſuppoſe that the activity of the medicine depends.

Although ſome of the articles contained in the latter compoſition may perhaps be ſuppoſed to operate as corrigentia, yet the former compoſition, which is the moſt ſimple, is in general preferable.

Pills ſimilar to the ſecond were contrived by a chemical empiric, Starkey, and communicated by him to Matthews, under whoſe name they were ſome time ago greatly celebrated. The form here given differs conſiderably from the original, in omitting many ingredients of no great ſervice. Nor indeed are any of the ingredients of much conſequence, except the opium; their quantity being too inconſiderable to anſwer any uſeful purpoſe. Ten grains of the compoſition contain one of opium.

Squill pills.

Take of freſh dried ſquills, powdered, one dram; ginger powdered, ſoap, of each three drams; ammoniacum, two drams; ſyrup of ginger, as much as is ſufficient. Beat them together. *L.*

Take of gum ammoniac, leſſer cardamom ſeeds, in powder, extract of liquorice, each one dram; dried root of ſquills, in fine powder, one ſcruple. Mix, and form them into a maſs with ſimple ſyrup. *E.*

Theſe are elegant and commodious forms for the exhibition of ſquills, whether for promoting expectoration, or with the other intentions to which that medicine is applied. As the virtue of the compound is chiefly from the ſquills, the other ingredients are often varied in extemporaneous preſcription: and probably no material difference takes place in the two forms here propoſed, excepting in the proportion of the ſquills, which in the former conſtitutes one ninth, in the latter one tenth of the maſs.

Chap. XXVIII. Electuaries.

Electuaries are compoſed chiefly of powders mixed up with ſyrups, &c. into ſuch a conſiſtence that the powders may not ſeparate in keeping, that a doſe may be eaſily taken upon the point of a knife, and not prove too ſtiff to ſwallow.

Electuaries receive chiefly the milder alterative medicines, and ſuch as are not ungrateful to the palate. The more powerful drugs, as cathartics, emetics, opiates, and the like (except in officinal electuaries to be diſpenſed by weight), are ſeldom truſted in this form, on account of the uncertainty of the doſe; diſguſtful ones, acrids, bitters, fetids, cannot be conveniently taken in it; nor is the form of an electuary well fitted for the more ponderous ſubſtances, as mercurials, theſe being apt to ſubſide in keeping, unleſs the compoſition be made very ſtiff.

The lighter powders require thrice their weight of honey, or ſyrup boiled to the thickneſs of honey, to make them into the conſiſtence of an electuary: of ſyrups of the common conſiſtence, twice the weight of the powder is ſufficient.

Where the common ſyrups are employed, it is neceſſary to add likewiſe a little conſerve, to prevent the compound from drying too ſoon; electuaries of Peruvian bark, for inſtance, made up with ſyrup alone, will often in a day or two grow too dry for taking.

Some powders, eſpecially thoſe of the leſs grateful kind, are more conveniently made up with mucilage than with ſyrup, honey, or conſerve. The three latter ſtick about the mouth and fauces, and thus occaſion the taſte of the medicine to remain for a conſiderable time; while mucilages paſs freely, without leaving any taſte in the mouth. A little ſoft extract of liquorice, joined to the mucilage, renders the compoſition ſufficiently grateful, without the inconveniences of the more adheſive ſweets.

The quantity of an electuary, directed at a time, in extemporaneous preſcription, varies much according to its conſtituent parts, but it is rarely leſs than the ſize of a nutmeg, or more than two or three ounces.

General Rules *for making* Electuaries.

I. The rules already laid down for decoctions and powders in general, are likewiſe to be obſerved in making decoctions and powders for electuaries.

II. Gums, inſpiſſated juices, and ſuch other ſubſtances as are not pulverizable, ſhould be diſſolved in the liquor preſcribed: then add the powders by little and little, and keep the whole briſkly ſtirring, ſo as to make an equable and uniform mixture.

III. Aſtringent electuaries, and ſuch as have pulps of fruit in their compoſition, ſhould be prepared only in ſmall quantities at a time: for aſtringent medicines loſe much of their virtue on being kept in this form, and the pulps of fruits are apt to become ſour.

IV. The ſuperfluous moiſture of the pulps ſhould be exhaled over a gentle fire, before the other ingredients are added to them.

V. Electuaries, if they grow dry in keeping, are to be reduced to a due conſiſtence, with the addition of a little Canary wine, and not with ſyrup or honey: by this means the doſe will be the leaſt uncertain; a circumſtance deſerving particular regard, in thoſe eſpecially which are made up with ſyrup, and contain a proportion of opium.

Electuary of caſſia. L.

Take of the freſh extracted pulp of caſſia, half a pound; manna, two ounces; pulp of tamarinds, one ounce; roſe-ſyrup, half a pound. Beat the manna, and diſſolve it over a ſlow fire in the roſe-ſyrup; then add the pulps; and with a continued heat evaporate the whole to the proper thickneſs of an electuary.

Electuary of caſſia, commonly called *diacaſia.* E.

Take of pulp of caſſia fiſtularis, ſix ounces; pulp of tamarinds, manna, each an ounce and a half; ſyrup of pale roſes, ſix ounces. Having beat the manna in a mortar, diſſolve it with a gentle heat in the ſyrup; then add the pulps, and evaporate them with a regularly continued heat to the conſiſtence of an electuary.

Theſe compoſitions are very convenient officinals, to ſerve as a baſis for purgative electuaries and other ſimilar purpoſes; as the pulping a ſmall quantity of the fruits, for extemporaneous preſcription, is very troubleſome. The tamarinds give them a pleaſant taſte, and do not ſubject them, as might be expected, to turn ſour. After ſtanding for four months, the compoſition has been found no ſourer than when firſt made. This electuary likewiſe is uſefully taken by itſelf, to the quantity of two or three drams occaſionally, for gently looſening the belly in coſtive habits.

Electuary of ſcammony. L.

Take of ſcammony, in powder, one ounce and a half; cloves, ginger, of each ſix drams; eſſential oil of caraway, half a dram; ſyrup of roſes, as much as is ſufficient. Mix the ſpices, powdered together, with the ſyrup; then add the ſcammony, and laſtly the oil of caraway.

This electuary is a warm briſk purgative. It is a reform of the *electuarium caryocoſtinum* of our preceding diſpenſatories; a compoſition which was greatly complained of, as being inconvenient to take on account of the largeneſs of its doſe. A dram and a half of this, which contains fifteen grains of ſcammony, is equivalent to half an ounce of the other.

Electuary of ſenna. L.

Take of ſenna, eight ounces; figs, one pound; pulp of tamarinds, of caſſia, of prunes, each half a pound; coriander ſeeds, four ounces; liquorice, three ounces; double-refined ſugar, two pounds and a half. Powder the ſenna with the coriander ſeeds, and ſift out ten ounces of the mixed powder. Boil the remainder, with the figs and liquorice, in four pints of diſtilled water, to one half; then preſs out and ſtrain the liquor. Evaporate this ſtrained liquor to the weight of about a pound and a half; then add the ſugar, and make a ſyrup; add this ſyrup by degrees to the pulps, and laſtly mix in the powder.

This is a very convenient laxative, and has long been in common uſe among practitioners. Taken to the quantity of a nutmeg or more, as occaſion may require, it is an excellent laxative for looſening the belly in coſtive habits.

Chap. XXIX. Confections.

Although the London college have ſeparated theſe from electuaries, yet they differ ſo little, that in moſt pharmacopœias they are ranked under the ſame head. And in that of Edinburgh, there are ſeveral articles which have promiſcuouſly the name either of *confection* or *electuary*. But as no inconvenience ariſes from the ſeparation, and as we have followed the order of the London pharmacopœia in other particulars, it would be improper to deviate from it in this.

Aromatic confection. L.

Take of zedoary in coarſe powder, ſaffron, of each half a pound; diſtilled water, three pints. Macerate for twenty-four hours; then preſs and ſtrain. Reduce the ſtrained liquor, by evaporation, to a pint and a half, to which add the following, rubbed to a very fine powder; compound-powder of crabs claws, ſixteen ounces; cinnamon, nutmegs, of each two ounces; cloves, one ounce; ſmaller cardamom-ſeeds, huſked, half an ounce; double-refined ſugar, two pounds. Make a confection.

This confection is compoſed of the more unexceptionable ingredients of a compoſition formerly held in great eſteem, and which was called, from its author, *confectio Raleighana*. The original confection was compoſed of no leſs than five-and-twenty particulars; each of which were examined apart, except one, moor-graſs, the flower of which is too ſmall to be gathered in ſufficient quantity for the general uſe of the medicine, and the plant is poſſeſſed of hurtful qualities, as is experienced in cattle that feed where it grows. In this examination, many of the extracts came out ſo very nauſeous, that it was impoſſible to retain them, conſiſtent with any regard to the taſte of the compoſition. But ſome few, of equal efficacy with any of the reſt, being of a tolerable taſte and flavour, were compounded in different proportions; and when, after many trials, a compoſition was approved, the quantity of each material, that would yield the proportion of extract which entered that compoſition, was calculated, and from thence the proportions were collected as now ſet down: after which the compound extract was made, and found to anſwer expectation. The London college, in the preſent edition of their pharmacopœia, have ſtill farther ſimplified this formula, by rejecting the roſemary, juniper, and cardamoms, which formerly entered it.

The confection, as now reformed, is a ſufficiently grateful and moderately warm cordial; and frequently given with that intention, from eight or ten grains to a ſcruple or upwards, in boluſes or draughts. The formula might perhaps be ſtill more ſimplified without any loſs.

Confection of opium. L.

Take of hard purified opium, powdered, ſix drams; long pepper, ginger, caraway-ſeeds, of each two ounces; ſyrup of white poppy, boiled to the conſiſtence of honey, three times the weight of the whole. Mix the purified opium carefully with ſyrup gently heated; then add the reſt, rubbed to powder.

Thebaic electuary. E.

Take of aromatic powder, ſix ounces; Virginian ſnake-root, in fine powder, three ounces; opium diffuſed in a ſufficient quantity of Spaniſh white wine, three drams; clariſied honey, thrice the weight of the powders. Mix them, and form an electuary.

Theſe compoſitions conſiſt of very powerful ingredients, and are doubtleſs capable of anſwering every end that can be reaſonably expected from the more voluminous *Theriaca* of Andromachus. The London college alſo had formerly their *Theriaca* compoſed of the leſs exceptionable ingredients of Andromachus's. But as theſe medicines have for a long time been chiefly employed for external purpoſes, by the way of cataplaſm, the London theriaca is now omitted, and its place ſupplied by a cataplaſm compoſed of a few well-choſen articles, under the name of *cataplaſm of cummin*; of which hereafter. For internal uſe, none of the theriacas are at preſent ſo much regarded as they have been heretofore; practitioners having introduced in their room extemporaneous boluſes of Virginian ſnake-root, camphor, contrayerva, and the like; which anſwer all their intentions, with this advantage, that they may be given either with or without opium; an ingredient which renders the others prejudicial in caſes where they might otherwiſe be proper.

With regard to the quantity of opium in the foregoing compoſitions, one grain thereof is contained in thirty-ſix grains of the confection of opium, and in five ſcruples of the thebaic electuary. The proportion of opium will vary a little, according to the time that they have been kept; their moiſture by degrees exhaling, ſo as to leave the remainder ſtronger of the opium than an equal weight was at firſt. A change of this kind is taken notice of by many writers, but falſely attributed to an imaginary fermentative quality of the ingredients; by which they were ſuppoſed, from their multiplicity and contrariety, to be continually exalting and improving the virtues of each other.

A good deal of care is requiſite in making theſe compoſitions, to prevent the waſte which is apt to happen in the pounding, and which would render the proportion of opium to the other ingredients precarious. The intention of diſſolving the opium in wine, for theſe and other electuaries, is, that it may be more uniformly mixed with the reſt.

Theſe compoſitions fully ſupply the place of two articles, long baniſhed from the ſhops, to wit, *Mithridate*, or the *confection of Democrates*, and the *Theriaca of Andromachus*, or Venice Treacle.

Chap. XXX. Medicated Waters.

We have already taken notice of many articles which are either diſſolved in water, or communicate their virtues to it; and in one ſenſe of the word theſe may be called *medicated waters*. Sometimes this impregnation is effected by the aid of heat, ſometimes without it: and thus are formed decoctions, infuſions, and the like. But among thoſe articles referred to in this chapter, there takes place mere watery ſolution only, and they are uſed ſolely with the intention of acting topically in the way of lotion, injection, or at the utmoſt of gargariſm.

Compound alum-water. L.

Take of alum, vitriolated zinc, each half an ounce; boiling diſtilled water, two pints. Pour the water on the ſalts in a glaſs veſſel, and ſtrain.

This water was long known in our ſhops under the title of *aqua aluminoſa Bateana*.

Bates directed the ſalts to be firſt powdered, and melted over the fire: but this is needleſs trouble, ſince the melting only evaporates the aqueous parts, which are reſtored again on the addition of the water. This liquor is uſed for cleanſing and healing ulcers and wounds; and for removing cutaneous eruptions, the part being bathed with it hot three or four times a-day. It is ſometimes likewiſe employed as a collyrium; and as an injection in the gonorrhœa and fluor albus, when not accompanied with virulence.

Water of ammoniated copper. L.

Take of lime-water, one pint; ſal ammoniac, one dram. Let them ſtand together, in a copper veſſel, till the ammonia be ſaturated.

Sapphire-coloured water. E.

Take of lime-water, newly made, eight ounces; ſal ammoniac, two ſcruples; verdegris, powdered, four grains. Mix them, and after 24 hours ſtrain the liquor.

This is a much more elegant and convenient method than the preceding.

This water is at preſent pretty much in uſe as a detergent of foul and obſtinate ulcers, and for taking away ſpecks or films in the eyes. The copper contributes more to its colour than to its medicinal efficacy; for the quantity of the metal diſſolved is extremely ſmall.

Compound water of acetated litharge. L.

Take of acetated water of litharge, two drams; diſtilled water, two pints; proof-ſpirit, two drams. Mix the ſpirit with the acetated water of litharge; then add the diſtilled water.

This liquor is of the ſame nature with ſolutions of ſugar of lead, and is analogous to the vegeto-mineral water of Mr. Goulard. It is only uſed externally as a coſmetic againſt cutaneous eruptions, redneſs, inflammation, &c. But even here it is not altogether void of danger, and there are examples of its continued employment having occaſioned ſundry ill conſequences. Hence it is that ſolutions of vitriolated zinc are ſubſtituted for it.

Water of vitriolated zinc with camphor. L.

Take of vitriolated zinc, half an ounce; camphorated ſpirit, half an ounce; boiling water, two pints. Mix, and filter through paper.

This is an improved method of forming the vitriolic camphorated water of the former editions of the London pharmacopœia. It is uſed externally as a lotion for ſome ulcers, particularly thoſe in which it is neceſſary to reſtrain a great diſcharge. It is alſo not unfrequently employed as a collyrium in ſome caſes of ophthalmia, where a large diſcharge of watery fluid takes place from the eyes, with but little inflammation. But when it is to be applied to this tender organ, it ought, at firſt at leaſt, to be diluted by the addition of more water.

Chap. XXXI. Plasters.

Plasters are compoſed chiefly of oily and unctuous ſubſtances, united with powders into ſuch a conſiſtence that the compound may remain firm in the cold without ſticking to the fingers; that it may be ſoft and pliable in a low degree of heat, and that by the warmth of the human body it be ſo tenacious as readily to adhere both to the part on which it is applied and to the ſubſtance on which it is ſpread.

There is, however, a difference in the conſiſtence of plaſters, according to the purpoſes they are to be applied to: thus, ſuch as are intended for the breaſt and ſtomach ſhould be very ſoft and yielding, while thoſe deſigned for the limbs are made firmer and more adheſive. An ounce of expreſſed oil, an ounce of yellow wax, and half an ounce of any proper powder, will make a plaſter of the firſt conſiſtence: for a hard one, an ounce more of wax, and half an ounce more of powder, may be added. Plaſters may likewiſe be made of reſins, gummy reſins, &c without wax, eſpecially in extemporaneous preſcription: ſo officinals theſe compoſitions are leſs proper, as they ſoon grow too ſoft in keeping, and fall flat in a warm air.

It has been ſuppoſed, that plaſters might be impregnated with the ſpecific virtues of different vegetables, by boiling the recent vegetable with the oil employed for the compoſition of the plaſter. The coction was continued till the herb was almoſt criſp, with care to prevent the matter from contracting a black colour; after which the liquid was ſtrained off, and ſet on the fire again till all the aqueous moiſture had exhaled. We have already obſerved, that this treatment does not communicate to the oils any very valuable qualities, even relative to their uſe in a fluid ſtate: much leſs can plaſters made with ſuch oils receive any conſiderable efficacy from the herbs.

Calces of lead, boiled with oils, unite with them into a plaſter of an excellent conſiſtence, and which makes a proper baſis for ſeveral other plaſters.

In the boiling of theſe compoſitions, a quantity of water muſt be added, to prevent the plaſter from burning and growing black. Such water as it may be neceſſary to add during the boiling muſt be previouſly made hot; for cold liquor would not only prolong the proceſs, but likewiſe occaſion the matter to explode, and be thrown about with violence, to the great danger of the operator: this accident will equally happen on the addition of hot water, if the plaſter be extremely hot.

Ammoniacum plaſter with quickſilver.

Take of ſtrained ammoniacum, one pound; purified quickſilver, three ounces; ſulphurated oil, one dram, or what is ſufficient. Rub the quickſilver with the ſulphurated oil until the globules diſappear; then add, by little at a time, the melted ammoniacum, and mix them.

This is a very well contrived mercurial plaſter. The ammoniacum in general affords a good baſis for the application of the mercury. In ſome caſes, however, it is not ſufficiently adheſive. But this inconvenience, when it does occur, may be readily remedied by adding a ſmall quantity of turpentine.

Plaſter of Spaniſh flies. L.

Take of Spaniſh flies, one pound; wax plaſter, two pounds; prepared hog's lard, half a pound. Having melted the plaſter and lard, a little before they coagulate ſprinkle in the flies, reduced to a very fine powder.

Cantharides of good quality, duly applied to the ſkin, never fail of producing bliſters. When, therefore, the deſired effect does not take place, it is to be aſcribed to the flies either being faulty at firſt, or having their activity afterwards deſtroyed by ſome accidental circumſtance; ſuch as too great heat in forming, in ſpreading the plaſter, or the like. And when due attention is paid to theſe particulars, the ſimple compoſition now introduced anſwers the purpoſe better than thoſe compound plaſters with muſtard-ſeed, black pepper, vinegar, verdegris, and the like, which had formerly a place in our pharmacopœias. It is not however improbable, that the pain of bliſtering-plaſters might be conſiderably diminiſhed by the addition of a portion of opium, without preventing the good effects otherwiſe to be derived from them.

Wax plaſter.

Take of yellow wax, prepared mutton-ſuet, each three pounds; yellow reſin, one pound. Melt them together, and ſtrain the mixture whilſt it is fluid. *L.*

Take of yellow wax, three parts; mutton-ſuet, white reſin, two parts. Melt them together into a plaſter; which ſupplies the place of melilot plaſter. *E.*

This plaſter had formerly the title of *drawing plaſter*, and was chiefly employed as a dreſſing after bliſters, to ſupport ſome diſcharge.

It is a very well contrived plaſter for that purpoſe. It is calculated to ſupply the place of melilot plaſter; whoſe great irritation, when employed for the dreſſing of bliſters, has been continually complained of. This was owing to the large quantity of reſin it contained, which is here on that account retrenched.

Cummin plaſter. L.

Take of the ſeeds of cummin, ſeeds of caraway, bay-berries, each three ounces; Burgundy-pitch, three pounds; yellow wax, three ounces. Mix, with the melted pitch and wax, the reſt of the ingredients, powdered, and make a plaſter.

This plaſter ſtands recommended as a moderately warm diſcutient; and is directed by ſome to be applied to the hypogaſtric region, for ſtrengthening the viſcera, and expelling flatulencies: but it is a matter of great doubt, whether it derives any virtue either from the article from which it is named, or from the caraway or bay-berries which enter its compoſition.

Ladanum plaſter. L.

Take of ladanum, three ounces; frankincenſe, one ounce; cinnamon powdered, expreſſed oil, called *oil of mace*, of each half an ounce; eſſential oil of ſpearmint, one dram. To the melted frankincenſe add firſt the ladanum, ſoftened by heat; then the oil of mace. Mix theſe afterwards with the cinnamon and oil of mint, and beat them together in a warm mortar into a plaſter. Let it be kept in a cloſe veſſel.

This has been conſidered as a very elegant ſtomach plaſter. It is contrived ſo as to be eaſily made occaſionally (for theſe kinds of compoſitions, on account of their volatile ingredients, are not fit for keeping), and to be but moderately adheſive, ſo as not to offend the ſkin, and that it may without difficulty be frequently taken off and renewed; which theſe ſorts of applications, in order to their producing any conſiderable effect, require to be. But, after all, it probably acts more from the mere covering which it gives to the ſtomach, than from any of the articles abounding with eſſential oil which it contains.

Litharge-plaſter. L.

Take of litharge, in very fine powder, five pounds; olive-oil, a gallon. Boil them with a ſlow fire, in about two pints of water, conſtantly ſtirring, until the oil and litharge unite, and have the conſiſtence of a plaſter. But it will be proper to add more boiling water, if the water that was firſt added be nearly conſumed before the end of the proceſs.

Common plaſter. E.

Take of litharge, one part; olive-oil, two parts; boil them, adding water, and conſtantly ſtirring the mixture till the oil and litharge be formed into a plaſter.

The heat in theſe proceſſes ſhould be gentle, and the matter kept conſtantly ſtirring; otherwiſe it ſwells up, and is apt to run over the veſſel. If the compoſition proves diſcoloured, the addition of a little white lead and oil will improve the colour.

Theſe plaſters, which have long been known under the name of *Diachylon*, are the common application in excoriations of the ſkin, ſlight fleſh wounds, and the like. They keep the part ſoft, and ſomewhat warm, and defend it from the air, which is all that can be expected in theſe caſes from any plaſter. Some of our induſtrious medicine-makers have thought theſe purpoſes might be anſwered by a cheaper compoſition, and accordingly have added a large quantity of common whitening and hog's lard: this, however, is by no means allowable, not only as it does not ſtick ſo well, but likewiſe as the lard is apt to grow rancid and acrimonious. The counterfeit is diſtinguiſhable by the eye.

Litharge-plaſter with gum. L.

Take of litharge-plaſter, three pounds; ſtrained galbanum, eight ounces; turpentine, ten drams; frankincenſe, three ounces. The galbanum and turpentine being melted with a ſlow fire, mix with them the powdered frankincenſe, and afterwards the litharge-plaſter melted with a very ſlow fire, and make a plaſter.

Gum plaſter. E.

Take of common plaſter, eight parts; gum-ammoniacum ſtrained, ſtrained galbanum, yellow wax, each one part. Make them into a plaſter according to art.

Both theſe plaſters are uſed as digeſtives and ſuppuratives; particularly in abſceſſes, after a part of the matter has been maturated and diſcharged, for ſuppurating or diſcuſſing the remaining hard part; but it is very doubtful whether they derive any advantage from the gums entering their compoſition.

Litharge-plaſter with quickſilver. L.

Take of litharge plaſter, one pound; purified quickſilver, three ounces; ſulphurated oil, one dram, or what is ſufficient. Make the plaſter in the ſame manner as the ammoniacum-plaſter with quickſilver.

Mercurial or blue plaſter. E.

Take of olive-oil, white reſin, each one part: quickſilver, three parts; common plaſter, ſix parts. Melt the oil and reſin together; and when this mixture is cold, let the quickſilver be rubbed with it till the globules diſappear; then add by degrees the common plaſter, melted, and let the whole be accurately mixed.

Theſe mercurial plaſters are looked on as powerful reſolvents, and diſcutients, acting with much greater certainty for theſe intentions than any compoſition of vegetable ſubſtances alone; the mercury exerting itſelf in a conſiderable degree, and being ſometimes introduced into the habit in ſuch quantity as to affect the mouth. Pains in the joints and limbs from a venereal cauſe, nodes, tophi, and beginning indurations of the glands, are ſaid ſometimes to yield to them.

Litharge-plaſter with reſin. L.

Take of litharge-plaſter, three pounds; yellow reſin, half a pound. Mix the powdered reſin with litharge-plaſter, melted with a very ſlow fire, and make a plaſter.

Sticking-plaſter. E.

Take of common plaſter, five parts; white reſin, one part. Melt them together, ſo as to make a plaſter.

Theſe plaſters are uſed chiefly as adheſives for keeping on other dreſſings, &c.

Plaſter of Burgundy pitch. L.

Take of Burgundy pitch, two pounds; ladanum, one pound; yellow reſin, yellow wax, of each four ounces; the expreſſed oil, commonly called the *oil of mace*, one ounce. To the pitch, reſin, and wax, melted together, add firſt the ladanum, and then the oil of mace.

This plaſter was at one time much celebrated under the title of *cephalic plaſter*, the name which it formerly held in our pharmacopœias. It was applied, in weakneſs or pains of the head, to the temples, forehead, &c. and ſometimes likewiſe to the feet.

Soap-plaſter. L.

Take of ſoap, half a pound; litharge-plaſter, three pounds; mix the ſoap with the melted litharge-plaſter, and boil them to the thickneſs of a plaſter.

Saponaceous plaſter. E.

Take of common plaſter, four parts; gum-plaſter, two parts; Caſtile ſoap, ſcraped, one part. To the plaſters, melted together, add the ſoap; then boil for a little, ſo as to form a plaſter.

Theſe plaſters have been ſuppoſed to derive a reſolvent power from the ſoap; and in the laſt the addition of the gums is ſuppoſed to promote the reſolvent virtue of the ſoap: but it is a matter of great doubt, whether they derive any material advantage from either addition.

Frankincenſe-plaſter. L.

Take of frankincenſe, half a pound; dragon's blood, three ounces; litharge-plaſter, two pounds. To the melted litharge-plaſter add the reſt, powdered.

This plaſter had formerly in the London pharmacopœia the title of *ſtrengthening plaſter*, and is a reformation of the complicated and injudicious compoſition deſcribed in the former pharmacopœias, under the title of *Emplaſtrum ad herniam*. It has been ſuppoſed that plaſters compoſed of ſtyptic medicines conſtringe and ſtrengthen the part to which they are applied, but on no very juſt foundation; for plaſters in general relax rather than aſtringe, the unctuous ingredients neceſſary in their compoſition counteracting and deſtroying the effect of the others.

Chap. XXXII. Ointments and Liniments.

Ointments and liniments differ from plaſters little otherwiſe than in conſiſtence. Any of the officinal plaſter, diluted with ſo much oil as will reduce it to the thickneſs of ſtiff honey, forms an ointment: by farther increaſing the oil, it becomes a liniment.

In making theſe preparations, the Edinburgh college direct, that fat and reſinous ſubſtances are to be melted with a gentle heat; then to be conſtantly ſtirred, ſprinkling in at the ſame time the dry ingredients, if any ſuch are ordered, in the form of a very fine powder, till the mixture on diminiſhing the heat becomes ſtiff.

It is to be underſtood that the above general directions are meant to apply to each particular compoſition contained in the preſent edition of the Edinburgh pharmacopœia. It is alſo to be obſerved, that where any compoſitions are ordered, as baſes or ingredients of others, the college always refer to thoſe made according to their own formula.

Ointment of hog's lard. L.

Take of prepared hog's lard, two pounds; roſe-water, three ounces. Beat the lard with the roſe-water until they be mixed; then melt the mixture with a ſlow fire, and ſet it apart that the water may ſubſide; after which, pour off the lard from the water, conſtantly ſtirring until it be cold.

In the laſt edition of the London pharmacopœia, this was ſtyled *Unguentum ſimplex*, the name given by the Edinburgh college to a compoſition of olive oil and white wax.

Both theſe ointments may be uſed for ſoftening the ſkin and healing chaps.

Ointment of the white calx of quickſilver. L.

Take of the white calx of quickſilver, one dram; ointment of hog's lard, one ounce and a half. Mix, and make an ointment.

This is a very elegant mercurial ointment, and frequently uſed in the cure of obſtinate and cutaneous affections. It is an improvement of the ointment of precipitated mercury of the laſt London pharmacopœia; the precipitated ſulphur being thrown out of the compoſition, and the quantity of mercury increaſed.

Ointment of Spaniſh flies. L.

Take of Spaniſh flies, powdered, two ounces; diſtilled water, eight ounces; ointment of yellow reſin, eight ounces. Boil the water with the Spaniſh flies to one half, and ſtrain. To the ſtrained liquor add the ointment of yellow reſin. Evaporate this mixture in a water-bath, ſaturated with ſea-ſalt, to the thickneſs of an ointment.

Epiſpaſtic ointment from infuſion of cantharides. E.

Take of cantharides, white reſin, yellow wax, each one ounce; hog's lard, Venice turpentine, each two ounces; boiling water, four ounces. Infuſe the cantharides in the water, in a cloſe veſſel, for a night; then ſtrongly preſs out and ſtrain the liquor, and boil it with the lard till the water be conſumed: then add the reſin, wax, and turpentine, and make the whole into an ointment.

These ointments, containing the ſoluble parts of the cantharides, uniformly blended with the other ingredients, are more commodious, in general, occaſion leſs pain, and are no leſs effectual in ſome caſes, than the compoſitions with the fly in ſubſtance.

Wax ointment. L.

Take of white wax, four ounces; ſpermaceti, three ounces; olive-oil, one pint. Stir them, after being melted with a ſlow fire, conſtantly and briſkly, until cold.

This ointment had formerly the title of *unguentum album* in the London pharmacopœia. It differs very little from the ſimple ointment of the Edinburgh pharmacopœia, and in nothing from the ointment of ſpermaceti of the London pharmacopœia, excepting that in this ointment the proportion of ſpermaceti is ſomewhat leſs. It is an uſeful cooling ointment for excoriations and other frettings of the ſkin.

Ointment of acetated ceruſe. L.

Take of acetated ceruſe, two drams; white wax, two ounces; olive-oil, half a pint. Rub the acetated ceruſe, previouſly powdered, with ſome part of the olive-oil; then add it to the wax, melted with the remaining oil. Stir the mixture until it be cold.

Saturnine ointment. E.

Take of ſimple ointment, twenty parts; ſugar of lead, one part.

Both theſe ointments are uſeful coolers and deſiccatives; much ſuperior both in elegance and efficacy to the *nutritum* or *tripharmacum*, at one time very much celebrated.

Ointment of elemi. L.

Take of elemi, one pound; turpentine, ten ounces; mutton-ſuet, prepared, two pounds; olive-oil, two ounces. Melt the elemi with the ſuet; and having removed it from the fire, mix it immediately with the turpentine and oil; after which ſtrain the mixture.

This ointment, perhaps beſt known by the name of *linimentum arcei*, has long been in uſe for digeſting, cleanſing, and incarnating; and for theſe purpoſes is preferred by ſome to all the other compoſitions of this kind.

Theſe, however, are much more proceſſes of nature than of art; and it is much to be doubted whether it has in reality any influence.

Ointment of white hellebore. L.

Take of the root of white hellebore, powdered, one ounce; ointment of hog's lard, four ounces; eſſence of lemons, half a ſcruple. Mix them, and make an ointment.

White hellebore externally applied has long been celebrated in the cure of cutaneous affections; and this is perhaps one of the beſt formulæ under which it can be applied, the hog's lard ointment ſerving as an excellent baſis for it, while the eſſence of lemons communicates to it a very agreeable ſmell.

Stronger ointment of quickſilver. L.

Take of purified quickſilver, two pounds; hog's lard, prepared, twenty-three ounces; mutton-ſuet, prepared, one ounce. Firſt rub the quickſilver with the ſuet and a little of the hog's lard, until the globules diſappear; then add what remains of lard, and make an ointment.

Weaker ointment of quickſilver. L.

Take of the ſtronger ointment of quickſilver, one part; hog's lard, prepared, two parts. Mix them.

Quickſilver or blue ointment. E.

Take of quickſilver, mutton-ſuet, each one part; hog's lard, three parts. Rub them carefully in a mortar till the globules entirely diſappear.

This ointment may alſo be made with double or triple the quantity of quickſilver.

Theſe ointments are principally employed, not with a view to their topical action, but with the intention of introducing mercury in an active ſtate into the circulating ſyſtem. And this may be effected by gentle friction on the ſound ſkin of any part, particularly on the inſide of the thighs or legs. For this purpoſe, theſe ſimple ointments are much better ſuited than the more compounded ones with turpentine and the like, formerly employed. For by any acrid ſubſtance topical inflammation is apt to be excited, preventing farther friction, and giving much uneaſineſs. To avoid this, it is neceſſary, even with the mildeſt and weakeſt ointment, ſomewhat to change the place at which the friction is performed. But by theſe ointments properly managed, mercury may in moſt inſtances be as advantageouſly introduced, either for eradicating ſyphilis, or combating other obſtinate diſeaſes, as under any form whatever. But to obtain theſe effects, it is requiſite that the ointment ſhould be prepared with very great care: for upon the degree of triture which has been employed, the activity of the mercury muſt entirely depend. The addition of the mutton-ſuet, now adopted by both colleges, is an advantage to the ointment, as it prevents it from running into the ſtate of oil, which the hog's lard alone in warm weather, or in a warm chamber, is ſometimes apt to do, and which is followed by a ſeparation of parts. We are even inclined to think, that the proportion of ſuet directed by the London college is too ſmall for this purpoſe, and indeed ſeems to be principally intended for the more effectual triture of the mercury. But it is much more to be regretted, that, in a medicine of ſuch activity, the two colleges ſhould not have directed the ſame proportion of mercury to the fatty matter. For, although both have directed ointments of different ſtrength, neither the weakeſt nor the ſtrongeſt agree in the proportion of mercury which they contain.

Ointment of nitrated quickſilver. L.

Take of purified quickſilver, one ounce; nitrous acid, two ounces; hog's lard, prepared, one pound. Diſſolve the quickſilver in the nitrous acid; and, while it is yet hot, mix it with the hog's lard, previouſly melted, and juſt growing cold.

Yellow ointment. E.

Take of quickſilver, one ounce; ſpirit of nitre, two ounces; hog's lard, one pound. Diſſolve the quickſilver in the ſpirit of nitre by digeſtion in a ſand heat; and, while the ſolution is very hot, mix with it the lard, previouſly melted by itſelf, and juſt beginning to grow ſtiff. Stir them briſkly together, in a marble mortar, ſo as to form the whole into an ointment.

Theſe ointments differ only in name; and that employed by the London college is certainly the preferable appellation: for here the quickſilver, previous to its union with the lard, is brought to a ſaline ſtate by means of the nitrous acid. And although its activity be very conſiderably moderated by the animal fat with which it is afterwards united, yet it ſtill affords us a very active ointment; and as ſuch it is frequently employed with ſucceſs in cutaneous and other topical affections. In this condition, however, the mercury does not ſo readily enter the ſyſtem as in the preceding form. Hence it may even be employed in ſome caſes with more freedom; but in other inſtances it is apt to excoriate and inflame the parts. On this account a reduction of its ſtrength is ſometimes requiſite; and it is often alſo neceſſary, from the hard conſiſtence which it acquires, in conſequence of the action of acid on the lard.

Tar ointment.

Take of tar, mutton-ſuet prepared, each half a pound. Melt them together, and ſtrain. *L.*

Take of tar, five parts; yellow wax, two parts. *E.*

Theſe compoſitions, though the one be formed into an ointment by means of ſuet, the other by wax, cannot be conſidered as differing eſſentially from each other. As far as they have any peculiar activity, this entirely depends on the tar. And this article, from the empyreumatic oil and ſaline matters which it contains, is undoubtedly, as well as turpentine, of ſome activity. Accordingly, it has been ſucceſsfully employed againſt ſome cutaneous affections, particularly thoſe of domeſtic animals. At one time, as well as the black baſilicon, it was a good deal employed as a dreſſing even for recent wounds. But although it ſtill retains a place in our pharmacopœias, it is at preſent little uſed with any intention.

Ointment of yellow reſin. L.

Take of yellow reſin, yellow wax, each one pound; olive oil, one pint. Melt the reſin and wax with a ſlow fire; then add the oil, and ſtrain the mixture whil hot.

Baſilicon ointment. E.

Take of hog's lard, eight parts; white reſin, five parts; yellow wax, two parts.

Theſe are commonly employed in dreſſings, for digeſting, cleanſing, and incarnating wounds and ulcers. They differ very little, if at all, in their effects, from the *linimentum arcæi*, or ointment of elemi, as it is now more properly ſtyled. But it is probable that no great effect is to be attributed to either: for there can be no doubt that the ſuppurative and adheſive inflammation are proceſſes of nature, which will occur without the aid of any ointment.

Elder ointment. L.

Take of elder flowers, four pounds; mutton ſuet, prepared, three pounds; olive-oil, one pint. Boil the flowers in the ſuet and oil, firſt melted together, till they be almoſt criſp; then ſtrain with expreſſion.

This ointment does not ſeem ſuperior to ſome others, which are much neater, and leſs expenſive. It can ſcarcely be ſuppoſed to receive any conſiderable virtue from the ingredient from which it takes its name. And accordingly it is not without propriety that it is rejected from the pharmacopœia of the Edinburgh college.

Ointment of ſpermaceti. L.

Take of ſpermaceti, ſix drams; white wax, two drams; olive-oil, three ounces. Melt them together over a ſlow fire, ſtirring them conſtantly and briſkly until they be cold.

This had formerly the name of *white liniment*, and it is perhaps only in conſiſtence that it can be conſidered as differing from the ſimple ointment already mentioned, or the ſimple cerate afterwards to be noticed.

Sulphur ointment. L.

Take of hog's lard, half a pound; flowers of ſulphur, four ounces. Mix them, and make an ointment.

Ointment of ſulphur, or *antipſoric ointment.* E.

Take of hog's lard, four parts; ſulphur, beat into a very fine powder, one part. To each pound of this ointment add eſſence of lemons, or oil of lavender, half a dram.

Sulphur is a certain remedy for the itch, and ſafer than mercury. Sir John Pringle obſerves, that unleſs a mercurial unction was to touch every part of the ſkin, there can be no certainty of ſucceſs: whereas, from a ſulphureous one, a cure may be obtained by only partial unction; the animalcula, which are ſuppoſed to occaſion this diſorder, being, like other inſects, killed by the ſulphureous ſteams which exhale by the heat of the body.

Tutty ointment.

Take of prepared tutty, one dram; ointment of ſpermaceti, what is ſufficient. Mix them ſo as to make a ſoft ointment. L.

Take of ſimple liniment, five parts; prepared tutty, one part. *E.*

Theſe ointments have long been celebrated, and are ſtill much employed againſt affections of the eyes. But they cannot, we imagine, be eſteemed elegant.

Both calamine and tutty act only by means of the zinc they contain, and calamine appears to contain the moſt of the two, and likewiſe to be the leaſt variable in its contents. But the pure flowers prepared from zinc itſelf are doubtleſs preferable to either. Hence the ointment of tutty may be conſidered as inferior to both the ointment of calamine and to the ointment of the calx of zinc, which have alſo a place in our pharmacopœia.

Liniment of ammonia. L.

Take of water of ammonia, half an ounce; olive-oil, one ounce and a half. Shake them together in a phial till they are mixed.

This has long been known in the ſhops under the title of *volatile liniment*, but is now more properly denominated from the principal active article which enters its compoſition. It has been much employed in practice, particularly on the recommendation of Sir John Pringle in his Obſervations on the Diſeaſes of the Army. He obſerves, that, in the inflammatory quinſey, or ſtrangulation of the fauces, a piece of flannel, moiſtened with this mixture, applied to the throat, and renewed every four or five hours, is one of the moſt efficacious remedies. By means of this warm ſtimulating application, the neck, and ſometimes the whole body, is put into a ſweat, which after bleeding either carries off or leſſens the inflammation. Where the ſkin cannot bear the acrimony of this mixture, a larger proportion of oil may be uſed.

Stronger liniment of ammonia. L.

Take of water of pure ammonia, one ounce; olive-oil, two ounces. Shake them together in a phial.

This article differs from the foregoing in ſtrength only. This ariſes both from its being formed of a more acrid ſpirit and from its containing that ſpirit in a larger proportion to the oil. It is uſed to ſupply the place of the *epithema et emplaſtrum volatile* of our former pharmacopœias, and is a very acrid ſtimulating compoſition. When largely applied, it often excites inflammation, and even veſication, on tender ſkin. It is often, however, ſucceſsfully employed againſt obſtinate rheumatic and iſchiatic pains.

Camphor liniment. L.

Take of camphor, two ounces; water of ammonia, ſix ounces; ſimple ſpirit of lavender, ſixteen ounces. Mix the water of ammonia with the ſpirit, and diſtil from a glaſs retort, with a ſlow fire, ſixteen ounces. Then diſſolve the camphor in the diſtilled liquor.

This formula, which has now for the firſt time a place in the London pharmacopœia, approaches to the volatile eſſence of that celebrated empyric the late Dr. Ward. But the above is a more elegant and active formula than either of the receipts publiſhed by Mr. Page, from Dr. Ward's book of receipts; and there is no reaſon to doubt that it will be equally effectual in removing ſome local pains, ſuch as particular kinds of headach, in conſequence of external application.

Soap-liniment. L.

Take of ſoap, three ounces; camphor, one ounce; ſpirit of roſemary, one pint. Digeſt the ſoap in the ſpirit of roſemary until it be diſſolved, and add to it the camphor.

This is the ſoap liniment of the former edition of the London pharmacopœia, without any alteration; and it differs very little from the ſoap-balſam of the Edinburgh college already mentioned. Though a leſs active and penetrating application than the preceding, it is perhaps no leſs uſeful; and it is often ſucceſsfully employed for external purpoſes againſt rheumatic pains, ſprains, bruiſes, and ſimilar complaints.

Chap. XXXIII. Cerates.

Cerates are ſubſtances intended for external application, formed of nearly the ſame materials which conſtitute ointments and plaſters. And they differ principally from theſe in being merely of an intermediate conſiſtence between the two. Accordingly, they are ſeldom the ſubject of a ſeparate chapter by themſelves, but are claſſed either with the one or the other. In the Edinburgh pharmacopœia they are claſſed among the ointments: but as the London college have referred them to a ſeparate head, we ſhall here alſo conſider them by themſelves.

Cerate of cantharides, or *Spaniſh flies.* L.

Take of cerate of ſpermaceti, ſoftened with heat, ſix drams; Spaniſh flies, finely powdered, one dram. Mix them.

Under this form cantharides may be made to act to any extent that is requiſite. It may ſupply the place either of the bliſtering plaſter or ointment; and there are caſes in which it is preferable to either. It is particularly more convenient than the plaſter of cantharides, where the ſkin to which the bliſter is to be applied is previouſly much affected, as in caſes of ſmall-pox; and in ſupporting a drain under the form of iſſue, it is leſs apt to ſpread than the ſofter ointment.

Calamine cerate. L.

Take of calamine prepared, yellow wax, each half a pound; olive-oil, one pint. Melt the wax with the oil; and, as ſoon as the mixture begins to thicken, mix with it the calamine, and ſtir the cerate until it be cold.

Cerate of calamine. E.

Take of ſimple cerate, five parts; calamine prepared, one part.

Theſe compoſitions are formed on the cerate which Turner ſtrongly recommends in cutaneous ulcerations and excoriations, and which has been uſually diſtinguiſhed by his name. They appear from experience to be excellent epulotics, and as ſuch are frequently uſed in practice.

Cerate of acetated litharge. L.

Take of water of acetated litharge, two ounces and a half; yellow wax, four ounces; olive-oil, nine ounces; camphor, half a dram. Rub the camphor with a little of the oil. Melt the wax with the remaining oil; and as ſoon as the mixture begins to thicken, pour in by degrees the water of acetated litharge, and ſtir conſtantly until it be cold; then mix in the camphor before rubbed with oil.

This application has been rendered famous by the recommendations of Mr. Goulard. It is unqueſtionably in many caſes very uſeful. It cannot, however, be conſidered as varying eſſentially from the ſaturnine ointment, or ointment of acetated ceruſe, formerly mentioned. It is employed with nearly the ſame intentions, and differs from it chiefly in conſiſtence.

Cerate of yellow reſin. L.

Take of ointment of yellow reſin, half a pound; yellow wax, one ounce. Melt them together, and make a cerate.

This had formerly the name of *lemon-ointment*. It is no otherwiſe different from the yellow baſilicum, or ointment of yellow reſin, than being of a ſtiffer conſiſtence, which renders it for ſome purpoſes more commodious.

Soap cerate. L.

Take of ſoap, eight ounces; yellow wax, ten ounces; litharge powdered, one pound; olive-oil, one pint; vinegar, one gallon; boil the vinegar with the litharge over a ſlow fire, conſtantly ſtirring until the mixture unites and thickens; then mix in the other articles, and make a cerate.

This, notwithſtanding the name, may rather be conſidered as

another ſaturnine application; its activity depending very little on the ſoap; and it may be held as varying in little elſe but conſiſtence from the plaſter of litharge. It can hardly be thought to differ in its properties from the cerate of acetated litharge juſt mentioned; for neither the ſmall proportion of camphor which enters the compoſition of the one, nor the ſoap which gives name to the other, can be conſidered as having much influence.

Cerate of ſpermaceti. L.

Take of ſpermaceti, half an ounce; white wax, two ounces; olive oil, four ounces. Melt them together, and ſtir until the cerate be cold.

This had formerly the name of *white cerate*, and it differs in nothing from the ointment of ſpermaceti, or white liniment, as it was formerly called, excepting in conſiſtence, both the wax and the ſpermaceti bearing a greater proportion to the oil.

Chap. XXXIV. Epithems.

By epithems or cataplaſms are in general underſtood thoſe external applications which are brought to a due conſiſtence or form for being properly applied, not by means of oily or fatty matters, but by water or watery fluids. Of theſe not a few are had recourſe to in actual practice; but they are ſeldom prepared in the ſhops of the apothecaries; and in ſome of the beſt modern pharmacopœias no formulæ of this kind are introduced. The London college, however, although they have abridged the number of epithems, ſtill retain a few. And it is not without ſome advantage that there are fixed forms for the preparation of them.

Cataplaſm of cummin. L.

Take of cummin-ſeed, one pound; bay-berries, dry leaves of water-germander, or ſcordium, Virginian ſnake-root, of each three ounces; cloves, one ounce. Rub them all together; and, with the addition of three times the weight of honey, make a cataplaſm.

This is adopted into the preſent edition of the London pharmacopœia with very little alteration from the laſt. It was then intended as a reformation of the *theriaca Londinenſis*, which for ſome time paſt has been ſcarcely otherwiſe uſed than as a warm cataplaſm. In place of the numerous articles which formerly entered that compoſition, only ſuch of its ingredients are retained as contribute moſt to this intention: but even the article from which it now derives its name, as well as ſeveral others which ſtill enter it, probably contribute very little to any medical properties it may poſſeſs.

Muſtard cataplaſm. L.

Take of muſtard-ſeed, powdered, crumb of bread, each half a pound; vinegar, as much as is ſufficient. Mix, and make a cataplaſm.

Epithems of this kind are commonly known by the name of *ſinapiſms*. They were formerly not unfrequently prepared in a more complicated ſtate, containing garlic, black ſoap, and other ſimilar articles; but the above ſimple form will anſwer every purpoſe which they are capable of accompliſhing. They are employed only as ſtimulants: they often inflame the part and raiſe bliſters, but not ſo perfectly as cantharides. They are frequently applied to the ſoles of the feet in the low ſtate of acute diſeaſes, for raiſing the pulſe and relieving the head. The chief advantage they have depends on the ſuddenneſs of their action.

Alum curd. L.

Take the whites of two eggs; ſhake them with a piece of alum till they be coagulated.

This preparation is taken from Riverius. It is an uſeful aſtringent epithem for ſore, moiſt eyes, and excellently cools and repreſſes thin deſluxions. Slighter inflammations of the eyes, occaſioned by duſt, expoſure to the ſun, or other ſimilar cauſes, are generally removed by fomenting them with warm milk and water, and waſhing them with ſolutions of white vitriol. Where the complaint is more violent, this preparation, after the inflammation has yielded a little to bleeding, is one of the beſt external remedies. It is to be ſpread on lint, and applied at bed-time.

A Table, *ſhowing in what Proportions* Mercury *and* Opium *enter different Formulæ.*

Pulvis e creta compoſitus cum opio. L. In about forty-four grains, one grain of opium is contained.

Pulvis ipecacuanhæ compoſitus. L. In ten grains, one grain of opium.

Pulvis ſudorificus. E. In eleven grains, one grain of opium.

Pulvis opiatus. L. In ten grains, one grain of opium.

Pulvis e ſcammonio cum calomelane. L. In four grains, one grain of calomel.

Pilula ex opio. L. In five grains, one grain of opium.

Pilulæ thebaicæ. E. In ten grains, one grain of opium.

Pilulæ ex hydrargyro. L. In two grains and a half, one grain of mercury.

Pilulæ ex hydrargyro. E. In four grains, one grain of mercury.

Pilulæ Plummeri. E. In two grains and two thirds, one grain of calomel.

Confectio opiata. L. In thirty-ſix grains, one grain of opium.

Electuarium Japonicum. E. In about one hundred and ninety-three grains, one grain of opium.

Electuarium Thebaicum. E. In ninety-ſeven grains, one grain of opium.

Trochiſci bechici cum opio. E. In fifty-five grains, one grain of opium.

Theſe trochiſci are not unfrequently ordered *cum duplice opio*, and under this form are kept in many ſhops.

Emplaſtrum ammoniacum cum hydrargyro. L. In five ounces, one ounce of mercury.

Emplaſtrum lithargyri cum hydrargyro. L. In five ounces, one ounce of mercury.

Emplaſtrum e hydrargyro. E. In three ounces and two-thirds, one ounce of mercury.

Unguentum hydrargyri fortius. L. In two drams, one dram of mercury.

Unguentum hydrargyri mitius. L. In five drams, one dram of mercury.

Unguentum ex hydrargyro. E. In five drams, one dram of mercury.

Unguentum hydrargyri nitrati. L. In one dram, four grains of nitrated quickſilver.

Unguentum citrinum. E. In one dram, four grains of nitrated quickſilver.

Unguentum calcis hydrargyri albæ. L. In one dram, four grains and two-thirds of the calx hydrargyri alba.

Tinctura opii (L.) is made with opium, in the proportion of one grain to about thirteen of the menſtruum.

Tinctura Thebaica (E.) is made with opium, in the proportion of one grain to twelve of the menſtruum.

Tinctura opii camphorata (L.) is made with opium, in the proportion of one grain to two hundred and ſixty of the menſtruum.

Elixir paregoricum (E.) is made with opium, in the proportion of one grain to ſixty-eight of the menſtruum.

Balſamum anodynum (E.) is made with opium, in the proportion of one grain to about thirty of the menſtruum.

PHAROS, (Homer, Strabo, &c.) a ſmall oblong iſland, adjoining to the continent of Egypt, over againſt Alexandria. On this iſland ſtood a cognominal light-tower, of four ſides, each ſide a ſtadium in length; and the tower ſo high as to be ſeen 100 miles off. Some affirm each of its four corners reſted on a large ſea crab of glaſs, or of hard tranſparent ſtone of Ethiopia or Memphis. Others imagine the crabs were only added externally to the baſe by way of ornament, or as emblematical of its ſituation and uſe. The architect was Soſtrates the Cnidian, as appears by an inſcription on the tower, under Ptolemy Philadelphus, who laid out 800 talents upon it. On account of the port of Alexandria, the entrance to which was difficult and dangerous, the Pharos was called *the key of the Egyptian ſea*, or even of Egypt itſelf (Lucan): and Pharos, from being a proper name, is become an appellative to denote all light-houſes.

PHAROS, or *Phare*, a light houſe; a pile raiſed near a port, where fire is kept burning in the night, to guide and direct veſſels near at hand. The pharos of Alexandria, built in the iſland of Pharos, at the mouth of the Nile, was anciently very famous, inſomuch as to communicate its name to all the reſt. This moſt magnificent tower conſiſted of ſeveral ſtories and galleries, with a lantern at top, in which a light being continually burning, might be ſeen for many leagues at ſea, and along the coaſt. It was accounted one of the ſeven wonders of the world. It was built by the famed architect Soſtrates, a native of Cnidos, or, according to ſome, by Deiphanes, the father of Soſtrates; and coſt Ptolemy Philadelphus 800 talents. The ſeveral ſtories were adorned with columns, baluſtrades, galleries of the fineſt marble and workmanſhip; to which ſome add, that the architect had contrived to faſten ſome looking-glaſſes ſo artificially againſt the higheſt galleries, that one could ſee in them all the ſhips that ſailed on the ſea for a great way. Inſtead of which noble ſtructure, one ſees now only a kind of irregular caſtle, without ditches or outworks of any ſtrength, the whole being accommodated to the inequality of the ground on which it ſtands, and which it ſeems is no higher than that which it ſhould command. Out of the midſt of this clumſy building riſes a tower, which ſerves for a light-houſe, but which hath nothing of the beauty and grandeur of the old one. The Coloſſus of Rhodes alſo ſerved as a pharos.

PHARPAR, or PHARPHAR, is one of the rivers of Damaſcus, or rather it is an arm of the Barrady or Chryſorrhoas, which waters the city of Damaſcus and the country about it (2 Kings v. 12.) "Are not Abana and Pharpar, rivers of Damaſcus, better than all the waters of Iſrael?" The river of Damaſcus has its fountain in the mountains of Libanus. At its approach to the city it is divided into three arms, one of which paſſes through Damaſcus. The other two water the gardens round about, and then reuniting, they loſe themſelves at four or five leagues from the city, towards the north. See *Maundrell's Travels from Aleppo to Jeruſalem*; ſee alſo the articles ABANA and DAMASCUS.

PHARSALIA, PHARSALIUM, *Pharſalus*, or *Pharſalos*, (anc. geog.) a town of the Phthiotis, a diſtrict of Theſſaly, near Pheræ and Lariſſa, to which laſt place Pompey fled from the plains of Pharſalus; watered by the river Enipeus, which falls into the Apidanus, and both together into the Peneus. Between Pharſalus and Enipeus, Pompey drew up his men at the fatal battle of Pharſalia.

In this battle, the advantage with reſpect to numbers was greatly on the ſide of Pompey. That general himſelf was on the left with the two legions which Cæſar had returned to him at the beginning of the war. Scipio, Pompey's father-in law, was in the centre, with the legions he had brought from Syria, and the reinforcements ſent by ſeveral kings and ſtates of Aſia. The Cilician legion, and ſome cohorts which had ſerved in Spain, were on the right, under the command of Afranius. As Pompey's right wing was covered by the Enipeus, he ſtrengthened the left with his ſlingers, archers, and the 7000 Roman horſe, on whom chiefly his party founded their hopes of victory. The whole army was drawn up in three lines, with very little ſpaces between them. In conformity to this diſpoſition, Cæſar's army was drawn up in the following order: The tenth legion, which had on all occaſions ſignalized themſelves above all the reſt, was placed in the right wing, and the ninth in the left; but as the latter had been conſiderably weakened in the action at Dyrrhachium, the eighth legion was poſted ſo near it as to be able to ſupport and reinforce it upon occaſion. The reſt of Cæſar's forces filled up the ſpace between the two wings. Marc Antony commanded the left wing, Sylla the right, and Cneius Domitius Calvinus the main body. As for Cæſar, he poſted himſelf in the right over againſt Pompey, that he might have him always in his ſight.

Thus was the whole plain covered, from Pharſalia to the Enipeus, with two armies, dreſſed and armed after the ſame manner, and bearing the ſame enſigns, the Roman eagles. Pompey obſerving how well the enemy kept their ranks, expecting quietly the ſignal of battle, and on the contrary how impatient and unſteady his own men were, running up and down in great diſorder for want of experience, he began to be afraid leſt his ranks ſhould be broken upon the firſt onſet; and therefore commanded the foot in the front to keep their ground, and quietly wait for the enemy. The two armies, though within reach of each other, kept a mournful ſilence; but at length the trumpets ſounded the charge, and Cæſar's army advanced in good order to begin the attack, being encouraged by the example of one Caius Craſſinus, a centurion, who at the head of 120 men threw himſelf upon the enemy's firſt line with incredible fury. This he did to acquit himſelf of a promiſe he had ſolemnly made to Cæſar, who meeting him as he was going out of his tent in the morning, aſked him, after ſome diſcourſe, *What his opinion was touching the event of the battle?* To which he, ſtretching out his hand, replied aloud, *Thine is the victory, Cæſar; thou ſhalt glorioufly conquer, and I myſelf this day will be the ſubject of thy praiſe either dead or alive.* In purſuance of this promiſe he broke out of his rank as ſoon as the trumpet ſounded; and, at the head of his company, ran in upon the enemy, and made a great ſlaughter of them. But while he was ſtill preſſing forward, forcing his way through the firſt line, one of Pompey's men ran him in at the mouth with ſuch violence, that the point of his ſword came out at the hind part of his neck. Upon his death Pompey's ſoldiers took courage, and with great bravery ſtood the enemy's onſet. While the foot were thus ſharply engaged in the centre, Pompey's horſe in the left wing marched up confidently; and having firſt widened their ranks, with a deſign to ſurround Cæſar's right wing, charged his cavalry, and forced them to give ground. Hereupon Cæſar ordered his horſe to retreat a little, and give way to the ſix cohorts, which he had poſted in the rear as a body of reſerve. Theſe, upon a ſignal given, coming up, charged the enemy's horſe with that reſolution and good order which is peculiar to men who have ſpent all their lives in camps. They remembered their inſtructions, not ſtriking at the legs or thighs of the enemy, but aiming only at their faces. This unexpected and new manner of fighting had the deſired effect. For the young patricians, whom Cæſar contemptuouſly calls the *pretty young dancers*, not being able to bear the thoughts of having their faces deformed with ſcars, turned their backs, and, covering their faces with their hands, fled in the utmoſt confuſion, leaving the foot at the mercy of the enemy. Cæſar's men did not purſue the fugitives; but, charging the foot of that wing, now naked and unguarded, ſurrounded them, and cut moſt of them in pieces.

Pompey was ſo tranſported with rage, in ſeeing the flower of

his forces thus put to flight or cut in pieces, that he left his army, and retired ſlowly towards his camp, looking more like a man diſtracted and beſide himſelf than one who by his exploits had acquired the name of *the Great*. When he had reached the camp, he retired to his tent without ſpeaking a word to any; and continued there, like one diſtracted and out of his ſenſes, till his whole army was defeated. Cæſar no ſooner ſaw himſelf maſter of the field than he marched to attack the enemy's entrenchments, that Pompey might not have time to recollect himſelf. When Pompey was informed that his rival was advancing to attack his entrenchments, he then firſt ſeemed to have recovered his ſenſes, and cried out, *What, into my camp too!* He ſaid no more; but immediately laying aſide the marks of his dignity, and putting on ſuch a garment as might beſt favour his flight, he ſtole out at the decuman gate, and took the road to Lariſſa, which city had hitherto ſhown great attachment to him. In the mean time Cæſar began the attack on the enemy's camp, which was vigorouſly defended by the cohorts Pompey had left to guard it; but they were at length forced to yield. Cæſar was not a little ſurpriſed, when, after having forced the entrenchments, he found the enemy's tents and pavilions richly adorned with carpets and hangings, their couches ſtrewed with flowers, their tables ready ſpread, and ſideboards ſet out with abundance of plate, bowls, and glaſſes, and ſome of them even filled with wine. So great was the confidence of Pompey's party, that they made preparations before-hand for pleaſures to be enjoyed after the victory, which they thought certain. In Pompey's tent, Cæſar found the box in which he kept his letters: but, with a moderation and magnanimity worthy of himſelf, he burnt them all, without reading one; ſaying, that he had rather be ignorant of crimes, than obliged to puniſh them.

The next day, when the dead were numbered, it appeared that Cæſar had ſcarce loſt 200 men; among whom were about 30 centurions, whom Cæſar cauſed to be buried with great ſolemnity. He did particular honours to the body of Craſtinus, who had begun the battle; and ordered his aſhes to be depoſited in a tomb which he erected to his memory. On Pompey's ſide, the number of the dead amounted to 15,000 according to ſome, and to 25,000 according to others. Cæſar took 24,000 priſoners, eight eagles, and 180 enſigns.

PHARSALIA, an epic poem, compoſed by Lucan on the civil war between Pompey and Cæſar, and particularly on the victory of the latter over the former, of which we have given an account in the preceding article. It is a poem univerſally acknowledged to have great beauties and great defects; but we are the leſs capable of eſtimating its merit as a whole, that either time has deprived us of the laſt books, or its author has left it incomplete. "The ſubject of the Pharſalia (ſays Dr. Blair in his Lectures) carries undoubtedly all the epic grandeur and dignity: neither does it want unity of object, viz. the triumph of Cæſar over the Roman liberty. In the choice of that ſubject, he thinks, however, that the author was not happy. The civil wars were too recent to admit in the deſcription of them the embelliſhments of fiction and machinery. The fables of the gods mixed with the exploits of Cæſar and Pompey, inſtead of raiſing, would have diminiſhed, the dignity of ſuch well known facts." Another objection to the ſubject, perhaps more forcible than this, ariſes from the ſucceſs of the war and the abilities of the generals. Lucan was a friend to liberty, and wiſhed to raiſe the character of Pompey and Cato; but, in ſpite of his utmoſt efforts, they are always eclipſed by the ſuperior talents and conſequent ſucceſs of Cæſar. All his characters, however, are drawn with ſpirit, and with uncommon regard to truth: and ſome of the ſpeeches which he puts into the mouths of his heroes are equal for moral ſublimity to any thing that is to be found in all antiquity.

"There are in the Pharſalia (continues the critic already quoted) ſeveral very poetical and ſpirited deſcriptions. But the author's chief ſtrength does not lie either in narration or deſcription. His narration is often dry and harſh; his deſcriptions are often over-wrought, and employed too upon diſagreeable objects. His principal merit conſiſts in his ſentiments, which are generally noble and ſtriking, and expreſſed in that glowing and ardent manner which peculiarly diſtinguiſhes him. Lucan is the moſt philoſophical and the moſt public-ſpirited poet of all antiquity. He was the nephew of the famous Seneca the philoſopher; was himſelf a Stoic; and the ſpirit of that philoſophy breathes throughout his poem. We muſt obſerve, too, that he is the only ancient epic poet whom the ſubject of his poem really and deeply intereſted. Lucan recounted no fiction. He was a Roman, and had felt all the direful effects of the Roman civil wars, and of that ſevere deſpotiſm which ſucceeded the loſs of liberty. His high and bold ſpirit made him enter deeply into this ſubject, and kindle, on many occaſions, into the moſt real warmth. Hence, he abounds in exclamations and apoſtrophes, which are almoſt always well timed, and ſupported with a vivacity and fire that do him no ſmall honour.

"But it is the fate of this poet, that his beauties can never be mentioned without their ſuggeſting his blemiſhes alſo. As his principal excellency is a lively and glowing genius, which appears ſometimes in his deſcriptions, and very often in his ſentiments, his great defect in both is want of moderation. He carries every thing to an extreme. He knows not where to ſtop. From an effort to aggrandiſe his objects, he becomes tumid and unnatural: and it frequently happens, that where the ſecond line of one of his deſcriptions is ſublime, the third, in which he meant to riſe ſtill higher, is perfectly bombaſt. Lucan lived in an age when the ſchools of the declaimers had begun to corrupt the eloquence and taſte of Rome. He was not free from the infection; and too often, inſtead of ſhowing the genius of the poet, betrays the ſpirit of the declaimer: but he is, on the whole, an author of lively and original genius."

PHARUS, in botany: A genus of the hexandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the fourth order, *Gramina*. The male calyx is a bivalved uniflorous glume; the corolla, a bivalved glume; the female calyx the ſame with the male; the corolla an uniflorous, long, and wrapping glume. There is but one ſeed.

PHARYNX, in anatomy. See ANATOMY.

PHASCUM, in botany: A genus of the order of muſci, belonging to the cryptogamia claſs of plants. The anthera is operculated, with a ciliated mouth; the calyptræ are minute.

PHASEOLUS. See KIDNEY-BEAN.

PHASES, in aſtronomy, from the Greek word φαινω, "to appear;" the ſeveral appearances or quantities of illumination of the moon, Venus, Mercury, and the other planets. See ASTRONOMY.

PHASGA, or PISGAH, (Moſes), a mountain on the other ſide Jordan, joined to Abarim and Nebo, and running ſouth to the mouth of the Arnon: from which Moſes had a view of the promiſed land, and where he died, having before appointed Joſhua his ſucceſſor. Wells takes Piſgah and Nebo to be different names of one and the ſame mountain, a part or branch of the mountains Abarim, Deut. xxxii. 49. compared with Deut. xxxiv. 1. Or that the top of Nebo was peculiarly called *Piſgah*; or ſome other part of it, cut out in ſteps, as the primitive word denotes: and thus it is rendered by Aquila, by a Greek word ſignifying *cut out* (Jerome). There was alſo a city of this name, *id.*; and the adjoining country was in like manner called *Piſgah*, id.

PHASIANUS, in ornithology, a genus belonging to the order of gallinæ. The cheeks are covered with a ſmooth naked ſkin. Gibbon, in his Roman Hiſtory, tells us, that *Phaſianus* is derived from the river PHASIS, the banks of which are the native habitation of the pheaſant. See PHASIS. The ſpecies are,

1. The *gallus*, or common dunghill cock and hen, with a compreſſed caruncle or fleſhy comb on the top of the head, and a couple of caruncles or wattles under the chin. The ears are naked, and the tail is compreſſed and erected. Of all other birds, perhaps this ſpecies affords the greateſt number of varieties; there being ſcarce two to be found that exactly reſemble each other in plumage and form. The tail, which makes ſuch a beautiful figure in the generality of theſe birds, is yet found entirely wanting in others; and not only the tail, but the rump alſo. The toes, which are uſually four in all animals of the poultry kind, yet in a ſpecies of the cock are found to amount to five. The feathers, which lie ſo ſleek and in ſuch beautiful order in moſt of thoſe we are acquainted with, are in a peculiar breed all inverted, and ſtand ſtaring the wrong way. Nay, there is a ſpecies that comes from Japan, which, inſtead of feathers, ſeems to be covered over with hair.

It is not well aſcertained when the cock was firſt made domeſtic in Europe; but it is generally agreed that we firſt had him in our weſtern world from the kingdom of Perſia. Ariſtophanes calls the cock the *Perſian bird*; and tells us he enjoyed that kingdom before ſome of its earlieſt monarchs. This animal was in fact known ſo early, even in the moſt ſavage parts of Europe, that we are told the cock was one of the forbidden foods among the ancient Britons. Indeed, the domeſtic fowl ſeems to have baniſhed the wild one. Perſia itſelf, that firſt introduced it to our acquaintance, ſeems no longer to know it in its natural form; and if we did not find it wild in ſome of the woods of India, as well as thoſe of the iſlands in the Indian ocean, we might begin to doubt, as has been done with regard to ſheep, in what form it firſt exiſted in a ſtate of nature. But the cock is ſtill found in the iſlands of Tinian, in many others of the Indian ocean, and in the woods on the coaſt of Malabar, in its ancient ſtate of independence. In his wild condition, his plumage is black and yellow, and his comb and wattles yellow and purple. There is another peculiarity alſo in thoſe of the Indian woods; their bones, which, when boiled, with us are white, as every body knows, in thoſe are as black as ebony.

In their firſt propagation in Europe, there were diſtinctions then that now ſubſiſt no longer. The ancients eſteemed thoſe fowls whoſe plumage was reddiſh as invaluable; but as for the white, it was conſidered as utterly unfit for domeſtic purpoſes. Theſe they regarded as ſubject to become a prey to rapacious birds; and Ariſtotle thinks them leſs fruitful than the former. Indeed, his diviſion of thoſe birds ſeems taken from their culinary uſes: the one ſort he calls *generous and noble*, being remarkable for fecundity; the other ſort, *ignoble and uſeleſs*, from their ſterility. Theſe diſtinctions differ widely from our modern notions of generoſity in this animal; that which we call the *game cock* being by no means ſo fruitful as the ungenerous dunghill cock, which we treat with contempt. The Athenians had their cock-matches as well as we; but it is probable they did not enter into our refinement of chooſing out the moſt barren of the ſpecies for the purpoſes of combat.

However this be, no animal in the world has greater courage than the cock when oppoſed to one of his own ſpecies; and in every part of the world where refinement and poliſhed manners have not entirely taken place, cock-fighting is a principal diverſion. In China, India, the Philippine iſlands, and all over the Eaſt, cock-fighting is the ſport and amuſement even of kings and princes. With us it is declining every day; and it is to be hoped it will in time become only the paſtime of the loweſt vulgar. See the article COCK-*pit*.

The cock claps his wings before he ſings or crows. His ſight is very piercing; and he never fails to cry in a peculiar manner when he diſcovers any bird of prey in the air. His extraordinary courage is thought to proceed from his being the moſt ſalacious of all other birds whatſoever. A ſingle cock ſuffices for ten or a dozen hens; and it is ſaid of him, that he is the only animal whoſe ſpirits are not abated by indulgence. But then he ſoon grows old; the radical moiſture is exhauſted; and in three or four years he becomes utterly unfit for the purpoſes of impregnation. "Hens alſo (to uſe the words of Willughby), as they for the greateſt part of the year daily lay eggs, cannot ſuffice for ſo many births, but for the moſt part after three years become effete and barren; for, when they have exhauſted all their ſeed-eggs, of which they had but a certain quantity from the beginning, they muſt neceſſarily ceaſe to lay, there being no new ones generated within."

The hen ſeldom clutches a brood of chickens above once a ſeaſon, though inſtances have been known in which they produced two. The number of eggs a domeſtic hen will lay in the year are above 200, provided ſhe be well fed and ſupplied with water and liberty. It matters not much whether ſhe be trodden by the cock or no; ſhe will continue to lay, although the eggs of this kind can never by hatching be brought to produce a living animal. Her neſt is made without any care, if left to herſelf: a hole ſcratched in the ground, among a few buſhes, is the only preparation ſhe makes for this ſeaſon of patient expectation. Nature, almoſt exhauſted by its own fecundity, ſeems to inform her of the proper time for hatching, which ſhe herſelf teſtifies by a clucking note, and by diſcontinuing to lay. The good houſewives, who often get more by their hens laying than by their chickens, often artificially protract this clucking ſeaſon, and ſometimes entirely remove it. As ſoon as a hen begins to cluck, they ſtint her in her proviſions; and, if that fails, they plunge her into cold water: this, for the time, effectually puts back her hatching; but then it often kills the poor bird, who takes cold and dies under the operation.

If left entirely to herſelf, the hen would ſeldom lay above 20 eggs in the ſame neſt, without attempting to hatch them: but in proportion as ſhe lays, her eggs are removed; and ſhe continues to lay, vainly hoping to increaſe the number. In the wild ſtate, the hen ſeldom lays above 15 eggs; but then her proviſion is more difficultly obtained, and ſhe is perhaps ſenſible of the difficulty of maintaining too numerous a family.

When the hen begins to ſit, nothing can exceed her perſeverance and patience; ſhe continues for ſome days immoveable; and when forced away by the importunities of hunger, ſhe quickly returns. Sometimes alſo her eggs become too hot for her to bear, eſpecially if ſhe be furniſhed with too warm a neſt within doors, for then ſhe is obliged to leave them to cool a little: thus the warmth of the neſt only retards incubation, and often puts the brood a day or two back in the ſhell. While the hen ſits, ſhe carefully turns her eggs, and even removes them to different ſituations; till at length, in about three weeks, the young brood begins to give ſigns of a deſire to burſt their confinement. When by the repeated efforts of their bill, which ſerves like a pioneer on this occaſion, they have broke themſelves a paſſage through the ſhell, the hen ſtill continues to ſit till all are excluded. The ſtrongeſt and beſt chickens generally are the firſt candidates for liberty; the weakeſt come behind, and ſome even die in the ſhell. When all are produced, ſhe then leads them forth to provide for themſelves. Her affection and her pride ſeem then to alter her very nature, and correct her imperfections. No longer voracious or cowardly, ſhe abſtains from all food that her young can ſwallow, and flies boldly at every creature that ſhe thinks is likely to do them miſchief. Whatever the invading animal be, ſhe boldly attacks him; the horſe, the hog, or the maſtiff. When marching at the head of her little troop, ſhe acts the commander; and has a variety of notes to call her numerous train to their food, or to warn them of approaching danger. Upon one of theſe occaſions, the whole brood have been ſeen to run for ſecurity into the thickeſt part of an hedge, while the hen

herſelf ventured boldly forth, and faced a fox that came for plunder.

Ten or twelve chickens are the greateſt number that a good hen can rear and clutch at a time; but as this bears no proportion to the number of her eggs, ſchemes have been imagined to clutch all the eggs of a hen, and thus turn her produce to the greateſt advantage. By theſe contrivances it has been obtained, that a hen that ordinarily produces but 12 chickens in the year, is found to produce as many chickens as eggs, and conſequently often above 200. This contrivance is the artificial method of HATCHING chickens in ſtoves, as is practiſed at Grand Cairo; or in a chemical elaboratory properly graduated, as has been effected by Mr. Reaumur At Grand Cairo, they thus produce 6000 or 7000 chickens at a time; where, as they are brought forth in their mild ſpring, which is warmer than our ſummer, the young ones thrive without clutching. But it is otherwiſe in our colder and unequal climate; the little animal may without much difficulty be hatched from the ſhell, but they almoſt all periſh when excluded. To remedy this, Reaumur has made uſe of a woollen hen, as he calls it; which was nothing more than putting the young ones in a warm baſket, and clapping over them a thick woollen canopy.

Capons may very eaſily be taught to clutch a freſh brood of chickens throughout the year; ſo that when one little colony is thus reared, another may be brought to ſucceed it. Nothing is more common than to ſee capons thus employed; and the manner of teaching them is this: Firſt the capon is made very tame, ſo as to feed from one's hand: then, about evening, they pluck the feathers off his breaſt, and rub the bare ſkin with nettles; they then put the chickens to him, which preſently run under his breaſt and belly, and probably rubbing his bare ſkin gently with their heads, allay the ſtinging pain which the nettles had juſt produced. This is repeated for two or three nights, till the animal takes an affection to the chickens that have thus given him relief, and continues to give them the protection they ſeek for: perhaps alſo the querulous voice of the chickens may be pleaſant to him in miſery, and invite him to ſuccour the diſtreſſed. He from that time brings up a brood of chickens like a hen, clutching them, feeding them, clucking, and performing all the functions of the tendereſt parent. A capon once accuſtomed to this ſervice, will not give over; but when one brood is grown up, he may have another nearly hatched put under him, which he will treat with the ſame tenderneſs he did the former.

The cock, from his ſalaciouſneſs, is allowed to be a ſhort-lived animal; but how long theſe birds live, if left to themſelves, is not yet well aſcertained by any hiſtorian. As they are kept only for profit, and in a few years become unfit for generation, there are few that, from mere motives of curioſity, will make the tedious experiment of maintaining a proper number till they die. Aldrovandus hints their age to be 10 years; and it is probable that this may be its extent. They are ſubject to ſome diſorders; and as for poiſons, beſides nux vomica, which is fatal to moſt animals except man, they are injured, as Linnæus aſſerts, by elderberries; of which they are not a little fond.

Of this ſpecies Mr. Latham enumerates no leſs than 13 varieties, beginning with the wild cock, which is a third leſs in the body than the domeſtic cock. This variety he imagines to be the original ſtock from whence all our domeſtic varieties have ſprung. They appear to be natives of the foreſts of India. There are but few places, however, as Mr Latham goes on to obſerve, where the different voyagers have not met with cocks and hens, either wild or tame; and mention has been particularly made of finding them at St. Jago, Pulo Condore, Iſle of Timor, Philippine and Molucca Iſles, Sumatra and Java, New Guinea, Tinian, and moſt of the iſles of the South Seas. Thoſe of Pulo Condore are very much like our own, but conſiderably leſs, being only of the ſize of a crow. The cocks crow like ours, but their voices are much more ſmall and ſhrill.—*Damp. Voy.* vol. i. p. 392.—Two wild ones were ſhot there by our laſt voyagers.—*Ellis's Narr.* ii. p. 340. Thoſe of Sumatra and Java are remarkably large, and are called the *St. Jago breed*. The cock is ſo tall as to peck off a common dining-table. When fatigued, he ſits down on the firſt joint of the leg; and is then taller than the common fowls.—*Hiſt. Sumatr.* p. 98. They are found in New Guinea, but not in great plenty.—*Forr. Voy.* p. 105. The fowls which were met with wild at Tinian "were run down without much trouble, as they could ſcarce fly farther than 100 yards at a flight."—*Anſon's Voy.* p. 416. Forſter obſerves, that they are plenty at Eaſter, Society, and Friendly Iſles: at the two laſt they are of a prodigious ſize. They are not uncommon at the Marqueſas, Hebrides, and New Caledonia; but the Low Iſles are quite deſtitute of them —See *Obſ.* p. 193.—Ducks and poultry are numerous in the Sandwich Iſles.—*Cook's Journal*, p. 229. In reſpect to Europe little need be ſaid, as varieties without end are everywhere ſeen, and their manners fully known to every one. It is obſerved, however, that they breed moſt freely in the warmer ſituations. In the very cold regions, though they will live and thrive, they ceaſe to multiply. They are not found to breed in the northern parts of Siberia; and in Groenland are only kept as rarities.—*Faun. Groen.* On the whole, it ſeems quite unneceſſary to enlarge further on a ſubject well known to every body. They are ſo common, that every one who wiſhes to become acquainted with their nature and manners, has the means of ſuch knowledge in his power. Thoſe who wiſh for minuter deſcriptions, we muſt refer to the authors who have profeſſedly written on the ſubject; for the varieties which we have already mentioned, we refer to Mr. Latham.

2. The *motmot*, or Guinea pheaſant, is browniſh, ſomewhat red below, with a wedge-like tail, and wants ſpurs. 3. The colchicus is red, with a blue head, a wedge-ſhaped tail, and papillous cheeks. It is a native of Africa and Aſia. 4. The argus is yellowiſh, with black ſpots, a red face, and a blue creſt on the back part of the head. It is found in Chineſe Tartary. 5. The pictus has a yellowiſh creſt, a red breaſt, and a wedge-ſhaped tail. It is a native of China. 6. The nectheremus is white, with a black creſt and belly, and a wedge-ſhaped tail. It is a native of China.

Mr. Latham enumerates nine different ſpecies of pheaſants, and of the common pheaſant he reckons ſix varieties. The firſt which he deſcribes is the ſuperb pheaſant. This bird Linnæus deſcribed from the various repreſentations of it painted on paper-hangings and China-ware; and farther confirmed by a figure and deſcription in a Chineſe book which came under his inſpection.

"We have lately ſeen (ſays Latham) a drawing of the tail feather of a bird of the pheaſant kind, which meaſured above ſix feet in length, and which, it is probable, muſt have belonged to ſome bird not hitherto come to our knowledge. The drawing is in the poſſeſſion of Major Davies, who took it from the original feather; two of which were in the poſſeſſion of a gentleman of his acquaintance, and were brought from China. They are exactly in ſhape of the two middle feathers of the painted pheaſant; the general colour is that of a fine blue grey, margined on the ſides with a rufous cream-colour, and marked on each ſide the ſhaft with numerous bars of black; between 70 and 80 bars in all; thoſe on the oppoſite ſides of the ſhaft ſeldom correſponding with each other.

"The argus, though it be a native of China, is very commonly found in the woods of Sumatra, where it is called *ceo ow*. It is found extremely difficult to be kept alive for any conſiderable time after catching it in the woods; never for more than a

month. It ſeems to have an antipathy to the light, being quite inanimate in the open day; but when kept in a dark place, it appears perfectly at eaſe, and ſometimes makes its note or call, from which it takes its name; and which is rather plaintive, and not harſh like that of a peacock. The fleſh reſembles that of the common pheaſant."

Mr. Latham obſerves, that the common pheaſant is now found in a ſtate of nature in almoſt the whole of the Old Continent. They ſometimes (he ſays) come into farm-yards near woods, and produce croſs breeds with common hens. He then ſays, "M. Salerne remarks, that the hen-pheaſant, when done laying and ſitting, will get the plumage of the male, and after that become ſo little reſpected by him, as to be treated with the ſame incivility as he would ſhow to one of his own ſex. He mentions this as a new obſervation; but it is far more common than may be generally ſuppoſed, and had been long before mentioned by Edwards, who gave for example one kept in the menagery of the duke of Leeds; and remarks, that this change is moſt likely to happen when in a confined ſtate. The circumſtance of the hen acquiring the plumage of the cock after a certain time is not confined to the pheaſant: the inſtance of the pea-hen belonging to lady Tynte, now in the Leverian Muſeum, evinces the contrary, which, after having many broods, got much of the fine plumage of the cock, with the addition even of the fine train feathers. The female alſo of the rock manakin is ſaid to get the plumage of the oppoſite ſex after a number of years; and perhaps, if obſerved hereafter, this may be found to be the caſe with many other ſpecies. A gentleman of my acquaintance (continues our author), dead long ſince, who uſed to keep theſe birds for his amuſement, obſerved the ſame to me: and the ingenious Mr. J. Hunter has a well drawn up paper in the Philoſophical Tranſactions, vol. lxx. p. 527, to the ſame purport. But, in addition to this, I am well informed, that it does not always require mature age to give the hen-pheaſant the appearance of the male, as ſometimes young birds will be adorned with his fine plumage. I will not ſay how this happens, and whether it may be peculiar to this ſpecies to grow barren (if that be the reaſon) ſooner than any other of the gallinaceous tribe; but I am aſſured that ſeveral of theſe ſpurleſs, cock-like hens have proved on eating to be young birds, from their juicineſs and delicacy of flavour."

One of the varieties which our author remarks under this ſpecies, he calls the *Hybridal pheaſant*, which is a mixed breed between the pheaſant and cock; one of which is in the Leverian Muſeum. The two laſt ſpecies which our author deſcribes, is the parraka and courier.

The parraka is about the ſize of a ſmall fowl, reſembling it in the bill, legs, and body. Its length is 23 inches. The colour of the bill is dark rufous; the eyes are brown; the general colour of the plumage is a deep brown on the back, and fulvous under the belly: the top of the head is fulvous, and the feathers are ſomewhat long, but not ſo much as to form a real creſt; the wings are ſhort; the webs of ſome of the quills are ſomewhat rufous; the tail conſiſts of 12 feathers, is even at the end, about a foot in length, and is, for the moſt part, carried pendent; the legs are of a dark rufous, inclining to black; the claws are like thoſe of a fowl.

"It is peculiar (ſays Mr. Latham) in its internal ſtructure in reſpect to the windpipe; which, inſtead of entering directly the breaſt, as in moſt birds, paſſes over the ſide of the left clavicle, and on the outſide of the fleſhy part of the breaſt, being covered only by the ſkin; then taking a turn upwards, paſſes over the right clavicle into the breaſt, and is diſtributed through the lungs in the uſual way. The female has not this circumvolution of the windpipe. The hannequaw, mentioned by Bancroft, is probably the ſame bird. He ſays that it is black, roofts in trees, and may be heard early in the morning, diſtinctly but hoarſely, repeating the word *hannequaw* (eaſily miſtaken for parraquaw) very loud. Theſe are found in the unfrequented woods of the internal parts of Cayenne, Guiana, and many parts of South America. At ſun-riſe they ſet up a very loud cry, which is thought to be the loudeſt of all birds in the New World; at which time the eyes appear red, as does a ſmall ſkin under the breaſt, which is not at all ſeen except when the bird makes ſuch exertions, or is angry. This cry is very like the word parraquaw, and is repeated many times together; and often many cry at once, or anſwer one another, but moſt in breeding-time, which is twice in the year; at each time laying from four to ſix eggs; making the neſt in low branches or ſtumps of trees, and behaving with their chickens in the ſame manner as hens. They feed on grain, ſeeds, and herbs; but feed the young in the neſt with worms and ſmall inſects. Theſe, with many other birds, inhabit the woods by day, coming out into the open ſavannas morning and evening to feed; at which times they are chiefly killed by the natives and near inhabitants. They may be brought up tame; and their fleſh is much eſteemed.

"The courier pheaſant is but very imperfectly deſcribed by Fernandez; and is ſaid to be 18 inches long. The general colour of the plumage is white, inclined to fulvous; about the tail they are black, mixed with ſome ſpots of white: the tail itſelf is long, and of a green colour, reflecting in ſome lights like the feathers of a peacock: the wings are ſhort. This ſpecies inhabits the hottter parts of Mexico; flies ſlow; but is recorded to outrun the ſwifteſt horſe."

Pheaſants were originally brought into Europe from the banks of the Phaſis, a river of Colchis, in Aſia Minor; and from whence they ſtill retain their name. Next to the peacock, they are the moſt beautiful of birds, as well for the vivid colour of their plumes as for their happy mixtures and variety. It is far beyond the power of the pencil to draw any thing ſo gloſſy, ſo bright, or points ſo finely blending into each other. We are told, that when Cræſus, king of Lydia, was ſeated on his throne, adorned with royal magnificence, and all the barbarous pomp of eaſtern ſplendour, he aſked Solon if he had ever beheld any thing ſo fine? The Greek philoſopher, no way moved by the objects before him, or taking a pride in his native ſimplicity, replied, That after having ſeen the beautiful plumage of the pheaſant, he could be aſtoniſhed at no other finery.

Theſe birds, though ſo beautiful to the eye, are not leſs delicate when ſerved up to the table. Their fleſh is conſidered as the greateſt dainty; and when the old phyſicians ſpoke of the wholeſomeneſs of any viands, they made their compariſon with the fleſh of the pheaſant. However, notwithſtanding all theſe perfections to tempt the curioſity or the palate, the pheaſant has multiplied in its wild ſtate.

A ſpirit of independence ſeems to attend the pheaſant even in captivity. In the woods, the hen-pheaſant lays from 18 to 20 eggs in a ſeaſon; but in a domeſtic ſtate ſhe ſeldom lays above 10. In the ſame manner, when wild, ſhe hatches and leads up her brood with patience, vigilance, and courage; but when kept tame, ſhe never ſits well, ſo that a hen is generally her ſubſtitute upon ſuch occaſions: and as for leading her young to their food, ſhe is utterly ignorant of where it is to be found; and the young birds ſtarve, if left ſolely to her protection. The pheaſant, therefore, on every account, ſeems better left at large in the woods than reclaimed to priſtine captivity. Its fecundity when wild is ſufficient to ſtock the foreſt; its beautiful plumage adorns it; and its fleſh retains a higher flavour from its unlimited freedom.

However, it has been the aim of late to take theſe birds once more from the woods, and to keep them in places fitted for their reception. Like all others of the poultry kind, they have no

great ſagacity, and ſuffer themſelves eaſily to be taken. At night they rooſt upon the higheſt trees of the wood; and by day they come down into the lower brakes and buſhes, where their food is chiefly found. They generally make a kind of flapping noiſe when they are with the females; and this often appriſes the ſportſman * of their retreats. At other times he traces them in the ſnow, and frequently takes them in ſpringes. But of all birds they are ſhot moſt eaſily; as they always make a whirring noiſe when they riſe, by which they alarm the gunner; and being a large mark, and flying very ſlow, there is ſcarce any miſſing them.

When theſe birds are taken young into keeping, they become as familiar as chickens: and when they are deſigned for breeding, they are put together in a yard, five hens to a cock; for this bird, like all of the poultry kind, is very ſalacious. In her natural ſtate the female makes her neſt of dry graſs and leaves: the ſame muſt be laid for her in the pheaſandry, and ſhe herſelf will ſometimes properly diſpoſe them. If ſhe refuſes to hatch her eggs, then a common hen muſt be got to ſupply her place, which talk ſhe will perform with perſeverance and ſucceſs. The young ones are very difficult to be reared†; and they muſt be ſupplied with ants eggs, which is the food the old one leads them to gather when wild in the woods. To make theſe go the farther, they are to be chopped up with curds or other meat; and the young ones are to be fed with great exactneſs, both as to the quantity and the time of their ſupply. This food is ſometimes alſo to be varied; and wood lice, earwigs, and other inſects, are to make a variety. The place where they are reared muſt be kept extremely clean; their water muſt be changed twice or thrice a-day; they muſt not be expoſed till the dew is off the ground in the morning, and they ſhould always be taken in before ſun-ſet. When they become adult, they very well can ſhift for themſelves; but they are particularly fond of oats and barley.

In order to increaſe the breed, and make it ſtill more valuable, Longolius teaches us a method that appears very peculiar.

* Pheaſants may be taken in a variety of ways. One method is, to be well acquainted with their haunts and breeding-places; which are generally young, thick, and well-grown coppices, free from the diſturbances of cattle, and without a path-way through them; for they are timorous birds. When their haunts are diſcovered, it will be neceſſary to find out where the brood is. And here it is to be remarked, that pheaſants come out of the wood three times a day to feed in green corn, freſh paſtures, or ſuch like places. The times of coming out are in the morning ſoon after ſunriſe, at noon, and at ſunſet. The ſides of the wood where they may be ſuppoſed to come out ought then to be carefully watched, and the young ones will be ſeen following the female as a flock of chickens follow the hen. The wood ought alſo to be watched in the evenings, when the noiſe of the cock and hen calling the young ones together will ſoon be heard; and the ſportſman muſt then endeavour to get as near as he can to the place; and, being very ſtill and ſilent, he may obſerve their numbers and diſpoſition, and learn how to ſpread his nets ſo as moſt eaſily to take the whole brood; but if by the leaſt motion they diſcover him, they will all take to their legs and run to a great diſtance; for they ſeldom riſe on the wing, except when very cloſe frighted. By practice ſome people have become able to imitate the voice of the old pheaſant, ſo as to be able to call the young ones together to any place that he pleaſes, when the haunts are once found out, and by this means they are eaſily led into the nets. The beſt time for uſing this call is in the morning or evening; and the note imitated ſhould be that by which they are called out to feed: indeed, by learning to imitate the other notes, they may be brought together at any time of the day. The ſportſman who can make this call, muſt ſhelter himſelf in ſome cloſe place, and begin very ſoftly at firſt; then, if none are near enough to be within hearing, he is gradually to raiſe it louder and louder, and at length he will be anſwered as loud, if any are within hearing, though at a conſiderable diſtance; whereas, if he ſhould ſet up the call too loud at firſt, and any of the birds ſhould happen to be very near, they would be frighted away.

When a pheaſant anſwers, the ſportſman is to creep nearer and nearer, ſtill calling, though not ſo loud; and he will ſtill be anſwered, till at length he will be led by the bird's voice within ſight of it. Then he is to ſpread his net, and to begin to call again, keeping in ſome cloſe and well ſheltered place behind the net: in this place he is to call till the bird approaches; and when he has drawn it under the net, he is to appear ſuddenly, and the bird, riſing up, will thus be caught.

There is another method of taking pheaſants much quicker than that we have juſt deſcribed, viz. the having a live cock-pheaſant to uſe as a ſtale: this bird is to be fixed under the net, and by his crowing he will ſoon entice others in. The ſportſman muſt lie concealed; and when another pheaſant comes in, he is to draw the net over him. Many people take pheaſants in ſpringes or horſe-hair ſnares: to ſucceed in this, it will be neceſſary to be careful in ſearching out their haunts, and the places by which they go out of the woods into the fields. When theſe are diſcovered, a peg muſt be fixed in the ground at each, and at each peg two ſpringes muſt be laid open; the one to take in the legs, the other the head. When the ſpringes are ſet, the ſportſman muſt go into the woods, and get behind the birds in order to fright them with ſome little noiſe, ſuch as ſhall not be enough to raiſe them to the wing, but only to ſet them a-running. They will naturally make their way out of the wood, through their accuſtomed paſſes, and be then caught in the ſpringes.

There is another method of taking theſe birds in winter, provided there be no ſnow. This muſt be done with a net made in the form of a caſting-net, but with wider meſhes; they may indeed be five inches wide. Some peas or wheat are to be taken out; and the path of the pheaſants being diſcovered, which may eaſily be done by their dung, a pint or thereabout of corn is to be thrown down in the path in a place marked, ſo that the ſportſman can come to it again. This muſt be done for ſome days, till at length the pheaſants will expect it every day regularly; and all of them that frequent the place are brought together to feed there, and then the net is to be fixed over the place; its top being tied up to ſome bough of a tree, and its bottom fixed down all around, except in one place, where the walk of the pheaſants lies. In this place it muſt be raiſed in the form of an arch, and the entrance muſt be lined with ſeveral rods of hazel; the thick ends of which are to be tied to the net, and the thin ones let into the ſpace covered by it; and thus the pheaſants will eaſily get in by parting the ſmall ends of the ſticks, as fiſh into a wheel, but they will not eaſily get out again. The nets are to be dyed of a ruſſet colour, by laying them in a tan-pit; and they muſt, when planted for this purpoſe, be covered with boughs, ſo that the birds do not diſcover them, and then they will eaſily run into them, and be all taken at once.

† The pheaſant is ſo nearly allied to our common poultry that this aſſertion may appear odd: it is nevertheleſs true; and the principal cauſe may be, that their proper food is not known, or not ſufficiently inquired into. They feed voraciouſly on ants and various other inſects; and it is ſaid, that when the muſtineſs of corn or want of cleanneſs in their apartments has made them ſick, a repaſt of ants has recovered them. When theſe fail, millepedes and earwigs together anſwer as an excellent medicine, along with their common food (corn), which muſt be very ſweet and clean. Theſe birds are very ſullen, and when coupling time is over, they are ſeldom found more than one in a place.

The pheaſant is a very bold bird when firſt brought into the yard among other poultry, not ſparing the peacock, nor even ſuch young cocks and hens as it can maſter; but after a time it will live tamely among them, and will at laſt be brought to couple with a common hen. The breed thus produced take much ſtronger after the pheaſant than the hen; and in a few ſucceſſions, if they be let to breed with the cock-pheaſant (for the mixture is not barren), there will be produced a ſpecies more tame, ſtronger, and more prolific; ſo that, he adds, it is ſtrange why moſt of our pheaſandries are not ſtocked with birds produced in this manner.

The pheaſant, when full grown, ſeems to feed indifferently upon every thing that offers. It is ſaid by a French writer, that one of the king's ſportſmen ſhooting at a parcel of crows that were gathered round a dead carcaſe, to his great ſurpriſe, upon coming up, found that he had killed as many pheaſants as crows. It is even aſſerted by ſome, that ſuch is the carnivorous diſpoſition of this bird, that when ſeveral of them are put together in the ſame yard, if one of them happens to fall ſick, or ſeems to be pining, all the reſt will fall upon, kill, and devour it. Such is the language of books; thoſe who have frequent opportunities of examining the manners of the bird itſelf, know what credit ought to be given to ſuch an account.

PHASIS, a river which falls into the Euxine ſea, about 700 miles from Conſtantinople. "From the Iberian Caucaſus (ſays Gibbon), the moſt lofty and craggy mountain of Aſia, that river deſcends with ſuch oblique vehemence, that in a ſhort ſpace it is traverſed by 120 bridges. Nor does the ſtream become placid and navigable till it reaches the town of Sarapana, five days journey from the Cyrus, which flows from the ſame hills, but in a contrary direction to the Caſpian lake. The proximity of theſe rivers has ſuggeſted the practice, or at leaſt the idea, of wafting the precious merchandiſe of India down the Oxus, over the Caſpian, up the Cyrus, and with the current of the Phaſis into the Euxine and Mediterranean ſeas. As it ſucceſſively collects the ſtreams of the plain of Colchos, the Phaſis moves with diminiſhed ſpeed, though accumulated weight. At the mouth it is 60 fathoms deep, and half a league broad; but a ſmall woody iſland is interpoſed in the midſt of the channel: the water, ſo ſoon as it has depoſited an earthy or metallic ſediment, floats on the ſurface of the waves, and is no longer ſuſceptible of corruption. In a courſe of 100 miles, 40 of which are navigable for large veſſels, the Phaſis divides the celebrated region of Colchos or Mingrelia, which, on three ſides, is fortified by the Iberian and Armenian mountains, and whoſe maritime coaſt extends about 200 miles, from the neighbourhood of Trebizond to Dioſcurias and the confines of Circaſſia. Both the ſoil and climate are relaxed by exceſſive moiſture: 28 rivers, beſides the Phaſis and his dependent ſtreams, convey their waters to the ſea; and the hollowneſs of the ground appears to indicate the ſubterraneous channels between the Euxine and the Caſpian."

PHASMATA, in phyſiology, certain appearances ariſing from the various tinctures of the clouds by the rays of the heavenly bodies, eſpecially the ſun and moon. Theſe are infinitely diverſified by the different figures and ſituations of the clouds, and the appulſes of the rays of light; and, together with the occaſional flaſhings and ſhootings of different meteors, they have, no doubt, occaſioned thoſe prodigies of armies fighting in the air, &c. of which we have ſuch frequent accounts in moſt ſorts of writers. See 2 Maccab. xi. 8. Melancth. Meteor. 2 Shel. de Comet. ann. 1618.

Kircher and Schottus have erroneouſly attempted to explain the phenomenon from the reflection of terreſtrial objects made on opake and congealed clouds in the middle region of the air, which, according to them, have the effect of a mirror. Thus, according to theſe authors, the armies pretended by ſeveral hiſtorians to have been ſeen in the ſkies, were no other than the reflection of the like armies placed on ſome part of the earth. See Hiſt. Acad. Roy. Scienc. ann. 1726, p. 405, & ſeq.

PHASSACHATES, in natural hiſtory, the name of a ſpecies of agate, which the ancients, in its various appearances, ſometimes called *leucachates* and *perileucos*.

PHEASANT, in ornithology. See PHASIANUS.

PHEASANT's-*eye*, *or Bird's-eye*. See ADONIS.

PHEBE, a deaconeſs of the port of Corinth, called *Cenchrea*. St. Paul had a particular eſteem for this holy woman; and Theodoret thinks the apoſtle lodged at her houſe for ſome time, while he continued in or near Corinth. It is thought ſhe brought to Rome the epiſtle he wrote to the Romans, wherein ſhe is commended and recommended in ſo advantageous a manner. He ſays (Rom. xvi. 1, 2.), "I commend unto you Phebe our ſiſter, which is a ſervant of the church which is at Cenchrea; that ye receive her in the Lord, as becometh ſaints, and that ye aſſiſt her in whatſoever buſineſs ſhe hath need of you; for ſhe hath been a ſuccourer of many, and of myſelf alſo." Some moderns have advanced a notion, that Phebe was wife to St. Paul; but none of the ancients have ſaid any thing like it. It is thought, in quality of deaconeſs, ſhe was employed by the church in ſome miniſtrations ſuitable to her ſex and condition; as to viſit and inſtruct the Chriſtian women, to attend them in their ſickneſs, and diſtribute alms to them.

PHEGOR, or PEOR, a deity worſhipped at a very early period by the Midianites and Moabites, and probably by all the other tribes which then inhabited Syria. Much has been ſaid concerning the functions of this god, and the rank which he held among the Pagan divinities (ſee BAAL-*Peor*); and many conjectures have been formed concerning the origin of his name. Moſt of theſe ſeem to have no better foundation than the ſenſeleſs dreams of the Jewiſh rabbis. PHEGOR, or PEOR, is undoubtedly the ſame with the Hebrew word *pechor*, which ſignifies *aperuit*, and probably refers to the prophetic influence always attributed to the ſolar deity, by which he *opened* or *diſcovered* things to come. Accordingly we find PHEGOR or PEOR generally joined to *Baal*, which was the Syrian and Chaldean name of the Sun after he became an object of worſhip; hence *Baal*-PHEGOR muſt have been the ſun worſhipped by ſome particular rites, or under ſome particular character. What theſe were, a reſolution of *Pechor* into its component parts may perhaps inform us. As this word, wherever it occurs in Scripture, has ſome relation to diſtending or opening the mouth wide, it is probably compounded of PHAH the *mouth* or *face*, and EHAR *naked*. In thoſe countries we know that the women wore veils; but it would appear, that in celebrating the rites of this deity they were unveiled. It ſeems even not improbable, that on theſe occaſions the ſexes danced promiſcuouſly without their clothes; a practice which would naturally give birth to the licentious amours mentioned in the 25th chapter of the book of Numbers. If this be admitted, it will follow that *Phegor* was the ſun preſiding over the myſteries of Venus.

PHELLANDRIUM, WATER-HEMLOCK; a genus of the digynia order, belonging to the pentandria claſs of plants. There are two ſpecies, one of which, viz. the aquaticum, is a native of Britain. This grows in ditches and ponds, but is not very common. The ſtalk is remarkably thick and dichotomous, and grows in the water. It is a poiſon to horſes, bringing upon them, as Linnæus informs us, a kind of palſy; which, however, he ſuppoſes to be owing not ſo much to the noxious qualities of the plant itſelf, as to thoſe of an inſect which feeds upon it, breeding within the ſtalks, and which he calls *curculio paraplecticus*. The Swedes give ſwine's dung for the cure. The ſeeds are ſometimes given in intermittent fevers, and the leaves are by ſome added to diſcutient cataplaſms. In the winter, the roots and ſtem, diſſected by the influence of the weather, afford a

very curious ſkeleton or network. Horſes, ſheep, and goats, eat the plant; ſwine are not fond of it; and it is refuſed by cows.

PHENGITES, among the ancients, the name of a beautiful ſpecies of alabaſter. It is a rude irregular maſs, very ſhattery and friable, but of a brightneſs ſuperior to that of moſt other marbles, and excelling them all in tranſparence. The colour is an agreeable pale yellowiſh white, or honey colour; the yellowiſh is more intenſe in ſome places than in others, and ſometimes makes an obſcure reſemblance of veins. It is very weak and brittle in the maſs; and, when reduced to ſmall pieces, may be eaſily crumbled between the fingers into looſe, but conſiderably large angular pieces, ſome perfect, others complex, irregular, or mutilated, and all approaching to a flat ſhape. The ancients were very fond of this ſpecies in public buildings; and the Temple of Fortune, built entirely of it, has long been celebrated. Its great beauty is its tranſparence; from which alone this temple was perfectly light when the doors were ſhut, though it was built without a window, and had no other light but what was tranſmitted through the ſtone its walls were built with. It was anciently found in Cappadocia, and is ſtill plentiful there: we have it alſo in Germany and France, and in our own kingdom in Derbyſhire, and in ſome other counties. It takes an excellent poliſh, and is very fit for ornamental works, where there is no great ſtrength required. See AMETHYST.

PHENICE, a port of the iſland of Crete, to the weſt of the iſland. St. Paul having anchored at Phenice, when he was carried to Rome (Acts xxvii. 12.), adviſed the ſhip's crew to ſpend the winter there, becauſe the ſeaſon was too far advanced.

PHENICIA. See PHOENICIA.

PHEONS, in heraldry, the barbed heads of darts, arrows, or other weapons.

PHEOS, in botany, a name which Theophraſtus, Dioſcorides, and others, give to a plant uſed by fullers in dreſſing their cloths, and of which there were two kinds, a ſmaller called ſimply *pheos*, and a larger called *hippopheos*. This plant is ſometimes called *phleos*; and is thus confounded with a kind of marſh cudweed, or *gnaphalium*, called alſo by that name; but it may always be diſcovered which of the two plants an author means, by obſerving the ſenſe in which the word is uſed, and the uſe to which the plant was put. The *phleos*, properly ſo called, that is, the cudweed, was uſed to ſtuff beds and other ſuch things, and to pack up with earthen veſſels to prevent their breaking; but the pheos, improperly called *phleos*, only about cloths: this was, however, alſo called *ſtæbe* and *enaphon*.

PHERECRATES, a Greek comic poet, was contemporary with Plato and Ariſtophanes. After the example of the ancient comedians, who never introduced upon the theatre imaginary but living characters, he acted his contemporaries. But he did not abuſe the liberty which at that time prevailed upon the ſtage; and laid it down as a rule to himſelf, never to deſtroy the reputation of any perſon. Twenty-one comedies are attributed to him, of which there now only remain ſome fragments collected by Hertelius and Grotius. From theſe fragments, however, it is eaſy to diſcern, that Pherecrates wrote the pureſt Greek, and poſſeſſed that ingenious and delicate raillery which is called *attic urbanity*. He was author of a kind of verſe called, from his own name, *Pherecratick*. The three laſt feet were in hexameter verſe, and the firſt of thoſe three feet was always a ſpondee. This verſe of Horace (for example, *Quamvis pontica pinus*) is a Pherecratick verſe. We find in Plutarch a fragment of this poet upon the muſic of the Greeks, which has been critically examined by M. Burette of the academy of inſcriptions. See the 15th volume of the collection publiſhed by that learned ſociety.

PHERECYDES, a native of Scyros, flouriſhed about the year 560 before the Chriſtian era, and was diſciple of Pittacus, one of the ſeven wiſe men of Greece (ſee PITTACUS). He is ſaid to have been the firſt of all the philoſophers who has written on natural ſubjects and the eſſence of the gods. He was alſo the firſt, it is ſaid, who held the ridiculous opinion, "that animals are mere machines." He was Pythagoras's maſter, who loved him as his own father. This grateful ſcholar having heard that Pherecydes lay dangerouſly ill in the iſland of Delos, immediately repaired thither, in order to give every neceſſary aſſiſtance to the old man, and to take care that no means ſhould be left untried for the recovery of his health. His great age, however, and the violence of his diſeaſe, having rendered every preſcription ineffectual, his next care was to ſee him decently buried; and when he had paid the laſt duty to his remains, and erected a monument to his memory, he ſet out again for Italy. Other cauſes have been aſſigned for the death of Pherecydes: ſome ſay he was eaten up by lice, and others, that he fell headlong from the top of Mount Corycius in his way to Delphos. He lived to the age of 85 years, and was one of the firſt proſe writers among the Greeks.

"Marvellous circumſtances have been related of him, which only deſerve to be mentioned, in order to ſhow that what has been deemed ſupernatural by ignorant ſpectators may be eaſily conceived to have happened from natural cauſes. A ſhip in full ſail was at a diſtance approaching its harbour; Pherecydes predicted that it would never come into the haven, and it happened accordingly; for a ſtorm aroſe which ſunk the veſſel. After drinking water from a well, he predicted an earthquake, which happened three days afterwards. It is eaſy to ſuppoſe that theſe predictions might have been the reſult of a careful obſervation of thoſe phenomena which commonly precede ſtorms or earthquakes in a climate where they frequently happen.

"It is difficult to give in any degree an accurate account of the doctrines of Pherecydes; both becauſe he delivered them, after the manner of the times, under the concealment of ſymbols; and becauſe very few memoirs of this philoſopher remain. It is moſt probable that he taught thoſe opinions concerning the gods and the origin of the world which the ancient Grecian theogoniſts borrowed from Egypt;" and of which the reader will find accounts in different articles of this work. See the articles EGYPT, METAPHYSICS, MYSTERIES, MYTHOLOGY, and POLYTHEISM.

PHERETIMA, was the wife of Battus king of Cyrene, and the mother of Arceſilaus. After her ſon's death, ſhe recovered the kingdom by means of Amaſis king of Egypt; and to avenge the murder of Arceſilaus, ſhe cauſed all his aſſaſſins to be crucified round the walls of Cyrene; and ſhe cut off the breaſts of their wives, and hung them up near the bodies of their huſbands. It is ſaid that ſhe was devoured alive by worms; a puniſhment which, according to ſome of the ancients, was inflicted by Providence for her unparalleled cruelties.

PHERON, was a king of Egypt, who ſucceeded Seſoſtris. He was blind; and he recovered his ſight by waſhing his eyes, according to the directions of the oracle, in the urine of a woman who had never had any unlawful connections. He tried his firſt wife; but ſhe appeared to have been faithleſs to his bed, and ſhe was burnt with all thoſe whoſe urine could not reſtore ſight to the king. He married the woman whoſe urine proved beneficial.

PHIAL, a well-known veſſel made of glaſs, uſed for various purpoſes.

Leyden PHIAL, is a phial of glaſs coated on both ſides with tin-foil for a conſiderable way up the ſides, of great uſe in electrical experiments. See ELECTRICITY, *paſſim*.

PHIDIAS, the moſt famous ſculptor of antiquity, was an Athenian, and a contemporary of the celebrated Pericles, who flouriſhed in the 83d Olympiad. This wonderful artiſt was not only conſummate in the uſe of his tools, but accompliſhed in

thoſe ſciences and branches of knowledge which belong to his profeſſion, as hiſtory, poetry, fable, geometry, optics, &c. He firſt taught the Greeks to imitate nature perfectly in this way; and all his works were received with admiration. They were alſo incredibly numerous; for it was almoſt peculiar to Phidias, that he united the greateſt facility with the greateſt perfection. His Nemeſis was ranked among his firſt pieces: it was carved out of a block of marble, which was found in the camp of the Perſians after they were defeated in the plains of Marathon. He made an excellent ſtatue of Minerva for the Plateans; but the ſtatue of this goddeſs in her magnificent temple at Athens, of which there are ſtill ſome ruined remains, was an aſtoniſhing production of human art. Pericles, who had the care of this pompous edifice, gave orders to Phidias, whoſe prodigious talents he well knew, to make a ſtatue of the goddeſs; and Phidias formed a figure of ivory and gold 39 feet high. Writers never ſpeak of this illuſtrious monument of ſkill without raptures; yet what has rendered the name of the artiſt immortal, proved at that time his ruin. He had carved upon the ſhield of the goddeſs his own portrait and that of Pericles; and this was, by thoſe that envied them, made a crime in Phidias. He was alſo charged with embezzling part of the materials which were deſigned for the ſtatue. Upon this he withdrew to Elis, and revenged himſelf upon the ungrateful Athenians, by making for the Elians the Olympic Jupiter; a prodigy of art, and which was afterwards ranked among the ſeven wonders of the world. It was of ivory and gold; 60 feet high, and every way proportioned. "The majeſty of the work did equal the majeſty of the god (ſays Quintilian), and its beauty ſeems to have added luſtre to the religion of the country." Phidias concluded his labours with this maſterpiece; and the Elians, to do honour to his memory, erected, and appropriated to his deſcendants, an office, which conſiſted in keeping clean this magnificent image.

PHIDITIA, in Grecian antiquity, feaſts celebrated with great frugality at Sparta. They were held in the public places and in the open air. Rich and poor aſſiſted at them equally, and on the ſame footing; their deſign being to keep up peace, friendſhip, good underſtanding, and equality among the citizens great and ſmall. It is ſaid that thoſe who attended this feaſt brought each a buſhel of flour, eight meaſures of wine named *chorus*, five mince of cheeſe, and as many figs.

PHILA, in mythology, one of the attributes of Venus, which diſtinguiſhes her as the mother of love, from φιλειν *to love*.

PHILADELPHIA, in antiquity, were games inſtituted at Sardis to celebrate the union of Caracalla and Geta, the ſons of Septimius Severus.

PHILADELPHIA, the capital of the ſtate of Penſylvania in North America, ſituated in W. lon. 75. 8. N. lat. 39. 57. It is one of the moſt beautiful and regular cities in the world, being of an oblong form, ſituated on the weſt bank of the river Delaware, on an extenſive plain, about 118 miles (ſome ſay more) from the ſea. The length of the city eaſt and weſt, that is, from the Delaware to the Schuylkill, upon the original plan of Mr. Penn, is 10,300 feet, and the breadth, north and ſouth, is 4837 feet. Not two-fifths of the plot covered by the city charter is yet built. The inhabitants, however, have not confined themſelves within the original limits of the city, but have built north and ſouth along the Delaware two miles in length. The longeſt ſtreet is Second-ſtreet, about 700 feet from Delaware river, and parallel to it. The circumference of that part of the city which is built, if we include Kenſington on the north and Southwark on the ſouth, may be about five miles. Market-ſtreet is 100 feet wide, and runs the whole length of the city from river to river. Near the middle, it is interſected at right angles by Broad-ſtreet, 113 feet wide, running nearly north and ſouth quite acroſs the city.

Between Delaware river and Broad-ſtreet are 14 ſtreets, nearly equidiſtant, running parallel with Broad-ſtreet acroſs the city; and between Broad-ſtreet and the Schuylkill there are nine ſtreets equidiſtant from each other. Parallel to Market-ſtreet are eight other ſtreets, running eaſt and weſt from river to river, and interſecting the croſs ſtreets at right angles; all theſe ſtreets are 50 feet wide, except Arch-ſtreet, which is 65 feet wide. All the ſtreets which run north and ſouth, except Broad-ſtreet mentioned above, are 50 feet wide. There were four ſquares of eight acres each, one at each corner of the city, originally reſerved for public and common uſes. And in the centre of the city, where Broad-ſtreet and Market-ſtreet interſect each other, is a ſquare of ten acres, reſerved in like manner to be planted with rows of trees for public walks. This city was founded in 1682 by the celebrated William Penn, who in October 1701 granted a charter incorporating the town with city privileges. In 1749 the dwelling-houſes were computed, and found to be 2076; in 1790, they amounted to 5000. They are in general handſomely built of brick; and contain 40,000 inhabitants, compoſed of almoſt all nations and religions. Their places for religious worſhip are as follow: The Friends or Quakers have five, the Preſbyterians ſix, the Epiſcopalians three, the German Lutherans two, the German Calviniſts one, the Catholics three, the Swediſh Lutherans one, the Moravians one, the Baptiſts one, the Univerſal Baptiſts one, the Methodiſts one, the Jews one.

The other public buildings in the city, beſides the univerſity, academies, &c. are the following, viz. a ſtate-houſe and offices, a city court-houſe, a county court-houſe, a carpenter's hall, a philoſophical ſociety's hall, a diſpenſary, an hoſpital and offices, an alms-houſe, a houſe of correction, a public factory of linen, cotton, and woollen, a public obſervatory, three brick market-houſes, a fiſh-market, and a public gaol.

The univerſity of Philadelphia was founded during the war. Its funds were partly given by the ſtate, and partly taken from the old college of Philadelphia. A medical ſchool, which was founded in 1765, is attached to the univerſity; and has profeſſors in all the branches of medicine, who prepare the ſtudents (whoſe number yearly is 50 or 60) for degrees in that ſcience. Beſides the univerſity and medical ſchool, there is the Proteſtant epiſcopal academy, a very flouriſhing inſtitution; the academy for young ladies; another for the Friends or Quakers, and one for the Germans; beſides five free ſchools.

In Market-ſtreet, between Front and Fourth ſtreets, is the principal market, built of brick, and is 1500 feet in length. This market, in reſpect to the quantity, the variety, and neatneſs of the proviſions, is not equalled in America, and perhaps not exceeded in the world.

The Philadelphians are not ſo ſocial, nor perhaps ſo hoſpitable, as the people in Boſton, Charleſtown, and New York. Various cauſes have contributed to this difference; among which the moſt operative has been the prevalence of party-ſpirit, which has been and is carried to greater lengths in this city than in any other in America; yet no city can boaſt of ſo many uſeful improvements in manufactures, in the mechanical arts, in the art of healing, and particularly in the ſcience of humanity. In ſhort, whether we conſider the convenient local ſituation, the ſize, the beauty, the variety and utility of the improvements, in mechanics, in agriculture, and manufactures, or the induſtry, the enterpriſe, the humanity, and the abilities, of the inhabitants of the city of Philadelphia, it merits to be viewed as the capital not only of the province, but of the flouriſhing empire of United America.

Several canals are let into the town, which add much to the beauty and convenience of the place. Its quay is 200 feet ſquare, to which ſhips of 400 or 500 tons may come up, and lay their broadſides cloſe to it; with wet and dry docks for building and repairing ſhips, beſides magazines, warehouſes,

and all other conveniences for exporting and importing merchandize. Scarce any thing can appear more beautiful than the city and the adjacent country, which for ſome miles may be compared to a fine and flouriſhing garden.

Though all our readers muſt unqueſtionably have heard of the malignant fever which ſo lately raged in Philadelphia, yet as ſome of them may not be ſo well acquainted with particulars, it will not, we truſt, be thought improper if we give a ſhort account of that dreadful malady in this place. This account we ſhall extract from a pamphlet written by Matthew Carey, which had run through no leſs than three editions before the end of the laſt year.

Of this fever then it is obſerved, that, generally ſpeaking, the mortality was not ſo great among women as among men, but that corpulent, high-fed, and drunken men, common proſtitutes, and ſuch of the poor as had been debilitated through the want of ſufficient nouriſhment, and lived in dirty and confined habitations, became an eaſy prey to it; whilſt thoſe who reſided in the ſuburbs, enjoying the benefit of country air, were little affected by it. A ſingular fact is, that the French reſiding in Philadelphia were in a remarkable degree exempt from it; a circumſtance which cannot be accounted for. The report which prevailed here of the Africans having wholly eſcaped the diſeaſe, proves to be not altogether true, ſeveral of them having been ſeized. The fever, however, was found to yield more readily to medicine in them than in white perſons.

We find the following account of the nature and ſymptoms of the diſeaſe, as deſcribed by Dr. Currie, in the third edition of the pamphlet already mentioned. "The ſymptoms which characteriſed the firſt ſtage of the fever were, in the greateſt number of caſes, after a chilly fit of ſome duration, a quick tenſe pulſe; hot ſkin; pain in the head, back, and limbs; flushed countenance; inflamed eye, moiſt tongue; oppreſſion and ſenſe of ſoreneſs at the ſtomach, eſpecially upon preſſure; frequent ſick qualms, and retchings to vomit, without diſcharging any thing, except the contents laſt taken into the ſtomach; coſtiveneſs, &c. And when ſtools were procured, the firſt generally ſhowed a defect of bile, or an obſtruction to its entrance into the inteſtines. But briſk purges generally altered this appearance.

"Theſe ſymptoms generally continued with more or leſs violence from one to three, four, or even five days; and then gradually abating, left the patient free from every complaint, except general debility. On the febrile ſymptoms ſuddenly ſubſiding, they were immediately ſucceeded by a yellow tinge in the opaque cornea, or whites of the eyes; an increaſed oppreſſion at the præcordia, a conſtant puking of every thing taken into the ſtomach, with much ſtraining, accompanied with a hoarſe hollow noiſe.

"If theſe ſymptoms were not ſoon relieved, a vomiting of matter reſembling coffee-grounds in colour and conſiſtence, commonly called the *black vomit*, ſometimes accompanied with or ſucceeded by hemorrhagies from the noſe, fauces, gums, and other parts of the body; a yellowiſh purple colour, and putreſcent appearance of the whole body; hiccup, agitations, deep and diſtreſſed ſighing, comatoſe delirium, and finally death, were the conſequence. When the diſeaſe proved fatal, it was generally between the fifth and eighth days.

"This was the moſt uſual progreſs of this formidable diſeaſe through its ſeveral ſtages. There were, however, very conſiderable variations in the ſymptoms as well as in the duration of its different ſtages, according to the conſtitution and temperament of the patient, the ſtate of the weather, the manner of treatment, &c.

"In ſome caſes, ſigns of putreſcency appeared at the beginning or before the end of the third day. In theſe, the black vomiting, which was generally a mortal ſymptom, and univerſal yellowneſs, appeared early. In theſe caſes, alſo, a low delirium, and great proſtration of ſtrength, were conſtant ſymptoms, and coma came on very ſpeedily,

"In ſome, the ſymptoms inclined more to the nervous than the inflammatory type. In theſe, the jaundice colour of the eye and ſkin, and the black vomiting, were more rare. But in the majority of caſes, particularly after the nights became ſenſibly cooler, all the ſymptoms indicated violent irritation and inflammatory diatheſis. In theſe caſes, the ſkin was always dry, and the remiſſions very obſcure.

"The febrile ſymptoms, however, as has been already obſerved, either gave way on the third, fourth, or fifth day, and then the patient recovered; or they were ſoon after ſucceeded by a different but much more dangerous train of ſymptoms, by debility, low pulſe, cold ſkin (which aſſumed a tawny colour mixed with purple), black vomiting, hemorrhagies, hiccup, anxiety, reſtleſſneſs, coma, &c. Many who ſurvived the eighth day, though apparently out of danger, died ſuddenly in conſequence of an hemorrhagy."

Purging the patient with calomel and jalap appears to have proved the moſt ſucceſsful treatment; and the repeated uſe of the lancet, in caſes where no ſymptoms of putridity exiſted. Dr. Griffits, who had been ſeized with the diſeaſe, "was bled ſeven times in five days, and aſcribes his recovery principally to that operation." Dr. Maeſe alſo, "in five days, loſt 72 ounces of blood, by which he was recovered when at the loweſt ſtage of the diſorder." It was generally remarked that an obſtinate coſtiveneſs took place at the commencement of the diſeaſe; and when this was removed, by purgatives, within the firſt twelve hours, the patient ſeldom failed to do well.

The work concludes with a liſt of the committee for the relief of the ſick, of which our author was a member: alſo the names of a large number of the inhabitants who were cut off, a ſeries of meteorological tables, and a general account of burials during the prevalence of this fatal complaint. From the latter we extract the following account:

"Auguſt - - - -	325
"September - - -	1442
"October - - - -	1993
"November - - -	118
"Jews, returned in groſs - -	3
"Baptiſts, do. - -	60
"Methodiſts, do. - -	32
"Free Quakers, do. - -	39
"German part of St. Mary's congregation	30
Total	4042"

It is not difficult to conceive the general diſtreſs which ſuch an evil muſt have occaſioned to perſons of every rank and deſcription. Some of the moſt ſtriking inſtances our author has related in very affecting terms; but no picture of human calamity perhaps ever exceeded the following: "A ſervant girl belonging to a family in this city, in which the fever had prevailed, was apprehenſive of danger, and reſolved to remove to a relation's houſe in the country. She was, however, taken ſick on the road, and returned to town, where ſhe could find no perſon to receive her. One of the guardians of the poor provided a cart, and took her to the alms-houſe, into which ſhe was refuſed admittance. She was brought back, and the guardian offered five dollars to procure her a ſingle night's lodging, but in vain. And in fine, every effort made to provide her ſhelter, ſhe abſolutely expired in the cart."

We cannot diſmiſs the preſent article, though it has already extended to a ſufficient length, without giving our readers an account of a very extraordinary people who live within 50 miles of Philadelphia; where there is a little town or colony, particularly remarkable on account of its origin and the manners of the people by whom it is inhabited. It was founded by a German,

who, weary of the world, returned into the country that he might be more at liberty to give himſelf up to contemplation. Curioſity brought ſeveral of his countrymen to viſit his retreat; and by degrees his pious, ſimple, and peaceable manners induced them to ſettle near him; when they all formed a little colony, which they called *Euphrates*, in alluſion to the Hebrews, who uſed to ſing pſalms on the borders of that river.

This little town forms a triangle, the outſides of which are bordered with mulberry and apple-trees planted with great regularity; and its inhabitants, we know not for what reaſon, are called *Dumplers*. In the middle of the town is a very large orchard, and between the orchard and thoſe ranges of trees are houſes built of wood, three ſtories high, where every Dumpler is left to enjoy the pleaſures of his meditation without diſturbance. Theſe contemplative men do not amount to above 500; and the extent of their territory is about 250 acres, bounded by a river, a piece of ſtagnated water, and a mountain covered with trees.

The men and women live in ſeparate quarters of the town, and never ſee each other but at places of worſhip; for among the Dumplers there are no aſſemblies of any kind but for public buſineſs. Their lives are ſpent in labour, prayer and ſleep. Twice every day and night they are called forth from their cells to attend divine ſervice. Like the Methodiſts and Quakers, every individual among them has the right of preaching when he thinks himſelf inſpired. The favourite ſubjects on which they diſcourſe in their aſſemblies, are humility, temperance, chaſtity, and the other Chriſtian virtues. They never violate that day of repoſe which all orders of men, whether idle or luxurious, much delight in. They admit a hell and a paradiſe; but reject the eternity of future puniſhments. They abhor the doctrine of original ſin as an impious blaſphemy, and, in general, every tenet that is ſevere to men appears to them injurious to the Divinity. As they do not allow merit to any but voluntary works, they adminiſter baptiſm only to the adult; at the ſame time, they think baptiſm ſo eſſentially neceſſary to ſalvation, that they imagine the ſouls of Chriſtians in another world are employed in converting thoſe who have not died under the law of the Goſpel. In this ridiculous opinion we have known Chriſtians of other denominations, and who boaſted a higher antiquity, that agreed with them.

Still more diſintereſted than the Quakers, they never enter into any law-ſuit. One may cheat, rob, and abuſe them, without being expoſed to any retaliation, or even to any complaint from them. On them religion has the ſame effect that philoſophy had upon the Stoics: it makes them inſenſible to every kind of inſult.

Nothing can be plainer than their dreſs. In winter it is a long white gown, from which there hangs a hood, which ſerves inſtead of a hat; a coarſe ſhirt, thick ſhoes, and very wide breeches. The women are dreſſed very much like the men, except that they have no breeches. Their common food conſiſts wholly of vegetables; not becauſe it is unlawful to eat any other, but becauſe that kind of abſtinence is looked upon as more conformable to the ſpirit of Chriſtianity, which has an averſion from blood.

Each individual follows with cheerfulneſs the branch of buſineſs allotted him; and the produce of all their labours is depoſited in a common ſtock, for the uſe of the whole. This union of induſtry has not only eſtabliſhed agriculture, manufactures, and all the arts neceſſary for the ſupport of this little ſociety, but hath alſo ſupplied, for the purpoſes of exchange, ſuperfluities proportioned to the degree of its population.

Though the two ſexes live ſeparate at Euphrates, the Dumplers do not on that account fooliſhly renounce matrimony; but thoſe who find themſelves diſpoſed to it, leave the town, and form an eſtabliſhment in the country, which is ſupported at the public expence. They repay this by the produce of their labours, which is all thrown into the public treaſury; and their children are ſent to be educated in Euphrates, which they conſider as their mother-country.—Without this wiſe privilege, the Dumplers would be no better than monks; and in proceſs of time they would become either ſavages or libertines. They are at preſent an innocent, though perhaps deluded, race.

Philadelphia, an ancient town of Turkey in Aſia, in Natolia. It is ſeated at the foot of mount Tmolus, by the river Cogamus, from whence there is an exceeding fine view over an extenſive plain. This place was founded by Attalus Philadelphus, brother of Eumenes.

It was very liable to earthquakes, which, perhaps, aroſe from its vicinity to the region called *Catakekaumene*. So ſevere were thoſe earthquakes, that even the city walls were not ſecure; and ſo frequent were they, that theſe experienced daily concuſſions. The inhabitants, therefore, who were not numerous, lived in perpetual apprehenſion, and their conſtant employment was in repairs. In fact, ſo great were their fears, that their chief reſidence was in the country, the ſoil of which was very fertile. Such is Strabo's account of this place. In the year 1097, it was taken by aſſault by John Ducas the Greek general. It was without difficulty reduced alſo in the year 1106, under the ſame emperor. The Turks marched from the Eaſt with a deſign to plunder it and the maritime towns. The emperor Mamul, in 1175, retired for protection from the Turks to this place. In 1300 it fell by lot to Karaman. In 1306 it was beſieged by Aliſaras, and conſiderably haraſſed; but was not taken. In 1391, this place alone refuſed to admit Bajazet; but it was at length forced to capitulate for want of proviſions. It has been matter of ſurpriſe that this town was not totally abandoned; and yet it has ſurvived many cities leſs liable to inconveniences, and is ſtill an extenſive place, though in its appearance it is poor and mean. Some remnants of its walls are ſtill ſtanding, but with large gaps. The materials of the wall are ſmall ſtones ſtrongly cemented. It is thick, lofty, and has round towers. Near this place, between the mountains, there is a ſpring of a purgative quality; it is much eſteemed, and many people reſort to it in the hot months. It taſtes like ink, is clear, but tinges the earth with the colour of ochre. The famous wall which credulity has aſſerted to be made of human bones, ſtands beyond this and beyond the town. See the next article.

When Dr. Chandler was there, he tells us, "The biſhop of Philadelphia was abſent; but the proto-papas or chief-prieſt, his ſubſtitute, whom he went to viſit, received us at his palace, a title given to a very indifferent houſe or rather a cottage of clay. We found him ignorant of the Greek tongue, and were forced to diſcourſe with him by an interpreter in the Turkiſh language. He had no idea that Philadelphia exiſted before Chriſtianity, but told us it had become a city in conſequence of the many religious foundations. The number of churches he reckoned at 24, moſtly in ruins, and mere maſſes of wall decorated with painted ſaints. Only ſix are in a better condition, and have their prieſts. The epiſcopal church is large, and ornamented with gilding, carving, and holy portraits. The Greeks are about 300 families, and live in a friendly intercourſe with the Turks, of whom they ſpeak well. We were aſſured that the clergy and laity in general knew as little of Greek as the proto-papas; and yet the liturgies and offices of the church are read as elſewhere, and have undergone no alteration on that account.

"The Philadelphians are a civil people. One of the Greeks ſent us a ſmall earthen veſſel full of choice wine. Some families beneath the trees, by a rill of water, invited us to alight and partake of their refreſhments. They ſaluted us when we met; and the aga or governor, on hearing that we were Franks, bade us welcome by a meſſenger.

"Philadelphia poſſeſſing waters excellent in dyeing, and be-

ing ſituated on one of the moſt capital roads to Smyrna, is much frequented, eſpecially by Armenian merchants. The Greeks ſtill call this place by its ancient name, but the Turks call it *Allahijur*. The number of inhabitants are about 7000 or 8000; of whom 2000 are ſuppoſed to be Chriſtians. It is about 40 miles E. S. E. of Smyrna. E. lon. 28. 15. N. lat. 38. 28.

PHILADELPHIA-*Stones*, a name which ſome authors have given to what is otherwiſe called *Chriſtian bones*, found in the walls of that city. It is a vulgar error that theſe walls are built of bones; and the tradition of the country is, that when the Turks took the place, they fortified it for themſelves, and built their walls of the bones of the Chriſtians whom they had killed there. Dr. Smyth, in one of his epiſtles, mentions this wall as an inſtance of Turkiſh barbarity. This idle opinion has gained credit merely from a looſe and porous ſtone of the ſparry kind, found in an old aqueduct, which is ſtill in the wall. Sir Paul Rycaut brought home pieces of theſe ſtones, which even he ſuppoſed to have been bones; but they proved on examination to be various bodies, chiefly vegetable, incruſted over and preſerved in a ſpar of the nature of that which forms incruſtations in Knareſborough ſpring, and other places with us. Theſe bodies are often cemented together in conſiderable numbers by this matter, and their true ſhape loſt in the congeries, till a diligent and judicious eye traces them regularly.

PHILADELPHIAN-*Society*, in eccleſiaſtical hiſtory, an obſcure and inconſiderable ſociety of myſtics. They were formed about the end of the laſt century by an Engliſh female fanatic, whoſe name was *Jane Leadley*. This woman ſeduced by her viſions, predictions, and doctrines, ſeveral diſciples, among whom were perſons of learning. She believed that all diſſenſions among Chriſtians would ceaſe, and the kingdom of the Redeemer become a ſcene of charity and felicity, if Chriſtians, diſregarding the forms of doctrine or diſcipline of their ſeveral communions, would all join in committing their ſouls to the care of the internal guide, to be inſtructed, governed, and formed, by his divine impulſe and ſuggeſtions. But ſhe went farther than this: ſhe even pretended a divine commiſſion to proclaim the approach of this glorious communion of ſaints; and was convinced that the ſociety eſtabliſhed by herſelf was the true kingdom of Chriſt. One of her leading doctrines was, that of the final reſtoration of all intelligent beings to perfection and happineſs.

PHILADELPHUS, in antiquity, was a title or ſurname borne by ſeveral ancient kings, formed from the Greek φιλος, "friend, lover," and αδελφος, "brother;" *q. d.* one who loves his brother or brethren. See PTOLEMY and EGYPT.

PHILADELPHUS, the PIPE-TREE, or *Mock orange*; a genus of the monogynia order, belonging to the icoſandria claſs of plants. The ſpecies are,

1. The *coronarius*, white ſyringa, or mock orange, has been long cultivated in the gardens of this country as a flowering ſhrub; it is not well known in what country it is to be found native. It riſes ſeven or eight feet high; ſending up a great number of ſlender ſtalks from the root. Theſe have a grey bark, branch out from their ſides, and are garniſhed with oval ſpear-ſhaped leaves. Theſe laſt have deep indentures on their edges; their upper ſurface being of a deep green, but the under ſurface pale, with the taſte of a freſh cucumber. The flowers are white, and come out from the ſides and at the ends of the branches in looſe bunches, each ſtanding on a diſtinct foot-ſtalk: they have four oval petals, which ſpread open, with a great number of ſtamina within, ſurrounding the ſtyle.

This ſhrub by its flowers makes a fine figure in May and June; for they are produced in cluſters both at the end and from the ſides of the branches. They are of a fine white colour, and exceedingly fragrant. The petals of which each is compoſed are large, and ſpread open like thoſe of the orange; and then forming branches, which ſtand each on its own ſeparate ſhort foot-ſtalk, and being produced in plenty all over the ſhrub, both at once feaſt the eye and the ſmell: the eye, by the pleaſing appearance it will then have; the ſmell, as the air at ſome diſtance will be replete with the odoriferous particles conſtantly emitted from thoſe fragrant flowers. Theſe flowers, however, are very improper for chimneys, water-glaſſes, &c. in rooms; for in thoſe places their ſcent will be too ſtrong; and for the ladies in particular, often too powerful.

The double-flowering ſyringa is a low variety of this ſpecies, ſeldom riſing to more than a yard high. The deſcription of the other belongs to this ſort, except that the leaves and branches are proportionally ſmaller and more numerous, and the bark of the ſhoots of a lighter brown. It is called the *Double-flowering ſyringa*, becauſe it ſometimes produces a flower or two with three or four rows of petals; whereas, in general, the flowers, which are very few, and ſeldom produced, are ſingle. They are much ſmaller than thoſe of the other; and you will not ſee a flower of any kind on this ſhrub oftener perhaps than once in five years. It is hardly worth propagating on this account; ſo that a few plants only ought to be admitted into a collection, to be ready for obſervation.

The dwarf ſyringa is ſtill of lower growth than the other, ſeldom ariſing to more than two feet in height. The deſcription of the firſt ſort ſtill agrees with this; only that the branches and leaves are ſtill proportionally ſmaller and more numerous, and the bark is ſtill of a lighter brown. It never produces flowers.

2. The *nanus*, with oval leaves ſomewhat indented, and double flowers, ſeldom riſes above three feet high: the flowers come out ſingly from the ſides of the branches, and have a double or treble row of petals of the ſame ſize and form as well as the ſame ſcent with the former; but this ſort flowers very rarely, ſo is but little eſteemed.

3. The *inodorus*, with entire leaves, is a native of Carolina, and as yet but little known in Europe. It riſes with a ſhrubby ſtalk of about 16 feet in height, ſending out ſlender branches from the ſides oppoſite, garniſhed with ſmooth leaves ſhaped like thoſe of the pear-tree, and ſtanding on pretty long foot-ſtalks. The flowers are produced at the ends of the branches; and are large, white, ſpreading open, with a great number of ſhort ſtamina with yellow ſummits. This is called the *Carolina ſyringa*, is the talleſt grower by far of any ſort of the ſyringa, and makes the grandeſt ſhow when in blow; though the flowers are deſtitute of ſmell.

The propagation of all the ſorts is very eaſy: they are increaſed by layers, cuttings, or ſuckers. 1. The moſt certain method is by layers; for the young twigs, being laid in the earth in the winter, will be good-rooted plants by the autumn following. 2. Theſe plants may be increaſed by cuttings, which being planted in October, in a ſhady moiſt border, many of them will grow; though it will be proper to let thoſe of the Carolina ſort remain until ſpring, and then to plant them in pots, and help them by a little heat in the bed. By this aſſiſtance, hardly one cutting will fail. 3. They may be alſo increaſed by ſuckers; for all the ſorts throw out ſuckers, though the Carolina ſyringa the leaſt of any. Theſe will all ſtrike root, and be fit for the nurſery-ground: nay, the double-flowering and the dwarf ſorts are always increaſed this way; for theſe plants, having ſtood five or ſix years, may be taken up and divided into ſeveral ſcores. All the plants, however, whether raiſed from layers, cuttings, or ſuckers, ſhould be planted in the nurſery-ground to get ſtrength, before they are ſet out for good. They ſhould be planted a foot aſunder, and the diſtance in the rows ſhould be two feet. After this, they will require no other care than hoeing the weeds, until they have ſtood

about two years, which will be long enough for them to ſtand there.

PHILÆNI, were two brothers, citizens of Carthage, who ſacrificed their lives for the good of their country. At the time when the Carthaginians ruled over the greateſt part of Africa, the Cyrenians were alſo a great and wealthy people. The country in the middle betwixt them was all ſandy, and of an uniform appearance. There was neither river nor mountain to diſtinguiſh their limits; a circumſtance which engaged them in a terrible and tedious war with one another. After their armies and fleets had been often routed and put to flight on both ſides, and they had weakened one another pretty much; and fearing leſt, by and by, ſome third people ſhould fall upon the conquered and conquerors together, equally weakened; upon a ceſſation of arms they made an agreement, "that upon a day appointed deputies ſhould ſet out from their reſpective homes, and the place where they met one another ſhould be accounted the common boundary of both nations." Accordingly, the two brothers called Philæni, ſent from Carthage, made all diſpatch to perform their journey. The Cyrenians proceeded more ſlowly. Theſe laſt, perceiving themſelves a little behind, and turning apprehenſive of puniſhment at home for miſmanaging the affair, charged the Carthaginians with ſetting out before the time; made a mighty buſtle upon it; and, in ſhort, would rather chooſe any thing than go away outdone. But whereas the Carthaginians defired any other terms, provided only they were fair, the Greeks made this propoſal to the Carthaginians, "either to be buried alive in the place which they claimed as the boundary to their nation, or that they would advance forward to what place they inclined upon the ſame condition." The Philæni, accepting the offer, made a ſacrifice of themſelves and their lives to their country, and ſo were buried alive. The Carthaginians dedicated altars in that place to the memory of the two brothers. Theſe altars, called *Aræ Philænorum*, ſerved as a boundary to the empire of the Carthaginians, which extended from this monument to Hercules's Pillars, which is about 2000 miles, or, according to the accurate obſervations of the moderns, only 1420 geographical miles. It is Salluſt who gives this account in his hiſtory of the Jugurthine war.

PHILANTHROPY is compounded of two Greek words which ſignify the love of mankind. It is therefore of nearly the ſame import with *benevolence*. See BENEVOLENCE.

PHILEMON, a Greek comic poet, was ſon to Damon, and cotemporary with Menander. Any advantage he had over this poet, was owing leſs to his own merit than to the intrigues of his friends. Plautus has imitated his comedy *du Marchand*. He is reported to have died laughing on ſeeing his aſs eat figs. He was then about 97 years of age. His ſon, Philemon the younger, was alſo the author of 54 comedies, of which there are ſtill extant ſome conſiderable fragments collected by Grotius. Theſe clearly prove that he was not a poet of the firſt rank. He flouriſhed about the year 274 before our Saviour.

PHILEMON, was a rich citizen of Coloſſæ in Phrygia. He was converted to the Chriſtian faith, with Appia his wife, by Epaphras the diſciple of St. Paul; for St. Paul himſelf did not preach at Coloſſæ. Coloſſ. ii. 1. Perhaps we ſhould have known nothing of St. Philemon, had it not been on the account of his ſlave Oneſimus, who having robbed him, and run away from him, came to Rome, where he found St. Paul, and was very ſerviceable to him. St. Paul converted him, baptized him, and ſent him back to his maſter Philemon; to whom he wrote a letter ſtill extant, and which paſſes for a maſterpiece of that kind of eloquence, natural, lively, ſtrong, and pathetic, that was peculiar to St. Paul. Philemon (1, 2.) had made a church of his houſe, and all his domeſtics, as well as himſelf, were of the houſehold of faith. His charity, liberality, and compaſſion were a ſure refuge to all that were in diſtreſs. The Apoſtolic Conſtitutions ſay, that St. Paul made him biſhop of Coloſſæ; but the Menæa inſinuate, that he went to Gaza in Paleſtine, of which he was the apoſtle and firſt biſhop. From thence he returned to Coloſſæ, where he ſuffered martyrdom with Appia his wife, in the time of Nero. They relate ſeveral particulars of his martyrdom, and ſay, that his body remained at Coloſſæ, where it performed ſeveral miracles.

PHILETAS, a Greek poet and grammarian, of the iſland of Cos, flouriſhed under Philip and Alexander the Great, and was preceptor of Ptolemy Philadelphus. He was the author of ſome Elegies, Epigrams, and other works, which have not come down to us. He is celebrated in the poems of Ovid and Propertius, as one of the beſt poets of his age. Elian reports a very improbable ſtory of him, namely, "that his body was ſo ſlender and feeble, that he was obliged to have ſome lead in his pockets, to prevent him from being carried away by the wind."

PHILETUS. St. Paul, writing to Timothy (2 Tim. ii. 16, 17, 18.) in the 65th year of Chriſt, and a little while before his own martyrdom, ſpeaks thus: "But ſhun profane and vain babblings, for they will increaſe unto more ungodlineſs. And their word will eat as doth a canker; of whom is Hymenæus and Philetus; who concerning the truth have erred, ſaying, that the reſurrection is paſt already, and overthrow the faith of ſome." We have nothing very certain concerning Philetus; for we make but ſmall account of what is read in the falſe Abdias, in the Life of St. James Major, even ſuppoſing this author had not put the name of Philetus inſtead of Phygellus. This is the ſubſtance of what is found in Abdias. St. James the ſon of Zebedee, paſſing through the ſynagogues of Judea and Samaria, preached every where the faith of Jeſus-Chriſt. Hermogenes and Philetus ſtrenuouſly oppoſed him, affirming, that Jeſus Chriſt was not the Meſſiah. Hermogenes was a notable magician, and Philetus was his diſciple, who being converted, was deſirous to bring his maſter to St. James; but Hermogenes bound him up ſo by his magic art, that he could not come at the apoſtle. Philetus found means to make St. James acquainted with what had happened to him; upon which St. James unbound him, and Philetus came to him. Hermogenes perceiving how ineffectual his art was againſt the ſaint, became himſelf a convert as well as Philetus.

PHILIBEG, is a little plaid, called alſo *kilt*, and is a ſort of ſhort petticoat reaching nearly to the knees, worn by the Scotch Highlanders. It is a modern ſubſtitute for the lower part of the plaid, being found to be leſs cumberſome, eſpecially in time of action, when the Highlanders uſed to tuck their brechdan into their girdle. Almoſt all of them have a great pouch of badger and other ſkins, with taſſels dangling before, in which they keep their tobacco and money.

PHILIP, foſter-brother of Antiochus Epiphanes (1 Macc. vi. 14 and 55. 2 Macc. ix. 29.), was a Phrygian by birth, and very much in Antiochus's favour. This prince made him governor of Jeruſalem, (2 Macc. viii. 8. v. 22.) where he committed many outrages upon the Jews, to force them to forſake their religion. Seeing that Apollonius and Seron were defeated by Judas Maccabæus, he ſent for new ſuccours to Ptolemy governor of Cœlo-Syria, who ſent him Gorgias and Nicanor with a powerful army. Some time after, Antiochus going beyond the Euphrates to extort money from the people, Philip went along with him; and Antiochus finding himſelf near his end (1 Macc. vi. 14.) made him regent of the kingdom, put his diadem into his hands, his royal cloak, and his ring, that he might render them to his ſon the young Antiochus Eupator. But Lyſias having taken poſſeſſion of the government in the name of young Eupator, who was but a child, Philip, not being able to cope with him, durſt not return into Syria; but he went into Egypt, carrying the body of Epiphanes along with him, there to implore aſſiſtance from Pto-

lemy Philometor againſt Lyſias the uſurper of the government of Syria. The year following, while Lyſias was buſy in the war carrying on againſt the Jews, Philip got into Syria, and took poſſeſſion of Antioch: but Lyſias returning into the country, with great diligence, retook Antioch, and put Philip to death, who was taken in the city.

Philip the apoſtle was a native of Bethſaida in Galilee. Jeſus Chriſt having ſeen him, ſaid to him, "Follow me," John i. 43, 44, &c. Philip followed him; and ſoon after finding Nathanael, Philip ſaid to him, "We have found the Meſſiah, of whom Moſes and the prophets have ſpoken, Jeſus of Nazareth, the ſon of Joſeph." Nathanael aſked him, "Can any thing good come out of Nazareth?" To which Philip replied, "Come and ſee." Then he brought Nathanael to Jeſus, and they went with him to the marriage of Cana in Galilee. St. Philip was called at the very beginning of our Saviour's miſſion; and when Jeſus Chriſt was about to feed the 5000 that followed him (Luke vi. 13. Mat. x. 2. John vi. 5—7.), he aſked St. Philip, only to prove him, whence bread might be bought for ſuch a multitude of people? Philip anſwered, that 200 pennyworth of bread would not be ſufficient for every one to taſte a little. Some Gentiles having a curioſity to ſee Jeſus Chriſt, a little before his paſſion, they addreſſed themſelves to St. Philip (John xii. 21, 22.), who mentioned it to St. Andrew, and theſe two to Chriſt. At the laſt ſupper, Philip deſired our Saviour, that he would be pleaſed to ſhow them the Father, being all that they deſired (John xiv. 8—10.) But Jeſus told them, that ſeeing the Son they ſaw the Father alſo. This is all we find concerning Philip in the goſpel.

The upper Aſia fell to this apoſtle's lot, where he took great pains in planting the goſpel, and by his preaching and miracles made many converts. In the latter part of his life, he came to Hierapolis in Phrygia, a city very much addicted to idolatry, and particularly to the worſhip of a ſerpent of a prodigious bigneſs. St. Philip by his prayers procured the death, or at leaſt the diſappearing, of this monſter, and convinced its worſhippers of the abſurdity of paying divine honours to ſuch odious creatures. But the magiſtrates, enraged at Philip's ſucceſs, impriſoned him, and ordered him to be ſeverely ſcourged, and then put to death, which ſome ſay was by crucifixion; others, by hanging him up againſt a pillar. St. Philip is generally reckoned among the married apoſtles; and it is ſaid he had three daughters, two whereof preſerved their virginity, and died at Hierapolis; the third, having led a very ſpiritual life, died at Epheſus. He left behind him no writings. The goſpel under his name was forged by the Gnoſtics, to countenance their bad principles and worſe practices. The Chriſtian church obſerves the feſtival of this ſaint, together with that of St. James, on the firſt day of May. Euſeb. lib. iii. c. 30.

Philip, the ſecond of the ſeven deacons, was choſen by the apoſtles after our Saviour's reſurrection. (Acts vi. 5.) This deacon, they ſay, was of Cæſarea in Paleſtine. It is certain that his daughters lived in this city. (Acts xxi. 8, 9.) After the death of St. Stephen, all the Chriſtians, excepting the apoſtles, having left Jeruſalem, and being diſperſed in ſeveral places, St. Philip went to preach at Samaria (*id.* viii. 1, 2, &c.), where he performed ſeveral miracles, and converted many perſons. He baptized them; but, being only a deacon, he could not confer on them the Holy Ghoſt. Wherefore, having made known to the apoſtles at Jeruſalem, that Samaria had received the word of God, Peter and John came thither, and the Samaritans that were converted received the Holy Ghoſt. St. Philip was probably at Samaria when the angel of the Lord ordered him to go to the ſouth part of the country, in the road that leads from Jeruſalem to old Gaza. Philip obeyed, and there met with an Ethiopian eunuch belonging to queen Candace, who had the care of her revenues, and had been at Jeruſalem to worſhip God there (*id.* viii. 26, 27, &c.) He was then returning into his own country, and was reading the prophet Iſaiah as he went along in his chariot. Philip, hearing the eunuch reading the prophet Iſaiah, ſaid to him, Do you underſtand what you read? The eunuch replied, How ſhould I underſtand, except ſomebody explain it to me? He deſired Philip therefore to come and ſit down by him in the chariot. The paſſage the eunuch was reading is this, "He was led as a ſheep to the ſlaughter, and like a lamb dumb before his ſhearer, ſo he opened not his mouth." The eunuch then ſays to Philip, Pray, whom does the prophet ſpeak of in this place? Is it of himſelf, or of ſome other? Then Philip began to inſtruct him concerning Jeſus Chriſt. And having gone on together, they came to a fountain; when the eunuch ſaid to Philip, Here is water, what hinders me from being baptized? Philip told him that he might be ſo, if he believed with all his heart. He replied, I believe that Jeſus Chriſt is the ſon of God. He then ordered the chariot to ſtop, and they both alighted and went down into the water; where Philip baptized the eunuch. Being come out of the water, the Spirit of the Lord took away Philip, and the eunuch ſaw no more of him. But Philip was found again at Azotus, and he preached the goſpel in all the cities he paſſed through, till he arrived at Cæſarea in Paleſtine. After this, the ſcripture does not inform us of any particulars relating to Philip. The modern Greeks ſay that he went to Tralles in Aſia, where he founded a church, of which he was the apoſtle and biſhop; and where he reſted in peace, after performing many miracles. The Latins, on the contrary, ſay that he died at Cæſarea, and that three of his daughters were there buried with him.

It is thought, that the eunuch converted by St. Philip was the firſt apoſtle of the Ethiopians; and that the Abyſſines boaſt of having received the Chriſtian faith from him.

Philip II. was the 4th ſon of Amyntas, king of Macedonia. He was ſent to Thebes as an hoſtage by his father, where he learnt the art of war under under Epaminondas, and ſtudied with the greateſt care the manners and purſuits of the Greeks. He diſcovered, from his earlieſt years, that quickneſs of genius and greatneſs of courage which afterwards procured him ſo great a name and ſuch powerful enemies. He was recalled to Macedonia; and at the death of his brother Perdiccas he aſcended the throne as guardian and protector of the youthful years of his nephew. His ambition, however, ſoon diſcovered itſelf, and he made himſelf independent about the year 360 before Chriſt. The valour of a prudent general, and the policy of an experienced ſtateſman, ſeemed requiſite to enſure his power. The neighbouring nations, ridiculing the youth and inexperience of the new king of Macedonia, appeared in arms; but Philip ſoon convinced them of their error. Unable to meet them as yet in the field of battle, he ſuſpended their fury by preſents, and ſoon turned his arms againſt Amphipolis, a colony tributary to the Athenians. Amphipolis was conquered, and added to the kingdom of Macedonia; and Philip meditated no leſs than the deſtruction of a republic which had rendered itſelf ſo formidable to the reſt of Greece, and had even claimed ſubmiſſion from the princes of Macedonia. His deſigns, however, were as yet immature; and before he could make Athens an object of conqueſt, the Thracians and the Illyrians demanded his attention He made himſelf maſter of a Thracian colony, to which he gave the name of *Philippi*, and from which he received the greateſt advantages on account of the golden mines in the neighbourhood. Theſe made it a very important capture. He ſettled in it a number of workmen, and was the firſt who cauſed gold to be coined in his own name. He employed his wealth in procuring ſpies and partiſans in all the great cities of Greece, and in making conqueſts without the aid of arms. It was at the ſiege of Methone in Thrace that Philip had the misfortune to receive a wound in his right eye from the ſtroke of an arrow. In the

midſt of his political proſperity, Philip did not neglect the honour of his family. He married Olympias the daughter of Neoptolemus, king of the Molcſſi; and when, ſome time after, he became father of Alexander, the monarch, conſcious of the ineſtimable advantages which ariſe from the leſſons, the example, and converſation of a learned and virtuous preceptor, wrote a letter with his own hand to the philoſopher Ariſtotle, and begged him to retire from his uſual purſuits, and to dedicate his whole time to the inſtruction of the young prince. Every thing ſeemed now to conſpire to his aggrandizement; and hiſtorians have obſerved that Philip received in one day the intelligence of three things which could gratify the moſt unbounded ambition, and flatter the hope of the moſt aſpiring monarch; the birth of a ſon, an honourable crown at the Olympic games, and a victory over the barbarians of Illyricum. But all theſe increaſed rather than ſatiated his ambition: he declared his inimical ſentiments againſt the power of Athens, and the independence of all Greece, by laying ſiege to Olynthus, a place which, on account of its ſituation and conſequence, would prove moſt injurious to the intereſt of the Athenians, and moſt advantageous to the intrigues and military operations of every Macedonian prince. The Athenians, rouſed by the eloquence of Demoſthenes, ſent 17 veſſels and 2000 men to the aſſiſtance of Olynthus; but the money of Philip prevailed over all their efforts. The greateſt part of the citizens ſuffered themſelves to be bribed by the Macedonian gold, and Olynthus ſurrendered to the enemy, and was inſtantly reduced to ruins. Philip ſoon after defeated the Athenians, and made a great number of them priſoners, whom he diſmiſſed without ranſom. Of this victory, the fruit of that excellent diſcipline which he had eſtabliſhed in his army, the Macedonian phalanx had the principal honour. This was a body of infantry heavily armed, conſiſting commonly of 16,000 men, who had each of them a ſhield ſix feet high and a pike 21 feet long. (See PHALANX.) The ſucceſs of his arms, and eſpecially his generoſity after victory, made his alliance and a peace a deſirable object to the people of Athens; and as both parties were inclined to this meaſure, it was concluded without delay. His ſucceſſes were as great in every part of Greece: he was declared head of the Amphictyonic council, and was entruſted with the care of the ſacred temple of Apollo at Delphi. If he was recalled to Macedonia, it was only to add freſh laurels to his crown, by victories over his enemies in Illyricum and Theſſaly. By aſſuming the maſk of a moderator and peacemaker, he gained confidence; and in attempting to protect the Peloponneſſians againſt the encroaching power of Sparta, he rendered his cauſe popular; and by ridiculing the inſults that were offered to his perſon as he paſſed through Corinth, he diſplayed to the world his moderation and philoſophic virtues. In his attempts to make himſelf maſter of Eubœa, Philip was unſucceſsful; and Phocion, who deſpiſed his gold as well as his meanneſs, obliged him to evacuate an iſland whoſe inhabitants were as inſenſible to the charms of money as they were unmoved at the horrors of war, and the bold efforts of a vigilant enemy. From Eubœa he turned his arms againſt the Scythians; but the advantages he obtained over this indigent nation were inconſiderable, and he again made Greece an object of plunder and rapine. He advanced far in Bœotia, and a general engagement was fought at Chæronea. The fight was long and bloody, but Philip obtained the victory. His behaviour after the battle reflects diſgrace upon him as a man and a monarch. In the hour of feſtivity, and during the entertainment he had given to celebrate the trophies he had won, Philip ſallied from his camp, and, with the inhumanity of a brute, inſulted the bodies of the ſlain, and exulted over the calamities of the priſoners of war. His inſolence, however, was checked, when Demades, one of the Athenian captives, reminded him of his meanneſs, by exclaiming, "Why do you, O king, act the part of a Therſites, when you can repreſent with ſo much dignity the elevated character of an Agamemnon?" The reproof was felt; Demades received his liberty; and Philip learned how to gain popularity even among his fallen enemies, by relieving their wants and eaſing their diſtreſſes. At the battle of Chæronea the independence of Greece was extinguiſhed; and Philip, unable to find new enemies in Europe, formed new enterpriſes, and meditated new conqueſts. He was nominated general of the Greeks againſt the Perſians, and was called upon, as well from inclination as duty, to revenge thoſe injuries which Greece had ſuffered from the invaſion of Darius and of Xerxes. But he was ſtopped in the midſt of his warlike preparations, being ſtabbed by Pauſanias as he entered the theatre at the celebration of the nuptials of his daughter Cleopatra. This murder has given riſe to many reflections upon the cauſes which produced it; and many who conſider the recent repudiation of Olympias and the reſentment of Alexander, are apt to inveſtigate the cauſes of his death in the boſom of his family. The ridiculous honours which Olympias paid to her huſband's murderer ſtrengthened the ſuſpicion; yet Alexander declared that he invaded the kingdom of Perſia to revenge his father's death upon the Perſian ſatraps and princes, by whoſe immediate intrigues the aſſaſſination had been committed. The character of Philip is that of a ſagacious, artful, prudent, and intriguing monarch: he was brave in the field of battle, eloquent and diſſimulating at home, and he poſſeſſed the wonderful art of changing his conduct according to the diſpoſition and caprice of mankind, without ever altering his purpoſe, or loſing ſight of his ambitious aims. He poſſeſſed much perſeverance, and in the execution of his plans he was always vigorous. He had that eloquence which is inſpired by ſtrong paſſions. The hand of an aſſaſſin prevented him from achieving the boldeſt and the moſt extenſive of his undertakings; and he might have acquired as many laurels, and conquered as many nations, as his ſon Alexander did in the ſucceeding reign; and the kingdom of Perſia might have been added to the Macedonian empire, perhaps with greater moderation, with more glory, and with more laſting advantages. The private character of Philip lies open to cenſure, and raiſes indignation. The admirer of his virtues is diſguſted to find him among the moſt abandoned proſtitutes, and diſgracing himſelf by the moſt unnatural crimes and laſcivious indulgences which can make even the moſt debauched and the moſt profligate to bluſh. He was murdered in the 47th year of his age, and the 24th of his reign, about 336 years before the Chriſtian era. His reign is become uncommonly intereſting, and his adminiſtration a matter of inſtruction. He is the firſt monarch whoſe life and actions are deſcribed with peculiar accuracy and hiſtorical faithfulneſs. Philip was the father of Alexander the Great and of Cleopatra, by Olympias; he had alſo by Audaca an Illyrian, Cyna, who married Amyntas the ſon of Perdiccas, Philip's elder brother; by Nicaſipolis a Theſſalian, Nicæa, who married Caſſander; by Philæna a Lariſſæan dancer, Aridæus, who reigned ſome time after Alexander's death; by Cleopatra, the niece of Attalus, Caranus and Europa, who were both murdered by Olympias; and Ptolemy, the firſt king of Egypt, by Arſinoe, who in the firſt month of her pregnancy was married to Lagus. Of the many memorable actions and ſayings reported by Plutarch of this prince, the following are the moſt remarkable. Being preſent at the ſale of ſome captives, in an indecent poſture, one of them informed him of it; "Set this man at liberty (ſays Philip), I did not know that he was my friend." Being ſolicited to favour a lord of his court, who was like to loſe his character by a juſt but ſevere ſentence, Philip refuſed to hearken to the ſolicitation, and added, "I had rather that he be diſgraced than myſelf." A poor woman was importuning him to do her juſtice; and as he ſent her away from day to day, under the pretence that he had no time to attend to her petition, ſhe

ſaid to him with ſome warmth, "Ceaſe then to be a king." Philip felt all the force of this reproof, and immediately gave her ſatisfaction. Another woman came to aſk juſtice of him as he was going out from a great entertainment, and was condemned. "I appeal," exclaimed ſhe. "And to whom do you appeal?" ſaid the king to her. "To Philip faſting." This anſwer opened the eyes of the monarch, who retracted his ſentence. If he poſſeſſed any virtue, it was principally that of ſuffering injuries with patience. Democharus, to whom the Greeks gave the ſurname of *Parrheſiaſtes*, on account of his exceſſive petulance of tongue, was one of the deputies whom the Athenians ſent to this monarch. Philip, at the concluſion of the audience, begged the ambaſſadors to tell him, "if he could be of any ſervice to the Athenians;" to which Democharus gave an inſolent return, which he forgave. Having learned that ſome Athenian ambaſſadors charged him, in full aſſembly, with atrocious calumnies: "I am under great obligations (ſaid he) to thoſe gentlemen; for I ſhall henceforward be ſo circumſpect in my words and actions, that I ſhall convict them of falſehood." One ſaying of Philip, which does him leſs honour than thoſe we have before mentioned, was, "Let us amuſe children with playthings, and men with oaths." This abominable maxim, which was the ſoul and ſpring of his politics, gave riſe to the obſervation, "That he was in full length what Louis XI. afterwards was in miniature." It is well known that Philip had a perſon about him, who called out at times, "Philip, remember that thou art mortal;" but whether we ſhould place this to the account of his pride or his humility, it is difficult to ſay.

Philip V. was king of Macedonia, and ſon of Demetrius. His infancy, at the death of his father, was protected by Antigonus, one of his friends, who aſcended the throne, and reigned for 12 years, with the title of *Independent monarch*. When Antigonus died, Philip recovered his father's throne, though only 15 years of age, and he early diſtinguiſhed himſelf by his boldneſs and his ambitious views. He came to the throne in the year 220 before our Saviour, and the beginning of his reign was rendered glorious by the conqueſts of Aratus; a general who was as eminent for his love of juſtice as his ſkill in war. But ſo virtuous a character could hardly fail to be diſagreeable to a prince who wanted to indulge himſelf in every ſpecies of diſſipation and vice: and indeed his cruelty to him ſoon diſplayed his character in its true light; for to the gratification of every vice, and every extravagant propenſity, he had the meanneſs to ſacrifice this faithful and virtuous Athenian. Not ſatisfied with the kingdom of Macedonia, Philip aſpired to become the friend of Annibal, and wiſhed to ſhare with him the ſpoils which the diſtreſſes and continual loſs of the Romans ſeemed ſoon to promiſe. But his expectations were fruſtrated; the Romans diſcovered his intrigues; and though weakened by the valour and artifice of the Carthaginian, yet they were ſoon enabled to meet him in the field of battle. The conſul Lævinus entered without delay his territories of Macedonia; and after he had obtained a victory over him near Apollonia, and reduced his fleet to aſhes, he compelled him to ſue for peace. This peaceful diſpoſition was not permanent; and when the Romans diſcovered that he had aſſiſted their formidable enemy Annibal with men and money, they appointed T. Q. Flaminius to puniſh his perfidy, and the violation of the treaty. The Roman conſul, with his uſual expedition, invaded Macedonia; and in a general engagement, which was fought near Cynocephale, the hoſtile army was totally defeated, and the monarch ſaved his life with difficulty by flying from the field of battle. Deſtitute of reſources, without friends either at home or abroad, Philip was obliged to ſubmit to the mercy of the conqueror, and to demand peace by his ambaſſadors. It was granted with difficulty: the terms were humiliating; but the poverty of Philip obliged him to accept the conditions, however diſadvantageous and degrading to his dignity. In the midſt of theſe public calamities, the peace of his family was diſturbed; and Perſes, the eldeſt of his ſons by a concubine, raiſed ſeditions againſt his brother Demetrius, whoſe condeſcenſion and humanity had gained popularity among the Macedonians, and who from his reſidence at Rome, as an hoſtage, had gained the good graces of the ſenate, and by the modeſty and innocence of his manners had obtained forgiveneſs from that venerable body for the hoſtilities of his father. Philip liſtened with too much avidity to the falſe accuſations of Perſes: and when he heard it aſſerted that Demetrius wiſhed to rob him of his crown, he no longer heſitated to puniſh with death ſo unworthy and ſo ungrateful a ſon. No ſooner was Demetrius ſacrificed to credulity, than Philip became convinced of his cruelty and raſhneſs; and to puniſh the perfidy of Perſes, he attempted to make Antigonus, another ſon, his ſucceſſor on the Macedonian throne. But he was prevented from executing his purpoſe by death, in the 42d year of his reign, 178 years before the Chriſtian era. The aſſaſſin of Demetrius ſucceeded his father, and with the ſame ambition, with the ſame raſhneſs and oppreſſion, renewed the war againſt the Romans, till his empire was deſtroyed, and Macedonia became a Roman province. Philip has been compared with his great anceſtor of the ſame name; but though they poſſeſſed the ſame virtues, the ſame ambition, and were tainted with the ſame vices, yet the father of Alexander was more ſagacious and more intriguing, and the ſon of Demetrius was more ſuſpicious, more cruel, and more implacable; and, according to the pretended prophecy of one of the Sybils, Macedonia was indebted to one Philip for her riſe and conſequence among nations; and under another Philip ſhe lamented the loſs of her power, her empire, and her dignity.

Philip (M. Julius), a Roman emperor, of an obſcure family in Arabia, from whence he was ſurnamed *Arabian*. From the loweſt rank in the army he gradually roſe to the higheſt offices; and when he was made general of the pretorian guards, he aſſaſſinated Gordian to make himſelf emperor. To ſecure himſelf on the imperial throne, he left Meſopotamia a prey to the continual invaſions of the Perſians, and hurried to Rome, where his election was univerſally approved by the ſenate and the Roman people. Philip rendered his cauſe popular by his liberality and profuſion; and it added much to his ſplendour and dignity, that the Romans during his reign commemorated the foundation of their city; a ſolemnity which was obſerved but once every 100 years, and which was celebrated with more pomp and magnificence than under the preceding reigns. The people were entertained with games and ſpectacles; the theatre of Pompey was ſucceſſively crowded during three days and three nights; and 2000 gladiators bled in the circus at once, for the amuſement and pleaſure of a gazing populace. His uſurpation, however, was ſhort. Philip was defeated by Decius, who had proclaimed himſelf emperor in Pannonia; and he was aſſaſſinated by his own ſoldiers near Verona, in the 45th year of his age, and the 5th of his reign. His ſon, who bore the ſame name, and who had ſhared with him the imperial dignity, was alſo maſſacred in the arms of his mother. Young Philip was then in the 12th year of his age, and the Romans lamented in him the loſs of his riſing talents, of natural humanity, and endearing virtues.

Philip, a native of Acarnania, phyſician to Alexander the Great. When that monarch had been ſuddenly taken ill, after bathing in the Cydnus, Philip undertook to remove the complaint, when the reſt of the phyſicians believed that all medical aſſiſtance would be ineffectual. But as he was preparing his medicine, Alexander received a letter from Parmenio, in which he was adviſed to beware of his phyſician Philip, as he had conſpired againſt his life. The monarch was alarmed; and when Philip preſented him the medicine, he gave him Parmenio's letter to peruſe, and began to drink the potion. The

ſerenity and compoſure of Philip's countenance, as he read the letter, removed every ſuſpicion from Alexander's breaſt, and he purſued the directions of his phyſician, and in a few days recovered.

There were, beſides, a vaſt number of perſons of this name in antiquity, and many of them were very eminent.

Philip I. king of France, ſucceeded his father Henry I. in 1060, when but eight years of age, under the regency and guardianſhip of Baudouin V. count of Flanders, who diſcharged his truſt with zeal and fidelity. He defeated the Gaſcons who were inclined to revolt, and died, leaving his pupil 15 years of age. This young prince made war in Flanders againſt Robert, Baudouin's younger ſon, who had invaded Flanders, which belonged to the children of his elder brother. Philip marched againſt him with a numerous army, which was cut to pieces near Mount Caſſel. Peace was the conſequence of the victory, and the conqueror quietly enjoyed his uſurpation. Philip, after the fatigues of the war, by way of relaxation gave himſelf up entirely to pleaſure and diſſipation. Tired of his wife Bertha, and fond of Bertrade, ſpouſe of Foulques count of Anjou, he carried her off from her huſband. Having, in 1093, legally annulled his own marriage, under the pretext of barrenneſs, and Bertrade's marriage with the count of Anjou having been ſet aſide under the ſame pretext, Philip and ſhe were afterwards ſolemnly married by the biſhop of Beauvais. This union was declared void by pope Urban II. a Frenchman by birth, who pronounced the ſentence in the king's own dominions, to which he had come for an aſylum. Philip, fearing that the anathemas of the Roman pontiff might be the means of exciting his ſubjects to rebellion, ſent deputies to the pope, who obtained a delay, during which time he was permitted to uſe the crown. To know what is meant by this permiſſion, it is neceſſary to recollect, that at that period kings appeared on public ſolemnities in royal habit, with the crown on their heads, which they received from the hand of a biſhop. This delay was not of long duration. Philip was excommunicated anew in a council held at Poitiers in 1100; but in the year 1104, Lambert biſhop of Arras, legate of pope Paſchal II. at laſt brought him his abſolution to Paris, after having made him promiſe never to ſee Bertrade more; a promiſe which he did not keep. It would appear that the pope afterwards approved their marriage; for Suger informs us, that their ſons were declared capable of ſucceeding to the crown. Philip died at Melun the 29th of July 1108, aged 57 years, after having witneſſed the firſt cruſade, in which he declined taking any part. His reign, which comprehends a period of 48 years, was the longeſt of any of his predeceſſors, excepting that of Clotarius, and of all who came after him except thoſe of Louis XIV. and Louis XV. It was diſtinguiſhed by ſeveral great events: but Philip, though brave in battle, and wiſe in councils, was no very excellent character. He appeared ſo much the more contemptible to his ſubjects, as that age abounded with heroes. Philip is not the firſt of the French monarchs (as is commonly reported), who, in order to give the greater authority to his charters, cauſed them to be ſubſcribed by the officers of the crown; for Henry I. had ſometimes done the ſame before him.

Philip II. ſurnamed *Auguſtus*, the *conqueror* and *given of God*, ſon of Louis VII. (called the *younger*), king of France, and of Alix, his third wife, daughter of Thibault, count of Champagne, was born the 22d of Auguſt 1165. He came to the crown, after his father's death in 1180, at the age of 15 years. His youth was not ſpent like that of the generality of other princes: for, by avoiding the rock of pleaſure on which ſo many are apt to ſplit, his courage thereby became the more lively and intrepid. The king of England ſeemed willing to take advantage of his minority, and to ſeize upon a part of his dominions. But Philip marched againſt him, and compelled him, ſword in hand, to confirm the ancient treaties between the two kingdoms. As ſoon as the war was ended, he made his people enjoy the bleſſings of peace. He gave a check to the oppreſſions of the great lords, baniſhed the comedians, puniſhed blaſphemies, cauſed the ſtreets and public places of Paris to be paved, and annexed to that capital a part of the adjacent villages. It was incloſed by walls with towers; and the inhabitants of other cities were equally proud to fortify and embelliſh theirs. The Jews having for a long time practiſed the moſt ſhameful frauds in France, Philip expelled them from his kingdom, and declared his ſubjects quit with them; an action unjuſt, contrary to the laws of nature, and conſequently to religion. The tranquillity of France was ſomewhat diſturbed by a difference with the count of Flanders, which was however happily terminated in 1184. Some time after he declared war againſt Henry II. king of England, and took from him the towns of Iſſoudun, Tours, Mans, and other places. The epidemical madneſs of the cruſades then agitated all Europe; and Philip, as well as other princes, caught the infection. He embarked in the year 1190, with Richard I. king of England, for the relief of the Chriſtians in Paleſtine who were oppreſſed by Saladin. Thoſe two monarchs ſat down before Acre, which is the ancient Ptolemais; as did almoſt all the Chriſtians of the eaſt, while Saladin was engaged in a civil war on the banks of the Euphrates. When the two European monarchs had joined their forces to thoſe of the Aſiatic Chriſtians, they counted above 300,000 fighting men. Acre ſurrendered the 13th of July 1191; but the unhappy diſagreement which took place between Philip and Richard, rivals of glory and of intereſt, did more miſchief than could be compenſated by the ſucceſsful exertions of thoſe 300,000 men. Philip, tired of theſe diviſions, and diſpleaſed with the behaviour of Richard his vaſſal, returned to his own country, which, perhaps, he ſhould never have left, or at leaſt have ſeen again with more glory. Beſides, he was attacked (ſay hiſtorians) with a languiſhing diſorder, the effects of which were attributed to poiſon; but which might have been occaſioned merely by the ſcorching heat of the climate, ſo different from that of France. He loſt his hair, his beard, and his nails; nay, his very fleſh came off. The phyſicians urged him to return home; and he ſoon determined to follow their advice. The year after, he obliged Baudouin VIII. count of Flanders to leave him the county of Artois. He next turned his arms againſt Richard king of England, from whom he took Evreux and Vexin; though he had promiſed upon the holy goſpels never to take any advantage of his rival during his abſence; ſo that the conſequences of this war were very unfortunate. The French monarch, repulſed from Rouen with loſs, made a truce for ſix months; during which time he married Ingelberge, princeſs of Denmark, whoſe beauty could only be equalled by her virtue. The divorcing of this lady, whom he quitted in order to marry Agnes daughter of the duke of Merania, embroiled him with the court of Rome. The pope iſſued a ſentence of excommunication againſt him; but it was taken off upon his promiſing to take back his former wife. John Sansterre ſucceeded to the crown of England in 1199, to the prejudice of his nephew Arthur, to whom of right it belonged. The nephew, ſupported by Philip, took arms againſt the uncle, but was defeated in Poitou, where he was taken priſoner, and afterwards murdered. The murderer being ſummoned before the court of the peers of France, and not having appeared, was declared guilty of his nephew's death, and condemned to loſe his life in 1203. His lands, ſituated in France, were forfeited to the crown. Philip ſoon ſet about gathering the fruit of his vaſſal's crime. He ſeized upon Normandy, then carried his victorious arms into Maine, Anjou, Touraine. Poitou, and brought thoſe provinces, as they anciently were, under the immediate authority of his crown. The Engliſh had no other

part left them in France but the province of Guienne. To crown his good fortune, John his enemy was embroiled with the court of Rome, which had lately excommunicated him. This eccleſiaſtical thunder was favourable for Philip. Innocent II. put into his hands, and transferred to him, a perpetual right to the kingdom of England. The king of France, when formerly excommunicated by the pope, had declared his cenſures void and abuſive. He thought very differently, however, when he found himſelf the executor of a bull inveſting him with the Engliſh crown. To give the greater force to the ſentence pronounced by his holineſs, he employed a whole year in building 1700 ſhips, and in preparing the fineſt army that was ever ſeen in France. Europe was in expectation of a deciſive battle between the two kings, when the pope laughed at both, and artfully took to himſelf what he had beſtowed upon Philip. A legate of the holy ſee perſuaded John Sans-terre to give his crown to the court of Rome, which received it with enthuſiaſm. Then Philip was expreſsly forbid by the pope to make any attempt upon England, now become a fee of the Roman church, or againſt John who was under her protection. Meanwhile the great preparations which Philip had made alarmed all Europe; Germany, England, the Low Countries were united againſt him in the ſame manner as we have ſeen them againſt Louis XIV. Ferrand, count of Flanders, joined the emperor Othon IV. He was Philip's vaſſal; which was the ſtrongeſt reaſon for declaring againſt him. The French king was nowiſe diſconcerted; his fortune and his courage diſſipated all his enemies. His valour was particularly conſpicuous at the battle of Bouvines, which was fought on the 27th of July 1214, and laſted from noon till night. Before the engagement, he knew well that ſome of his nobles followed him with reluctance. He aſſembled them together; and placing himſelf in the midſt of them, he took a large golden cup, which he filled with wine, and into which he put ſeveral ſlices of bread. He ate one of them himſelf, and offering the cup to the reſt, he ſaid, "My companions, let thoſe who would live and die with me follow my example." The cup was emptied in a moment, and thoſe who were the leaſt attached to him fought with all the bravery that could be expected from his warmeſt friends. It is alſo reported, that after ſhowing the army the crown that was worn by ſovereigns upon theſe occaſions, he ſaid, "If any one thought himſelf more worthy than he was to wear it, he had only to explain himſelf; that he ſhould be content it were the prize of that man who ſhould diſplay the greateſt valour in battle." The enemy had an army of 150,000 fighting men; that of Philip was not half ſo numerous; but it was compoſed of the flower of his nobility. The king ran great hazard of his life; for he was thrown down under the horſes' feet, and wounded in the neck. It is ſaid 30,000 Germans were killed; but the number is probably much exaggerated. The counts of Flanders and Boulogne were led to Paris with irons upon their feet and hands; a barbarous cuſtom which prevailed at that time. The French king made no conqueſt on the ſide of Germany after this ever memorable action; but it gained him an additional power over his vaſſals. Philip, conqueror of Germany, and poſſeſſor of almoſt all the Engliſh dominions in France, was invited to the crown of England by the ſubjects of king John, who were grown weary of his tyranny. The king of France, upon this occaſion, conducted himſelf like an able politician. He perſuaded the Engliſh to aſk his ſon Louis for their king; but, as he wiſhed at the ſame time to manage the pope, and not loſe the crown of England, he choſe to aſſiſt the prince his ſon, without appearing to act himſelf. Louis made a deſcent upon England, was crowned at London, and excommunicated at Rome in 1216; but that excommunication made no change upon John's ſituation, who died of grief. His death extinguiſhed the reſentment of the Engliſh, who having declared themſelves for his ſon Henry III. forced Louis to leave England. Philip Auguſtus died a little time after, at Mantes, the 14th of July 1223, aged 59, after a reign of 43 years. Of all the kings of the 3d race, he made the greateſt acceſſion to the crown-lands, and tranſmitted the greateſt power to his ſucceſſors. He reunited to his dominions Normandy, Anjou, Maine, Touraine, Poitou, &c. After having ſubdued John Sans-terre, he humbled the great lords, and, by the overthrow of foreign and domeſtic enemies, took away the counterpoiſe which balanced his authority in the kingdom. He was more than a conqueror; he was a great king and an excellent politician; fond of ſplendor on public occaſions, but frugal in private life; exact in the adminiſtration of juſtice; ſkilful in employing alternately flattery and threatenings, rewards and puniſhments; he was zealous in the defence of religion, and always diſpoſed to defend the church: but he knew well how to procure from her ſuccours for ſupplying the exigencies of the ſtate. The lords of Coucy, Rhetel, Roſey, and ſeveral others, ſeized upon the property of the clergy. A great many of the prelates applied for protection to the king, who promiſed them his good offices with the depredators. But, notwithſtanding his recommendations, the pillages continued. The biſhops redoubled their complaints, and intreated Philip to march againſt their enemies. "With all my heart (ſaid he); but in order to fight them, it is neceſſary to have troops; and troops cannot be raiſed without money." The clergy underſtood his meaning: they furniſhed ſubſidies, and the pillages ceaſed. The enterpriſes of Philip Auguſtus were almoſt always ſucceſsful; becauſe he formed his projects with deliberation, and executed them without delay. He began by rendering the French happy, and in the end rendered them formidable. Though he was more inclined to anger than to gentleneſs, to puniſh than to pardon, he was regretted by his ſubjects as a powerful genius and as the father of his country. It was in his reign that the marſhal of France was ſeen, for the firſt time, at the head of the army. It was then, alſo, that families began to have fixed and hereditary ſurnames; the lords took them from the lands which they poſſeſſed; men of letters from the place of their birth; the converted Jews and rich merchants from that of their reſidence. Two very cruel evils, *viz.* leproſy and uſury, were prevalent at that time; the one infected the body, the other proved the ruin of the fortunes of families. The number of lepers was ſo great, that the ſmalleſt villages were obliged to have an hoſpital for the cure of that diſtemper. It is remarkable, that when Philip was on the point of engaging Richard, the Engliſh, who were lying in ambuſh near the Loire, ran away with his equipages, in which he cauſed to be carried all the deeds or writings reſpecting the rights of the crown: a cuſtom which is uſed at this day by the grand ſeignior. Philip cauſed copies of his charters to be collected wherever they could be found; but, after all his endeavours, ſome of them were never recovered. The ſurname of *Auguſtus* was given to Philip by his cotemporaries. Mezerai is miſtaken, when he aſſerts that Paulus Emilius was the firſt who rendered the name of *conqueror* by that of Auguſtus; a learned critic has proved the contrary by undoubted authorities.

PHILIP of *Valois*, firſt king of France of the collateral branch of the Valois, was ſon to Charles count of Valois, brother of Philip *the Fair*. He mounted the throne in 1328, on the death of his couſin Charles the Fair, after having held for ſome time the regency of the kingdom. France was much divided in the beginning of his reign, by diſputes about the ſucceſſion to the crown. Edward III. king of England laid claim to it as grandſon of Philip the Fair, by his mother; but Philip of Valois took poſſeſſion of it as firſt prince of the blood. The people gave him, upon his acceſſion to the throne, the title of *fortunate*; to which might have been added, for ſome time, thoſe of *victorious* and *juſt*. He marched to the relief of his vaſſal the count of Flanders,

whoſe ſubjects, on account of bad uſage, had taken up arms againſt him. He engaged the rebels at Caſſel, performed prodigies of valour, and gained a ſignal victory, the 24th of Auguſt 1328. Having made all quiet, he went home, after ſaying to the count of Flanders, "Be more prudent and more humane, and you will have fewer diſloyal ſubjects." The victorious Philip devoted the time of peace to the internal regulations of his kingdom. The financiers were called to an account, and ſome of them condemned to death; among others Peter Remi, general of the finances, who left behind him near 20 millions. He afterwards enacted the law reſpecting freeholds, impoſing a tax upon churches, and commoners who had acquired the lands of the nobility. Then, alſo, began to be introduced the form of *appeal comme d'abus*, the principles of which are more ancient than the name. The year 1329 was diſtinguiſhed by a ſolemn homage paid to Philip, by Edward king of England, for the duchy of Guienne, upon his knees, and with his head uncovered. The interior peace of the kingdom was diſturbed by diſputes about the diſtinction of the church and ſtate. An aſſembly was ſummoned for hearing the two parties, in the preſence of the king: and in this aſſembly Peter de Cugnieres, his majeſty's advocate, defended the ſecular juriſdiction with great ability as a man well-informed, and an enlightened philoſopher. Bertrand biſhop of Autun, and Roger archbiſhop of Sens, pled the cauſe of the clergy with leſs ingenuity and judgment. This did not, however, prevent the king from ſhowing them favours, though the controverſy itſelf laid the foundation of all the diſputes which were afterwards agitated about the authority of the two powers; diſputes which contributed not a little to confine the eccleſiaſtical juriſdiction within narrower limits. While Philip was employing himſelf in ſome uſeful regulations, he was unhappily interrupted by Edward III. declaring war againſt France. This prince immediately recovered thoſe parts of Guienne of which Philip was in poſſeſſion. The Flemiſh having again revolted from France in ſpite of oaths and treaties, joined the ſtandard of Edward; and required that he would aſſume the title of *king of France*, in conſequence of his pretenſions to the crown: becauſe then, agreeably to the letter of their treaty, they only followed the king of France. From this period is dated the union of the flower-de-luce and leopards in the arms of England. Edward, in order to juſtify the change of his arms, cauſed the following manifeſto to be publiſhed in the verſe of the times.

Rex ſum regnorum, bina ratione, duorum:
Anglorum in regno ſum rex ego jure paterno;
Matris jure quidem Francorum nuncupor idem:
Hinc eſt armorum variatio facta meorum.

In the way of a parody to theſe lines, Philip made the following reply:

Prædo regnorum qui diceris eſſe duorum,
Francorum regno privaberis, atque paterno.
Succedunt mares huic regno, non mulieres:
Hinc eſt armorum variatio ſtulta tuorum.

In the mean time Philip put himſelf in a poſture of defence. His arms were at firſt attended with ſome ſucceſs; but thoſe advantages were far from compenſating the loſs of the battle of Ecluſe, in which the French fleet, conſiſting of 120 large ſhips, and manned by 40,000 ſeamen, was beat by that of England in the year 1340. This defeat is to be attributed, in part, to the little attention which had been paid to the navy of France, notwithſtanding her favourable ſituation, in being waſhed by two ſeas. She was obliged to make uſe of foreign ſhips, which obeyed but ſlowly, and even with ſome reluctance. This war, which had been alternately diſcontinued and renewed, began again with more heat than ever in 1345. The two armies having come to an engagement the 26th of Auguſt 1346, near Crecy, a village in the county of Ponthieu, the Engliſh there gained a ſignal victory. Edward had only 40,000 men, while Philip had nearly twice that number; but the army of the former was inured to war, and that of the latter was ill diſciplined, and overcome with fatiguing marches. France loſt from 25,000 to 30,000 men; of which numbers were John king of Bohemia (who, though blind, fought gallantly), and about 1500 gentlemen, the flower of the French nobility. The loſs of Calais, and ſeveral other places, was the ſad fruit of this defeat. Some time before Edward had challenged Philip of Valois to a ſingle combat; which he refuſed, not on the ſcore of cowardice, but from the idea that it was improper for a ſovereign prince to accept a challenge from a king who was his vaſſal. At length, in 1347, a truce for ſix months was concluded between France and England, and afterwards prolonged at different times. Philip died a ſhort time after, the 23d of Auguſt 1350, aged 57 years, and far from bearing on his monument the title of *Fortunate*. He had, however, reunited Dauphiny to France. Humbert, the laſt prince of that country, having loſt all his children, and wearied with the wars which he had held out againſt Savoy, turned a Dominician, and gave his province to Philip, in 1349, on condition that the eldeſt ſon of the kings of France ſhould bear the title of Dauphin. Philip likewiſe added to his domain Rouſſillon and a part of Cerdague, by lending ſome money to the king of Majorca, who gave him thoſe provinces as a ſecurity; provinces which Charles VIII. afterwards reſtored without any reimburſement. It is ſurpriſing that in ſo unfortunate a reign he ſhould have been able to purchaſe thoſe provinces after having paid a great deal for Dauphiny; but the duty on ſalt, the riſe on the other taxes, and eſpecially the frauds committed in the coinage of money, are ſuppoſed to have enabled him to make thoſe acquiſitions. The fictitious and ideal value of the coin was not only raiſed, but a great deal of bad money was iſſued from the mint. The officers of the mint were ſworn upon the goſpels to keep the ſecret: but how could Philip flatter himſelf that ſo groſs a fraud would not be diſcovered?

Philip II. ſon of Charles V. and of Iſabella of Portugal, who was born at Valladolid on the 21ſt of May 1527, became king of Naples and Sicily by his father's abdication in 1554. He aſcended the throne of Spain on the 17th of January 1556 by the ſame means. Charles had made a truce with the French, but his ſon broke it; and, having formed an alliance with England, poured into Picardy an army of 40,000 men. The French were cut to pieces at the battle of St. Quintin, which was fought on the 20th of Auguſt 1557. That town was taken by aſſault, and the day on which the breach was mounted Philip appeared armed cap-a-pee in order to animate the ſoldiers. It was the firſt and laſt time that he was obſerved to wear this military dreſs. It is well known, indeed, that his terror was ſo great during the action that he made two vows; one, that he ſhould never again be preſent in a battle; and the other, to build a magnificent monaſtery dedicated to St. Lawrence, to whom he attributed the ſucceſs of his arms, which he executed at Eſcurial, a village about ſeven leagues from Madrid. After the engagement, his general, the duke of Savoy, wanted to kiſs his hand; but Philip prevented him, ſaying, "It is rather my duty to kiſs yours, who have the merit of ſo glorious a victory;" and immediately preſented him with the colours taken during the action. The taking of Catelet, Ham, and Noyon, were the only advantages which were derived from a battle which might have proved the ruin of France. When Charles V. was informed of this victory, it is ſaid he aſked the perſon who brought him the intelligence, "if his ſon was at Paris?" and being anſwered in the negative, he went away without uttering a ſingle word. The duke of Guiſe having had time to aſſemble an army, repaired the diſgrace of his country by the taking of

Calais and Thionville. While he was animating the French, Philip gained a pretty conſiderable battle againſt Marſhal de Thermes near Gravelines. His army was, on this occaſion, commanded by Count Egmont, whom he afterwards cauſed to be beheaded. The conqueror made no better uſe of the victory of Gravelines than he had done of that of St. Quintin; but he reaped conſiderable advantage from the glorious peace of Cateau-Cambreſis, the maſter-piece of his politics. By that treaty, concluded the 13th of April 1559, he gained poſſeſſion of the ſtrong places of Thionville, Marienbourg, Montmedi, Heſdin, and the county of Charollois. This war, ſo terrible, and attended with ſo much cruelty, was terminated, like many others, by a marriage. Philip took for his third wife Elizabeth, daughter of Henry II. who had been promiſed to Don Carlos.

After theſe glorious achievements, Philip returned in triumph to Spain, without having drawn a ſword. His firſt care, upon his arrival at Valladolid, was to demand of the grand inquiſitor the ſpectacle of an *auto-da-fé*. This was immediately granted him; 30 wretches, ſome of whom were prieſts or monks, were ſtrangled and burnt, and one of them was burnt alive. Don Carlos de Seza, one of thoſe unfortunate victims, ventured to draw near to the king, and ſaid to him, "How, Sir, can you ſuffer ſo many wretches to be committed to the flames? Can you be witneſs of ſuch barbarity without weeping?" To this Philip coolly replied, "If my own ſon were ſuſpected of hereſy, I would myſelf give him up to the ſeverity of the inquiſition. Such is the horror which I feel when I think of you and your companions, that if an executioner were wanting, I would ſupply his place myſelf." On other occaſions he conducted himſelf agreeably to the ſpirit which had dictated this anſwer. In a valley of Piedmont, bordering on the country of the Milaneſe, there were ſome heretics; and the governor of Milan had orders to put them all to death by the gibbet. The new opinions having found their way into ſome of the diſtricts of Calabria, he gave orders that the innovators ſhould be put to the ſword, with the reſervation of 60 of them, of whom 30 were afterwards ſtrangled, and the reſt committed to the flames.

This ſpirit of cruelty, and ſhameful abuſe of his power, had the effect to weaken that power itſelf. The Flemiſh, no longer able to bear ſo hard a yoke, revolted. The revolution began with the fine and large provinces of the continent; but the maritime provinces only obtained their liberty. In 1579 they formed themſelves into a republic, under the title of the United Provinces. Philip ſent the duke of Alva to reduce them; but the cruelty of that general only ſerved to exaſperate the ſpirit of the rebels. Never did either party fight with more courage, or with more fury. The Spaniards, at the ſiege of Haerlem, having thrown into the town the head of a Dutch officer who had been killed in a ſkirmiſh, the inhabitants threw to them the heads of eleven Spaniards, with this inſcription: "Ten heads for the payment of the tenth penny, and the eleventh for intereſt." Haerlem having ſurrendered at diſcretion, the conquerors cauſed all the magiſtrates, all the paſtors, and above 1500 citizens, to be hanged.

The duke of Alva, being at length recalled, the grand commander of the Requeſnes was ſent in his place, and after his death Don John of Auſtria; but neither of thoſe generals could reſtore tranquillity in the Low Countries. To this ſon of Charles V. ſucceeded a grandſon no leſs illuſtrious, namely, Alexander Farneſe duke of Parma, the greateſt man of his time; but he could neither prevent the independence of the United Provinces, nor the progreſs of that republic which aroſe under his own eye. It was then that Philip, always at his eaſe in Spain, inſtead of coming to reduce the rebels in Flanders, proſcribed the Prince of Orange, and ſet 25,000 crowns upon his head. William, ſuperior to Philip, diſdained to make uſe of that kind of vengeance, and truſted to his ſword for his preſervation.

In the mean time the king of Spain ſucceeded to the crown of Portugal, to which he had a right by his mother Iſabella. This kingdom was ſubjected to him by the duke of Alva, in the ſpace of three weeks, in the year 1580. Antony, prior of Crato, being proclaimed king by the populace of Liſbon, had the reſolution to come to an engagement; but he was vanquiſhed, purſued, and obliged to fly for his life.

A cowardly aſſaſſin, Balthazar Gerard, by a piſtol-ſhot killed the Prince of Orange, and thereby delivered Philip from his moſt implacable enemy. Philip was charged with this crime, it is believed without reaſon; though, when the news was communicated to him, he was imprudent enough to exclaim, "If this blow had been given two years ago, the Catholic religion and I would have gained a great deal by it."

This murder had not the effect to reſtore to Philip the Seven United Provinces. That republic, already powerful by ſea, aſſiſted England againſt him. Philip having reſolved to diſtreſs Elizabeth, fitted out, in 1588, a fleet called the *Invincible*. It conſiſted of 150 large ſhips, on which were counted 2650 pieces of cannon, 8000 ſeamen, 20,000 ſoldiers, and all the flower of the Spaniſh nobility. This fleet, commanded by the duke of Medina Sidonia, ſailed from Liſbon when the ſeaſon was too far advanced; and being overtaken by a violent ſtorm, a great part of it was diſperſed. Twelve ſhips, driven upon the coaſt of England, were captured by the Engliſh fleet, which conſiſted of 100 ſhips; 50 were wrecked on the coaſts of France, Scotland, Ireland, Holland, and Denmark. Such was the ſucceſs of the Invincible. See ARMADA.

This enterpriſe, which coſt Spain 40 millions of ducats, 20,000 men, and 100 ſhips, was productive only of diſgrace. Philip ſupported this misfortune with an heroic reſolution. When one of his courtiers told him, with an air of conſternation, what had happened, he coolly replied, "I ſent to fight the Engliſh, and not the winds. God's will be done." The day after Philip ordered the biſhops to return thanks to God for having preſerved ſome remains of his fleet; and he wrote thus to the pope: "Holy father, as long as I remain maſter of the fountain head, I ſhall not much regard the loſs of a rivulet. I will thank the Supreme Diſpoſer of empires, who has given me the power of eaſily repairing a diſaſter which my enemies muſt attribute ſolely to the elements which have fought for them."

At the ſame time that Philip attacked England, he was encouraging in France the Holy League; the object of which was to overturn the throne and divide the ſtate. The leaguers conferred upon him the title of *Protector* of their aſſociation; which he eagerly accepted, from a perſuaſion that their exertions would ſoon conduct him, or one of his family, to the throne of France. He thought himſelf ſo ſure of his prey, that, when ſpeaking of the principal cities in France, he uſed to ſay, "My fine city of Paris, my fine city of Orleans," in the ſame manner as he would have ſpoken of Madrid and Seville. What was the reſult of all thoſe intrigues? Henry IV. embraced the Catholic religion, and by his abjuration of Proteſtantiſm made his rival loſe France in a quarter of an hour.

Philip, at length, worn out by the debaucheries of his youth, and by the toils of government, drew near his laſt hour. A ſlow fever, the moſt painful gout, and a complication of other diſorders, could not diſengage him from buſineſs, nor draw from him the leaſt complaint. "What!" ſaid he to the phyſicians who heſitated about letting blood of him; "What! are you afraid of drawing a few drops of blood from the veins of a king who has made whole rivers of it flow from heretics?" At laſt, exhauſted by a complication of diſtempers, which he bore

with an heroic patience, and being eaten up of lice, he expired the 13th of September 1598, aged 72 years, after a reign of 43 years and eight months. During the laſt 50 days of his illneſs he ſhowed a great ſenſe of religion, and had his eyes almoſt always fixed towards heaven.

No character was ever drawn by different hiſtorians in more oppoſite colours than that of Philip; and yet, conſidering the length and activity of his reign, there is none which it ſhould ſeem would be more eaſy to aſcertain. From the facts recorded in hiſtory, we cannot doubt that he poſſeſſed, in an eminent degree, penetration, vigilance, and a capacity for government. His eyes were continually open upon every part of his extenſive dominions. He entered into every branch of adminiſtration; watched over the conduct of his miniſters with unwearied attention; and in his choice both of them and of his generals diſcovered a conſiderable ſhare of ſagacity. He had at all times a compoſed and ſettled countenance, and never appeared to be either elated or depreſſed. His temper was the moſt imperious, and his looks and demeanor were haughty and ſevere; yet among his Spaniſh ſubjects he was of eaſy acceſs; liſtened patiently to their repreſentations and complaints; and where his ambition and bigotry did not interfere, was generally willing to redreſs their grievances. When we have ſaid thus much in his praiſe, we have ſaid all that truth requires or truth permits. It is indeed impoſſible to ſuppoſe that he was inſincere in his zeal for religion. But as his religion was of the moſt corrupt kind, it ſerved to increaſe the natural depravity of his diſpoſition; and not only allowed, but even prompted, him to commit the moſt odious and ſhocking crimes. Although a prince in the bigoted age of Philip might be perſuaded that the intereſt of religion would be advanced by falſehood and perſecution; yet it might be expected, that, in a virtuous prince, the ſentiments of honour and humanity would on ſome occaſions triumph over the dictates of ſuperſtition: but of this triumph there occurs not a ſingle inſtance in the reign of Philip; who without heſitation violated his moſt ſacred obligations as often as religion afforded him a pretence, and under that pretence exerciſed for many years the moſt unrelenting cruelty without reluctance or remorſe. His ambition, which was exorbitant; his reſentment, which was implacable; his arbitrary temper, which would ſubmit to no controul—concurred with his bigoted zeal for the Catholic religion, and carried the ſanguinary ſpirit, which that religion was calculated to inſpire, to a greater height in Philip than it ever attained in any other prince of that or of any former or ſucceeding age.

Though of a ſmall ſize, he had an agreeable perſon. His countenance was grave, his air tranquil, and one could not diſcover from his looks either joy in proſperity or chagrin in adverſity. The wars againſt Holland, France, and England, coſt Philip 564 millions of ducats; but America furniſhed him with more than the half of that ſum. His revenues, after the junction of Portugal, are ſaid to have amounted to 25 millions of ducats, of which he laid out only 100,000 for the ſupport of his own houſehold. Philip was very jealous of outward reſpect; he was unwilling that any ſhould ſpeak to him but upon their knees. The duke of Alva having one day entered this prince's cabinet without being introduced, he received the following harſh ſalutation, accompanied with a ſtormy countenance: "An impudence like this of yours would deſerve the hatchet." If he thought only how to make himſelf be feared, he ſucceeded in doing ſo; for few princes have been more dreaded, more abhorred, or have cauſed more blood to flow, than Philip II. of Spain. He had ſucceſſively, if not all at once, war to maintain againſt Turkey, France, England, Holland, and almoſt all the Proteſtants of the empire, without having a ſingle ally, not even the branch of his own houſe in Germany. Notwithſtanding ſo many millions employed againſt the enemies of Spain, Philip found in his œconomy and his reſources wherewith to build 30 citadels, 64 fortified places, 9 ſea ports, 25 arſenals, and as many palaces, without including the eſcurial. His debts amounted to 140 millions of ducats, of which, after having paid ſeven millions of intereſt, the greateſt part was due to the Genoeſe. Moreover, he had ſold or alineated a capital ſtock of 100 millions of ducats in Italy. He made a law, fixing the majority of the kings of Spain at 14 years of age. He affected to be more than commonly devout; he ate often at the refectory with the monks; he never entered their churches without kiſſing all the relics; he cauſed knead his bread with the water of a fountain which was thought to poſſeſs a miraculous virtue; he boaſted of never having danced, and of never wearing breeches after the Grecian faſhion. Grave and ſolemn in all his actions, he drove from his preſence a woman who had ſmiled while he was blowing his noſe. One great event of his domeſtic life is the death of his ſon Don Carlos. The manner of this prince's death is not certainly known. His body, which lies in the monument of the eſcurial, is there ſeparated from his head; but it is pretended that the head is ſeparated only becauſe the leaden coffin which contains the body is too ſmall. The particulars of his crime are as little known as the manner in which it was committed. There is no evidence, nor is there any probability, that Philip would have cauſed him to be condemned by the inquiſition. All that we know of the matter is, that in 1568 his father, having diſcovered that he had ſome correſpondence with the Hollanders his enemies, arreſted him himſelf in his own room. He wrote at the ſame time to Pope Pius V. in order to give him an account of his ſon's impriſonment; and in his letter to this pontiff, the 20th of January 1568, he ſays, "that from his earlieſt years the ſtrength of a wicked nature has ſtifled in Don Carlos every paternal inſtruction." It was Philip II. who cauſed to be printed at Anvers, between 1569 and 1572, in 8 vols folio, the fine Polyglot Bible, which bears his name; and it was he who ſubjected the iſlands afterwards called the *Philippines*. He married ſucceſſively, 1ſt, Mary daughter of John III. king of Portugal; 2dly, Mary daughter of Henry VIII. and queen of England; 3dly, Elizabeth of France, daughter of Henry II; 4thly, Anne daughter of the Emperor Maximilian II. Don Carlos was the ſon of his firſt wife, and Philip III. of the laſt.

PHILIPPI (anc. geog.), a town of Macedonia, in the territory of the Edones, on the confines of Thrace (Pliny, Ptolemy), ſituated on the ſide of a ſteep eminence; anciently called *Datum* and *Drenides* (Appian), though Strabo ſeems to diſtinguiſh them. This town was famous on ſeveral accounts; not only as taking its name from the celebrated Philip of Macedon, father of Alexander the Great, who conſidered it as a fit place for carrying on the war againſt the Thracians; but alſo on account of two battles fought in its neighbourhood between Auguſtus and the republican party. In the firſt of theſe battles, Brutus and Caſſius had the command of the republican army; while Octavianus, afterwards Auguſtus, and Mark Antony, had the command of their adverſaries. The army of Brutus and Caſſius conſiſted of 19 legions and 20,000 horſe; the imperial forces of an equal number of legions, but more complete, and 13,000 horſe; ſo that the numbers on both ſides were pretty equal. The troops of Brutus were very richly dreſſed, moſt of them having their armour adorned with gold and ſilver; for Brutus, though very frugal in other reſpects, was thus extravagant with reſpect to his men, thinking that the riches that they had about them would make them exert themſelves the more, to prevent theſe from falling into the enemy's hands. Both the republican generals appear to have been inferior in ſkill to Mark Antony; for, as to Octavianus, he is allowed never to have conquered but by the valour of others. A little before the firſt engagement, Octavianus, who had been indiſpoſed, was carried out of the camp, at the perſuaſion of

Artorius his phyſician, who had dreamed that he ſaw a viſion directing him to be removed. Brutus's men, who oppoſed the wing commanded by Octavianus, charged without orders; which cauſed great confuſion. However, they were ſucceſsful; for part of them, taking a compaſs about, fell upon the enemy's rear: after which they took and plundered the camp, making a great ſlaughter of ſuch as were in it, and among the reſt putting 2000 Lacedemonians to the ſword who were newly come to the aſſiſtance of Octavianus. The emperor himſelf was ſought for, but in vain, having been conveyed away for the reaſon above mentioned; and as the ſoldiers pierced the litter in which he was uſually carried, it was thence reported that he had been killed. This threw that whole part of the army into ſuch conſternation, that when Brutus attacked them in front, they were moſt completely routed; three whole legions being cut in pieces, and a prodigious ſlaughter made among the fugitives. But by the imprudence of the general in purſuing too far, the wing of the republican army commanded by Caſſius was left naked and ſeparated from the reſt of the army; on which they were attacked at once in front and in flank, and thus they were defeated and their camp taken, while Brutus imagined that he had gained a complete victory. Caſſius himſelf retired to an eminence at a ſmall diſtance from Philippi; whence he ſent one of his greateſt intimates to procure intelligence concerning the fate of Brutus. That general was on his way, and already in view, when the meſſenger ſet out. He ſoon met his friends; but they ſurrounding him to inquire the news, Caſſius, who beheld what paſſed, imagined that he was taken priſoner by the enemy, retired to his tent, and in deſpair cauſed one of his freedmen to cut off his head. Thus far at leaſt is certain, that he went into the tent with that freedman, and that his head was found ſeparated from his body when Brutus entered. However, the freedman was never afterwards ſeen.

The ſecond engagement was pretty ſimilar to the firſt. Brutus again oppoſed Octavianus, and met with the ſame ſucceſs; but in the mean time Antony, to whom he ought undoubtedly to have oppoſed himſelf, having to do only with the lieutenants of Caſſius, gained a complete victory over them. What was worſt, the fugitives, inſtead of leaving the field of battle altogether, fled for protection to Brutus's army; where, crowding in among the ranks, they carried deſpair and confuſion wherever they went, ſo that a total defeat enſued, and the republican army was almoſt entirely cut in pieces. After the battle, Brutus put an end to his own life, as is related more fully under the article Rome.

The city of Philippi is likewiſe remarkable on account of an epiſtle written by St. Paul to the church in that place. It was a Roman colony (Luke, Pliny, Coin, Inſcription). It is alſo remarkable for being the birth-place of Adraſtus, the Peripatetic philoſopher, and diſciple of Ariſtotle. The town is ſtill in being, and is an archbiſhop's ſee; but greatly decayed and badly peopled. However, there is an old amphitheatre, and ſeveral other monuments of its ancient grandeur. E. lon. 44. 55. N. lat. 41. 0.

PHILIPPICS, Φιλιππικοι λογοι, in literature, is a name which is given to the orations of Demoſthenes againſt Philip king of Macedon. The Philippics are reckoned the maſterpieces of that great orator: Longinus quotes many inſtances of the ſublime from them; and points out a thouſand latent beauties. Indeed, that pathetic in which Demoſthenes excelled, the frequent interrogations and apoſtrophes wherewith he attacked the indolence of the Athenians, where could they be better employed? Whatever delicacy there be in the oration againſt Leptines, the Philippics have the advantage over it, were it only on account of the ſubject, which gives Demoſthenes ſo fair a field to diſplay his chief talent, we mean, with Longinus, that of moving and aſtoniſhing.

Dionyſius Halicarnaſſeus ranks the oration on the Halonefe among the Philippics, and places it the eighth in order. But though his authority be great, yet that force and majeſty wherein Cicero characteriſes the Philippics of Demoſthenes ſeem to exclude the oration on the Halonefe out of the number; and authoriſe the almoſt univerſal opinion of the learned, who reject it as ſpurious. Libanius, Photius, and others, but above all the languidneſs of the ſtyle, and the lowneſs of the expreſſions, which reign throughout the whole, father it on Hegeſippus.

Philippic is likewiſe applied to the fourteen orations of Cicero againſt Mark Antony. Cicero himſelf gave them this title in his epiſtles to Brutus; and poſterity have found it ſo juſt, that it has been continued to our times. Juvenal, Sat. x. calls the ſecond the *divine Philippic*, and witneſſes it to be of great fame, *conſpicuæ divina Philippica famæ*. That orator's entitling his laſt and moſt valued orations after the Philippics of Demoſthenes ſhows the high opinion he had of them. Cicero's Philippics coſt him his life; Mark Antony having been ſo irritated with them, that, when he arrived at the triumvirate, he procured Cicero's murder, cut off his head, and ſtuck it up in the very place whence the orator had delivered the Philippics.

PHILIPPINE islands, are certain iſlands of Aſia, which lie between 114 and 126 degrees of eaſt longitude, and between 6 and 20 degrees of north latitude; about 300 miles ſouth-eaſt of China. They are ſaid to be about 1200 in number, of which there are 400 very conſiderable. They form a principal diviſion of that immenſe Indian Archipelago, which conſiſts of ſo many thouſand iſlands, ſome of which are the largeſt, and many of them the richeſt, in the world. The Philippines form the northernmoſt cluſter of theſe iſlands, and were diſcovered in the year 1521 by the famous navigator Ferdinand Magellan, a Portugueſe gentleman, who had ſerved his native country both in the wars of Africa and in the Eaſt Indies; particularly under Albuquerque, the famous Portugueſe general, who reduced Goa and Malacca to the obedience of that crown. Magellan having had a conſiderable ſhare in thoſe actions, and finding himſelf neglected by the government of Portugal, and even denied, as it is ſaid, the ſmall advance of a ducat a month in his pay, left the court of Portugal in diſguſt, and offered his ſervices to Charles V. then emperor of Germany and king of Spain, whom he convinced of the probability of diſcovering a way to the Spice Iſlands, in the Eaſt Indies, by the weſt; whereupon the command of five ſmall ſhips being given him, he ſet ſail from Seville on the 10th of Auguſt 1519, and, ſtanding over to the coaſt of South America, proceeded ſouthward to 52°, where he fortunately hit upon a ſtrait, ſince called the *Strait of* Magellan, which carried him into the Pacific Ocean or South Sea; and then ſteering northward, paſſed the equator: after which he ſtretched away to the weſt, acroſs that vaſt ocean, till he arrived at Guam, one of the Ladrones, on the 10th of March 1521; and ſoon after ſailed to the weſtward, and diſcovered the Philippines, which he did on St. Lazarus's day; and, in honour of that ſaint, he called them the *Archipelago of St. Lazarus*. He took poſſeſſion of them in the name of the king of Spain, but happened to be killed in a ſkirmiſh he had with the natives of one of them. His people, however, arrived afterwards at the Moluccas, or Clove Iſlands, where they left a colony, and returned to Spain by the way of the Cape of Good Hope; being the firſt perſons that ever ſailed round the globe.—But there was no attempt made by the Spaniards to ſubdue or plant the Philippine Iſlands until the year 1564, in the reign of Philip II. ſon of Charles V. when Don Louis de Velaſco, viceroy of Mexico, ſent Michael Lopez Delagaſpes thither with a fleet, and a force ſufficient to make a conqueſt of theſe iſlands, which he named the *Philippines*, in honour of Philip II. then upon the throne of Spain; and they have remained under the dominion of that crown till taken by Sir Wil-

liam Draper. The Philippines are ſcarce inferior to any other iſlands of Aſia in all the natural productions of that happy climate; and they are by far the beſt ſituated for an extenſive and advantageous commerce. By their poſition, they form the centre of intercourſe with China, Japan, and the Spice iſlands; and whilſt they are under the dominion of Spain, they connect the Aſiatic and American commerce, and become a general magazine for the rich manufactures of the one and for the treaſures of the other. Beſides, they are well ſituated for a ſupply of European goods, both from the ſide of Acapulco and by the way of the Cape of Good Hope. In fact, they formerly enjoyed a traffic in ſome degree proportioned to the peculiar felicity of their ſituation; but the Spaniſh dominion is too vaſt and unconnected to be improved to the beſt advantage. The ſpirit of commerce is not powerful in that people. The trade of the Philippines is thought to have declined; its great branch is now reduced to two ſhips, which annually paſs between theſe iſlands and Acapulco in America, and to a ſingle port of Manila in the iſland of Luconia.

Indeed the Spaniards appear by no means to be actuated by the ſpirit of induſtry; for, ſo far from improving the fine ſituation of theſe iſlands to the utmoſt, it happens, on the contrary, that the trade is hurtful to the mother-country; for (to confine ourſelves to Manila, with which they have moſt to do), inſtead of taking Spaniſh manufactures, they trade with the Chineſe for ſpices, ſilks, ſtockings, Indian ſtuffs, callicoes, chintz, and many other articles; and with the Japaneſe for cabinets, and all ſorts of lacquered ware; for all which they pay in gold or ſilver. All theſe commodities, together with what the iſlands produce, and great quantities of wrought plate by the Chineſe artiſans, are collected at Manila, and tranſported annually in two ſhips to Acapulco in Mexico. Each of theſe ſhips is eſteemed worth 600,000l. ſterling; and in the war which began in 1739, and which was not diſtinguiſhed by ſuch a ſeries of wonderful ſucceſſes as that which ended in 1763, the taking of one of the galleons which carry on the trade between Manila and America, was conſidered as one of the moſt brilliant advantages which we gained. This trade is not laid open to all the inhabitants of Manila, but is confined by very particular regulations, ſomewhat analogous to thoſe by which the trade of the regiſter ſhips from Cadiz to the Weſt Indies is reſtrained. The ſhips employed are all king's ſhips, commiſſioned and paid by him; and the tonnage is divided into a certain number of bales, all of the ſame ſize. Theſe are divided among the convents at Manila, but principally the Jeſuits, as a donation to ſupport their miſſions, for the propagation of the Roman Catholic faith. Moſt of the religious are concerned in this trade, and ſell to the merchants at a great price what room in the ſhip they are not to occupy. This trade is by a royal edict limited to a certain value, but it always exceeds it, each ſhip being generally worth 3,000,000 of dollars. The returns made from America are in ſilver, cochineal, ſweetmeats, together with ſome European millinery ware for the women, and ſome ſtrong Spaniſh wine. It is obvious, that the greateſt part of the treaſure remitted does not remain at Manila, but is diſperſed over India for goods. Many ſtrong remonſtrances againſt this Indian trade to Mexico have been made to the court of Spain, wherein they urge, that the ſilk manufactories of Valentia and other parts of Spain, the linens from Cadiz, and their other manufactories, are hurt in their ſale in Mexico and Peru, by the Chineſe being able to afford them goods of the ſame ſort cheaper than they are able; that were this trade laid open, the whole treaſure of the New world would centre in Spain, or with European merchants; but now it enriches only the Jeſuits and a few private perſons. Wiſe as theſe arguments are, the Jeſuits and prieſts, verſant in intrigue, and the moſt ſelfiſh ſet of men on earth, had intereſt enough at court to ſtop the effect.

At Cavite in this bay, are a fort, a town, and a fine dock-yard, where theſe large galleons are built and repaired, and where they load and unload, together with all the other large ſhips that trade to this bay.

The principal of the Philippine iſlands are Luconia or Manila, Tandago or Samul, Maſbate, Mindora, Luban, Paragoa, Panay, Leyte, Bohel, Sibu, Sogbu, Negros, St. John, Xolo, and Mindanao. In moſt of theſe, the Spaniſh power prevails, and all are under the governor of Luconia; but there are ſome in which that nation has little authority, or even influence, ſuch as Mindanao.

The inhabitants of theſe iſlands conſiſt of Chineſe, Ethiopians, Malays, Spaniards, Portugueſe, Pintados, or Painted People, and Meſtees, a mixture of all theſe. Their perſons and habits reſemble thoſe of the ſeveral nations whence they derive their original; only it is obſervable, that the features of the blacks of theſe iſlands are as agreeable as thoſe of the white people. There is not a ſoil in the world that produces greater plenty of all things for life; as appears by the multitude of inhabitants to be found in the woods and mountains, who ſubſiſt almoſt entirely by the fruits of the earth, and the veniſon they take. Nor can any country appear more beautiful; for there is a perpetual verdure, and buds, bloſſoms, and fruit, are found upon the trees all the year round, as well on the mountains as in the cultivated gardens. Vaſt quantities of gold are waſhed down from the hills by the rains, and found mixed with the ſand of their rivers. There are alſo mines of other metals, and excellent load-ſtones found here; and ſuch numbers of wild buffaloes, that a good huntſman on horſeback, armed with a ſpear, will kill 10 or 20 in a day. The Spaniards take them for their hides, which they ſell to the Chineſe; and their carcaſes ſerve the mountaineers for food. Their woods alſo abound with deer, wild hogs, and goats. Of the laſt, there is ſuch plenty in one of theſe iſlands, that the Spaniards gave it the name of *Cabras*. Horſes and cows have likewiſe been imported into theſe iſlands, from New Spain, China, and Japan, which have multiplied conſiderably; but the ſheep that were brought over came to nothing. The trees produce a great variety of gums; one kind, which is the commoneſt, by the Spaniards called *brea*, is uſed inſtead of pitch; of the others, ſome are medicinal, others odoriferous.

In thoſe iſlands are monkeys and baboons of a monſtrous bigneſs, that will defend themſelves if attacked by men. When they can find no fruit in the mountains, they go down to the ſea to catch crabs and oyſters; and that the oyſters may not cloſe and catch their paws, they firſt put in a ſtone to prevent their ſhutting cloſe: they take crabs by putting their tail in the holes where they lie, and when the crab lays hold of it, they draw him out. There are alſo great numbers of civet-cats in ſome of the iſlands. The bird called *tavan* is a black ſea-fowl, ſomething leſs than a hen, and has a long neck; it lays its eggs in the ſand by the ſea-ſide, 40 or 50 in a trench, and then covers them, and they are hatched by the heat of the ſun. They have likewiſe the bird *ſaligan*, which builds her neſt on the ſides of rocks, as the ſwallows do againſt a wall; and theſe are the delicious BIRDS-*Neſts* ſo much eſteemed, being a kind of jelly that diſſolves in warm water.

The Spaniards have introduced ſeveral of the American fruits, which thrive here as well as in America; the cocoa or chocolate-nut particularly, which increaſes ſo that they have no occaſion now to import it from Mexico. Here is alſo the FOUNTAIN-*Tree*, from which the natives draw water; and there is likewiſe a kind of cane, by the Spaniards called *vaxuco*, which, if cut, yields fair water enough for a draught, of which there are plenty in the mountains, where water is moſt wanted.

Theſe iſlands being hot and moiſt, produce abundance of

venomous creatures, as the ſoil does poiſonous herbs and flowers, which do not kill thoſe who touch or taſte them, but ſo infect the air, that many people die in the time of their bloſſoming.

The orange, lemon, and ſeveral other trees, bear twice a year. A ſprig, when planted, becomes a tree and bears fruit in a year's time; ſo that without any hyperbole it may be affirmed, that a more luxuriant verdant ſoil can ſcarcely be conceived. The woods are filled with old, large, and lofty trees, and ſuch as yield more ſuſtenance to man than is to be found in almoſt any other part of the world. Theſe iſlands, however, beſides their other inconveniences, of which they have many, are very ſubject to earthquakes, which often prove very fatal. See MANILA.

PHILIPPINES, a religious ſociety of young women at Rome, ſo called from their taking St. Philip de Neri for their protector. The ſociety conſiſts of 100 poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of ſome religious women, who teach them to read, write, and work, and inſtruct them in the duties of Chriſtianity. They wear a white veil, and a black croſs on their breaſts. See MACEDONIA.

PHILIPPISTS, a ſect or party among the Lutherans; the followers of Philip Melancthon. He had ſtrenuouſly oppoſed the Ubiquiſts, who aroſe in his time; and the diſpute growing ſtill hotter after his death, the univerſity of Wittemberg, who eſpouſed Melancthon's opinion, were called by the Flacians, who attacked it, *Philippiſts*.

PHILIPS (FABIAN), was author of ſeveral books relating to ancient cuſtoms and privileges in England. He was born at Preſtbury in Glouceſterſhire, September 28th, 1601. When very young, he ſpent ſome time in one of the inns of Chancery; and went from thence to the Middle-Temple, where he became learned in the law. In the civil wars he was a bold aſſertor of the king's prerogative; and was ſo paſſionate a lover of Charles I. that, two days before that illuſtrious monarch was beheaded, he wrote a proteſtation againſt the intended murder, and cauſed it to be printed and affixed to poſts in all public places. He publiſhed in 1649, 4to, a pamphlet entitled, "*Veritas inconcuſſa*; or King Charles I. no Man of Blood, but a Martyr for his People:" which was reprinted in 1660, 8vo. In 1663, when the courts of juſtice at Weſtminſter, eſpecially the Chancery, were voted down by Oliver's parliament, he publiſhed "Conſiderations againſt the diſſolving and taking them away:" for which he received the thanks of William Lenthal, Eſq. ſpeaker of the late parliament, and of the keepers of the liberties of England. He was for ſome time filazer for London, Middleſex, Cambridgeſhire, and Huntingdonſhire; and ſpent much money in ſearching records, and writing in favour of the royal prerogative. The only advantage he received for this attachment to the royal cauſe was, the place of one of the commiſſioners for regulating the law, worth 200l. *per annum*, which only laſted two years. After the reſtoration of Charles II. when the bill for taking away the tenures was depending in parliament, he wrote and publiſhed a book to ſhow the neceſſity of preſerving them, entitled, "*Tenenda non tollenda:* or, the Neceſſity of preſerving Tenures *in capite*, and by Knight's-ſervice, which, according to their firſt inſtitution, were, and are yet, a great part of the *Salus Populi*, &c. 1660," 4to. In 1663 he publiſhed "The Antiquity, Legality, Reaſon, Duty, and Neceſſity of Pre-emption and Pourveyance for the King," 4to; and afterwards many other pieces upon ſubjects of a ſimilar kind. He aſſiſted Dr. Bates in his "*Elenchus Motuum*;" eſpecially in ſearching the records and offices for that work. He died November 17th, 1690, in his 89th year; and was buried near his wife in the church of Twyford in Middleſex. He was a man well acquainted with records and antiquities; but his manner of writing is neither cloſe nor well digeſted. He publiſhed a political pamphlet in 1681, entitled, "*Urſa Major et Minor*; ſhowing that there is no ſuch Fear, as is factitiouſly pretended, of Popery and arbitrary Power."

PHILIPS (Ambroſe), an Engliſh poet, was deſcended from a very ancient and conſiderable family of that name in Leiceſterſhire. He received his education at St. John's college, Cambridge; during his ſtay at which univerſity he wrote his paſtorals, which acquired him at the time ſo high a reputation. His next performance was, *The Life of Archbiſhop Williams*, written, according to Mr. Cibber, to make known his political principles, which in the courſe of it he had a free opportunity of doing, as the archbiſhop, who is the hero of his work, was a ſtrong opponent to the high-church meaſures.

When he quitted the univerſity, and came to London, he became a conſtant attendant at, and one of the wits of, Button's coffee-houſe, where he obtained the friendſhip and intimacy of many of the celebrated geniuſes of that age, more particularly of Sir Richard Steele, who, in the firſt volume of his *Tatler*, has inſerted a little poem of Mr. Philips's, which he calls a *Winter Piece*, dated from Copenhagen, and addreſſed to the earl of Dorſet, on which he beſtows the higheſt encomiums; and, indeed, ſo much juſtice is there in theſe his commendations, that even Mr. Pope himſelf, who had a fixed averſion for the author, while he affected to deſpiſe his other works, uſed always to except this from the number.

The firſt diſlike Mr. Pope conceived againſt Mr. Philips, proceeded from that jealouſy of fame which was ſo conſpicuous in the character of that great poet; for Sir Richard Steele had taken ſo ſtrong a liking to the paſtorals of the latter, as to have formed a deſign for a critical compariſon of them with thoſe of Pope, in the concluſion of which the preference was to have been given to Philips. This deſign, however, coming to Mr. Pope's knowledge, that gentleman, who could not bear a rival near the throne, determined to ward off this ſtroke by a ſtratagem of the moſt artful kind; which was no other than taking the ſame taſk on himſelf; and, in a paper in the Guardian, by drawing the like compariſon, and giving a like preference, but on principles of criticiſm apparently fallacious, to point out the abſurdity of ſuch a judgment. However, notwithſtanding the ridicule that was drawn on him in conſequence of his ſtanding as it were in competition with ſo powerful an antagoniſt, it is allowed, that there are, in ſome parts of Philips's paſtorals, certain ſtrokes of nature, and a degree of ſimplicity, that are much better ſuited to the purpoſes of paſtoral, than the more correctly turned periods of Mr. Pope's verſification. Mr. Philips and Mr. Pope being of different political principles, was another cauſe of enmity between them; which aroſe at length to ſo great a height, that the former, finding his antagoniſt too hard for him at the weapon of wit, had even determined on making uſe of a rougher kind of argument; for which purpoſe he even went ſo far as to hang up a rod at Button's for the chaſtiſement of his adverſary whenever he ſhould come thither; which, however, Mr. Pope declining to do, avoided the *argumentum baculinum*, in which he would, no doubt, have found himſelf on the weakeſt ſide of the queſtion. Our author alſo wrote ſeveral dramatical pieces; The Briton, Diſtreſſed Mother, and Humphrey Duke of Glouceſter; all of which met with ſucceſs, and one of them is at this time a ſtandard of entertainment at the theatres, being generally repeated ſeveral times in every ſeaſon. Mr. Philips's circumſtances were in general, through his life, not only eaſy, but rather affluent, in conſequence of his being connected, by his political principles, with perſons of great rank and conſequence. He was concerned with Dr. Hugh Boulter, afterwards archbiſhop of Armagh, the right honourable Richard Weſt, Eſq. lord chancellor of Ireland, the reverend Mr. Gilbert Burnet, and the reverend Mr. Henry Stevens, in writing a ſeries

of papers called the *Free Thinker*, which were all published together by Mr. Philips, in three volumes in 12mo.

In the latter part of queen Anne's reign, he was secretary to the Hanover club, who were a set of noblemen and gentlemen who had formed an association in honour of that succession, and for the support of its interests, and who used particularly to distinguish in their toasts such of the fair sex as were most zealously attached to the illustrious House of Brunswic. Mr. Philips's station in this club, together with the zeal shown in his writings, recommended him to the notice and favour of the new government. He was, soon after the accession of king George I. put into the commission of the peace, and appointed one of the commissioners of the lottery. And, on his friend Dr. Boulter's being made primate of Ireland, he accompanied that prelate across St. George's Channel, where he had considerable preferments bestowed on him, and was elected a member of the House of Commons there, as representative for the county of Armagh. At length, having purchased an annuity for life of 400l. *per annum*, he came over to England some time in the year 1748; but having a very bad state of health, and being moreover of an advanced age, he died soon after, at his lodgings near Vauxhall, in Surry.

"Of his personal character (says Dr. Johnson) all I have heard is, that he was eminent for bravery, and skill in the sword, and that in conversation he was solemn and pompous." He is somewhere called *Quaker Philips*, but, however, appears to have been a man of integrity; for the late Paul Whitehead relates, that when Mr. Addison was secretary of state, Philips applied to him for some preferment, but was coolly answered, "that it was thought that he was already provided for, by being made a justice for Westminster." To this observation our author with some indignation replied, "Though poetry was a trade he could not live by, yet he scorned to owe subsistence to another which he ought not to live by."

The following anecdote is told of our author by Dr. Johnson: "At a coffee-house, he (Philips) was discoursing upon pictures, and pitying the painters, who, in their historical pieces, always draw the same sort of *sky*. "They should travel (said he), and then they would see that there is a different *sky* in every country, in England, France, Italy, and so forth." "Your remark is just (said a grave gentleman who sat by), I have been a traveller, and can testify what you observe is true; but the greatest variety of *skies* that I found was in Poland." "In Poland, Sir?" says Philips. "Yes, in Poland; for there is Sobie*sky*, and Sabrun*sky*, and Jablon*sky*, and Podebra*sky*, and many more *skies*."

Philips (Catharine), a very ingenious lady, the daughter of Mr. John Fowler, merchant, was born at London in January 1631, and educated at a school at Hackney. She married James Philips of the priory of Cardigan, Esq. and went with the viscountess of Dungannon into Ireland, where she translated Corneille's tragedy of Pompey into English, which was several times acted there with great applause.

She translated also the four first acts of Horace, another tragedy of Corneille, the fifth being done by Sir John Denham. This excellent and amiable lady, for such it seems she was, died of the smallpox in London the 22d of June 1664, much and justly regretted; "having not left (says Langbaine) any of her sex her equal in poetry. She not only equalled (adds he) all that is reported of the poetesses of antiquity, the Lesbian Sappho and the Roman Sulpitia, but justly found her admirers among the greatest poets of our age." Cowley wrote an ode upon her death. Dr. Jeremy Taylor had addressed to her his "Measures and Offices of Friendship:" the second edition of which was printed in 1657, 12mo. She assumed the name of *Orinda*. In 1667 were printed, in folio, "Poems by the most deservedly admired Mrs. Catharine Philips, the matchless Orinda. To which is added Monsieur Corneille's Pompey and Horace, tragedies. With several other translations from the French;" and her picture before them, engraven by Faithorne. There was likewise another edition in 1678, folio; in the preface of which we are told, that "she wrote her familiar letters with great facility, in a very fair hand, and perfect orthography; and if they were collected with those excellent discourses she wrote on several subjects, they would make a volume much larger than that of her poems." In 1705, a small volume of her letters to Sir Charles Cottrel was printed under the title of "Letters from Orinda to Poliarchus. The editor of these letters tells us, that "they were the effect of an happy intimacy between herself and the late famous Poliarchus, and are an admirable pattern for the pleasing correspondence of a virtuous friendship. They will sufficiently instruct us, how an intercourse of writing between persons of different sexes ought to be managed with delight and innocence; and teach the world not to load such a commerce with censure and detraction, when it is removed at such a distance from even the appearance of guilt."

Philips (John), an eminent English poet, was born in 1676. He was educated at Winchester and Oxford, where he became acquainted with Milton, whom he studied with great application, and traced in all his successful translations from the ancients. The first poem which distinguished our author, was his *Splendid Shilling*, which is in the *Tatler* styled the *finest burlesque poem in the English language*. His next was entitled *Blenheim*, which he wrote at the request of the earl of Oxford, and Mr. Henry St. John, afterwards Lord Bolingbroke, on the victory obtained there by the duke of Marlborough in 1704. It was published in 1705; and the year after he finished another poem upon cyder, the first book of which had been written at Oxford. It is on the model of Virgil's Georgics, and is a very excellent piece. We have no more of Mr. Philips but a Latin ode to Henry St. John, Esq. which is esteemed a masterpiece. He was contriving greater things; but illness coming on, he was obliged to drop every thing but the care of his health. This care, however, did not save him: for, after lingering a long time, he died at Hereford, Feb. 15, 1708, of a consumption and asthma, before he had reached his 33d year. He was interred in the cathedral of that city with an inscription over his grave; and had a monument erected to his memory in Westminster-abbey by Sir Simon Harcourt, afterwards lord-chancellor, with an epitaph upon it written by Dr. Atterbury, though commonly ascribed to Dr. Freind. He was one of those few poets whose muse and manners were equally excellent and amiable; and both were so in a very eminent degree.

Dr. Johnson observes, that "Philips has been always praised, without contradiction, as a man modest, blameless, and pious; who bore a narrow fortune without discontent, and tedious and painful maladies without impatience; beloved by those that knew him, but not ambitious to be known. He was probably not formed for a wide circle. His conversation is commended for its innocent gaiety, which seems to have flowed only among his intimates; for I have been told that he was in company silent and barren, and employed only upon the pleasures of his pipe. His addiction to tobacco is mentioned by one of his biographers, who remarks, that in all his writings except Blenheim he has found an opportunity of celebrating the fragrant fume. In common life, he was probably one of those who please by not offending, and whose person was loved because his writings were admired. He died honoured and lamented, before any part of his reputation had withered, and before his patron St. John had disgraced him. His works are few. The Splendid Shilling has the uncommon merit of an original design, unless it may be thought precluded by the ancient *Centos*. To degrade the sounding words and stately construction of Milton, by an appli-

cation to the loweſt and moſt trivial things, gratifies the mind with a momentary triumph over that grandeur which hitherto held its captives in admiration; the words and things are preſented with a new appearance, and novelty is always grateful where it gives no pain. But the merit of ſuch performances begins and ends with the firſt author. He that ſhould again adapt Milton's phraſe to the groſs incidents of common life, and even adapt it with more art, which would not be difficult, muſt yet expect but a ſmall part of the praiſe which Philips has obtained; he can only hope to be conſidered as the repeater of a jeſt.

"There is a Latin ode written to his patron St. John, in return for a preſent of wine and tobacco, which cannot be paſſed without notice. It is gay and elegant, and exhibits ſeveral artful accommodations of claſſic expreſſions to new purpoſes. It ſeems better turned than the odes of Haunes. To the poem on cyder, written in imitation of the Georgics, may be given this peculiar praiſe, that it is grounded in truth; that the precepts which it contains are exact and juſt; and that it is therefore at once a book of entertainment and of ſcience. This I was told by Miller the great gardener and botaniſt, whoſe expreſſion was, that 'there were many books written on the ſame ſubject in proſe, which do not contain ſo much truth as that poem.' In the diſpoſition of his matter, ſo as to interſperſe precept, relating to the culture of trees, with ſentiments more generally pleaſing, and in eaſy and graceful tranſitions from one ſubject to another, he has very diligently imitated his maſter; but he unhappily pleaſed himſelf with blank verſe; and ſuppoſed that the numbers of Milton, which impreſs the mind with veneration, combined as they are with ſubjects of inconceivable grandeur, could be ſuſtained by images which at moſt can riſe only to elegance. Contending angels may ſhake the regions of heaven in blank verſe; but the flow of equal meaſures, and the embelliſhment of rhime, muſt recommend to our attention the art of engrafting, and decide the merit of the redſtreak and the pearmain. What ſtudy could confer, Philips had obtained; but natural deficiency cannot be ſupplied. He ſeems not born to greatneſs and elevation. He is never loſty, nor does he often ſurpriſe with unexpected excellence: but perhaps to his laſt poem may be applied what Tully ſaid of the work of Lucretius, that 'it is written with much art, though with few blazes of genius.'"

It deſerves to be remarked, that there were two poets of both the names of our author, and who flouriſhed in his time. One of them was Milton's nephew, and wrote ſeveral things, particularly ſome memoirs of his uncle, and part of Virgil Traveſtied. The other was the author of two political farces, which were both printed in 1716; 1. The Earl of Mar married, with the Humours of Jocky the Highlander. 2. The Pretender's Flight; or a Mock Coronation, with the Humours of the facetious Harry St. John.

PHILIPSBURG, is an imperial town of Germany, in the circle of the Upper Rhine. It is very ſtrong, and looked upon as one of the bulwarks of the empire. It is ſeated in a moraſs, and fortified with ſeven baſtions, and ſeveral advanced works. The town belongs to the biſhop of Spire, but all the works and the fortifications to the empire. It has been ſeveral times taken and retaken, particularly by the French. It is ſeated on the river Rhine, over which there is a bridge, ſeven miles ſouth of Spire, 22 ſouth-eaſt of Worms, and 40 north-eaſt of Straſburg. E. lon. 8. 33. N. lat. 49. 12.

PHILISTÆA (anc. geog.), the country of the Philiſtines (Bible); which lay along the Mediterranean, from Joppa to the boundary of Egypt, and extending to inland places not far from the coaſt. *Palæſtini*, the people; *Palæſtina*, the country (Joſephus): Afterwards applied to the whole of the Holy Land and its inhabitants. *Philiſtai*, the people (Septuagint); *Philiſtini* (Vulgate), the *Caphtorim* and *Philiſtim*, originally from Egypt, and deſcendants of Cham (Moſes). Expelled and deſtroyed the Hivites the ancient inhabitants, and occupied their country; that is, the region which retained the name of *Philiſtim*, in which that of *Caphtorim* was ſwallowed up.

PHILISTINES, were the ancient inhabitants of Paleſtine, well known in ſacred hiſtory. Theſe people are ſometimes called in Scripture *Cherethites* and *Caphtorims*. The earlier part of their hiſtory is, like that of moſt other nations, very obſcure and uncertain. The authors of the Univerſal Hiſtory tell us, that they were deſcended from the Caſluhim partly, and partly from the Caphtorim, both from the loins of Mizraim the ſon of Ham, the ſon of Noah. Moſes tells us (Deut. xi. 23.), that they drove out the Avim or Avites even to Azzah or Gazah, where they ſettled; but when this happened cannot be determined. On the whole, however, our learned authors are clearly of opinion, that the Caſluhim and Caphtorim, from whom the Philiſtines are deſcended, came originally from Egypt, and called the country which they had conquered by their own name. (See PALESTINE.) Many interpreters, however, think, that Caphtor was but another name for Cappadocia, which they imagine to have been the original country of the Philiſtines. But Father Calmet, in a particular diſſertation prefixed to the firſt book of Samuel, endeavours to ſhow that they were originally of the iſle of Crete. The reaſons which led him to think that Caphtor is the iſle of Crete are as follow: The Philiſtines were ſtrangers in Paleſtine, as appears in various parts of Scripture; ſuch as Gen. x. 14. Deut. ii. 23. Jer. xlvii. 4. and Amos ix. 7. whence the Septuagint always tranſlate this name *Strangers*. Their proper name was Cherethims, for Ezekiel (xxv. 16.), ſpeaking againſt the Philiſtines, has theſe words, "I will ſtretch out mine hand upon the Philiſtines, and I will cut off the Cherethims, and deſtroy the remnant of the ſea-coaſt." Zephaniah (ii. 5.), inveighing againſt the ſame people, ſays, "Wo unto the inhabitants of the ſea coaſts, the nation of the Cherethites." And Samuel (Book I. xxx. 14.) ſays, that the Amalekites made an irruption into the country of the Cherethites, that is to ſay, of the Philiſtines, as the ſequel of the diſcourſe proves. And afterwards the kings of Judah had foreign guards called the *Cherethites* and *Pelethites*, who were of the number of the Philiſtines (2 Sam. xv. 18.). The Septuagint, under the name *Cherethites*, underſtood the *Cretans*; and by *Cherith* they underſtood *Crete*. Beſides, the Scripture ſays, that the Philiſtines came from the iſle of Caphtor. Now we ſee no iſland in the Mediterranean wherein the marks whereby the Scripture deſcribes Caphtor and Cherethim agree better than in the iſle of Crete. The name *Cretim* or *Cherethim* is the ſame with that of *Cretenſes*. The Cretans are one of the moſt ancient and celebrated people that inhabited the iſlands of the Mediterranean. They pretended to have been produced originally out of their own ſoil. This iſland was well peopled in the time of the Trojan war. Homer calls it the iſland with a hundred cities. The city of Gaza in Paleſtine went by the name of *Minoa (Steph. Byzant. in Gaza)*, becauſe Minos king of Crete coming into that country, called this ancient city by his own name.

Herodotus acknowledges that the Cretans were originally all barbarians, and did not come from Greece. Homer ſays, that a different language was ſpoken in the iſle of Crete; that there were Greeks there, true or ancient Cretans, Pelaſgians, &c. The ancient Cretans are the ſame as the Cherethites, the Pelaſgians, as the Philiſtines or Pelethites of the Scripture: their language was the ſame with that of the Canaanites or Phœnicians, that is, Hebrew: they were deſcended, as well as Canaan, from Ham, by Mizraim (Gen. x. 6. 13, 14.) The manners, arms, religion, and gods of the Cretans and Philiſtines

were the ſame. The arms of the one and the other were bows and arrows. Dagon the god of the Philiſtines was the ſame as the Dictynna of the Cretans.

Whether theſe arguments are convincing, it is not for us to determine; but Wells does not think they are, as he is of the ſame opinion with the authors of the Univerſal Hiſtory, who ſay, that *Coptus*, the name of an old city of Egypt, is a corruption of the ancient *Caphtor*. It is not, however, of great importance to determine whether they came from Crete, from Cappadocia, or from Egypt: they had certainly been a conſiderable time in the land of Canaan, when Abraham arrived there in the year of the world 2083. They were then a very powerful people, were governed by kings, and in poſſeſſion of ſeveral conſiderable cities. The race of kings then in power were honoured with the title of *Abimelech*. This race, however, was but of ſhort duration; for their monarchy became an ariſtocracy of five lords, who were, as far as we can diſcover, partly independent of each other, though they acted in concert for the common cauſe. This form of government was again ſucceeded by another race of kings, diſtinguiſhed by the title of *Achiſh*, though they alſo bore that of *Abimelech*. The kings were always under great limitations. The Philiſtines appear to have been a very warlike people, induſtrious, and lovers of freedom; they did not circumciſe, and in the early periods of their hiſtory held adultery in the greateſt abhorrence. "Their character (ſay the authors of the Univerſal Hiſtory) muſt be conſidered at different periods; for we may ſay they were not always the ſame people. In the days of Abraham and Iſaac, they were without all doubt a righteous and hoſpitable nation: but afterwards a revolution in government, religion, and morals, may have enſued. From thenceforward they became like other idolatrous nations; the ſame enormities crept in and prevailed among them. They are conſtantly mentioned in Scripture as ſtrangers; and, though poſſeſſed of a moſt conſiderable part of the Land of Promiſe, yet God would never ſuffer them to be driven out, they being Egyptians by deſcent, and not original natives, whoſe land only was promiſed to Abraham and his ſeed. Their arrogance and ambition were great; and ſo irreconcileable was their enmity to the Iſraelites *, that one would be almoſt tempted to think they were created on purpoſe to be a thorn in their ſides; for, though the hand of God was evidently againſt them ſeveral times, and particularly when they detained the ark, yet they hardened their hearts, and cloſed their eyes againſt conviction. They ſeem to have entertained a very fond veneration for their deities, in which they perſiſted, though they were eye-witneſſes of the ſhame and ignominy which befel them in the preſence of the captive ark; nay, they were ſo biaſſed in their favour, as to imagine that their gods might prevail againſt Him who had in ſo glaring a manner put them to ſhame and diſgrace. They were much addicted to trade; which, conſidering their ſituation, they may have exerciſed from the beginning; but, by the acceſſion of the fugitive Edomites in David's time, they roſe to ſo great a reputation as merchants, that the Greeks, it ſeems, preferred them to all other nations in that reſpect, and from them called all the country bordering on theirs *Paleſtine*. Their language was not ſo different from that ſpoken by the Hebrews as to cauſe any difficulty for them to converſe together, as will be perceived by their intercourſe with Abraham and Iſaac; ſo that, in all this region, the ſeveral nations ſpoke one and the ſame tongue, perhaps with ſome variation of dialect. They had doubtleſs the arts and ſciences in common with the moſt learned and ingenious among their contemporaries, and perhaps ſome of them in greater perfection. They had giants among them; but whether they were originally of the breed of the Anakims, who retired hither when they were expelled from Hebron, or were ſprung from accidental births, is not eaſily determined. We muſt not forget, that the invention of the bow and arrow is aſcribed to this people.

"Their religion was different at different times; under their firſt race of kings, they uſed the ſame rites with the Hebrews. Abimelech, in the ſin he had like to have committed with Sarah, through Abraham's timidity, was favoured with a divine admonition from God; and, by his ſpeech and behaviour at that time, it ſeems as if he had been uſed to converſe with the Deity. In after-times, they erred into endleſs ſuperſtitions, and different kinds of idolatry; each of the principal or five cities ſeemed to have had an idol of its own. Marna, Marnas, or Marnaſh, was worſhipped at Gaza, and is ſaid to have migrated into Crete, and to have become the Cretan Jupiter. Dagon was worſhipped at Azotus; he ſeems to have been the greateſt, the moſt ancient, and moſt favourite god they had; to which may be added, that he perhaps ſubſiſted the longeſt of any that did not ſtraggle out of the country. To him they aſcribed the invention of bread-corn, or of agriculture, as his name imports. We cannot enter into the common notion of his being repreſented as a monſter, half man half fiſh; nor conſequently into another almoſt as common, that he is the ſame with the Syrian goddeſs Derceto, who, we are told, was repreſented under ſome ſuch mixed form. Our opinion is, that this idol was in ſhape wholly like a man; for we read of his head, his hands, and his feet. He ſtood in a temple at Azotus, and had prieſts of his own who paid him a very conſtant attendance. Next to Dagon was Baalzebub the God of Ekron. In the text of the New Teſtament he is called *Beelzebub*, and the *prince of devils*. His name is rendered *lord of flies*; which by ſome is held to be a mock appellation beſtowed on him by the Jews; but others think him ſo ſtyled by his worſhippers, as Hercules Apomyios, and others, were, from his driving thoſe inſects away; and urge, that Ahaziah, in his ſickneſs, would ſcarcely have applied to him, if his name had carried in it any reproach. But it muſt be remembered, it is the ſacred hiſtorian that makes uſe of that contemptuous term in deriſion; whereas the idolatrous monarch, who was one of his votaries, might call him by his common name, ſuppoſed to have been *Baal-zebaoth*, 'the lord of armies,' or *Baal-ſhamim*, 'lord of heaven,' or ſome other bordering on Baal-zebub. How, or under what form he was repreſented, is uncertain: ſome place him on a throne, and attire him like a king; others paint him as a fly. Not to dwell on this obſcurity, it appears that he became an oracle of the higheſt repute for omniſcience and veracity; that he had prieſts of his own; and that he, in the middle times at leaſt, was much ſought after by thoſe who were anxious about futurity. Dercето we take certainly to have been the goddeſs of Aſcalon; but we are ſupported by profane authority, without the leaſt countenance from Scripture. Gath is ſeemingly the only city of all the five unprovided with a deity; wherefore, as the Scripture declares, that Aſhtaroth, or Aſtarte, was worſhipped by this people, we are ready to place her at Gath; and the rather, as this of all their cities may have had moſt

* "From a paſſage in Chronicles, it is gueſſed to have been of very ancient date; where it is ſaid, that 'the men of Gath ſlew the children of Ephraim, who would have taken their cattle from them.' This incident is nowhere elſe to be found; and there are various notions concerning the ſenſe in which we muſt take this paſſage. As to the time of the tranſaction, moſt people allow it to have been while the children of Iſrael were ſojourners in Egypt. It plainly appears, by the next verſe, that Ephraim himſelf was living at that period. The Targum ſuppoſes his children miſcomputed the time they were to ſerve in Egypt, and began too early an attempt upon their Promiſed Land."

communication with Sidon. To ſpeak in general concerning their religious rites and ceremonies, which is all we can do, they ſeem to have erected very large and ſpacious temples, or very wide halls, for the celebration of their ſolemn ſeaſons and feſtivals (for ſuch they ſurely had); their religious offices were attended with much pomp, and a great concourſe from all parts; and they preſented their gods with the chief part of their ſpoil, and carried them about with them when they went to war. We do not find in Scripture that they ſacrificed their children; and yet the Curetes* are ſaid to be their deſcendants."

With reſpect to the hiſtory of this extraordinary people, we find from the above extract, that they were not comprehended in the number of nations devoted to extermination, and whoſe territory the Lord had abandoned to the Hebrews; nor were they of the curſed ſeed of Canaan. However, Joſhua did not forbear to give their lands to the Hebrews, and to ſet upon them by command from the Lord, becauſe they poſſeſſed a country which was promiſed to the people of God (Joſh. xv. 45—47. and xiii. 2, 3.) But theſe conqueſts of Joſhua muſt have been ill maintained, ſince under the Judges, under Saul, and at the beginning of the reign of David, the Philiſtines oppreſſed the Iſraelites. True it is, Shamgar, Samſon, Samuel, and Saul, made head againſt them, but did not reduce their power; and they continued independent down to the reign of David, who ſubjected them to his government.

They continued in ſubjection to the kings of Judah down to the reign of Jehoram, ſon of Jehoſhaphat; that is, for about 246 years. However, Jehoram made war againſt them, and probably reduced them to his obedience again; becauſe it is obſerved in Scripture, that they revolted again from Uzziah; and that this prince kept them to their duty during the time of his reign (2 Chr. xxi. 16. and xxvi. 6, 7.) During the unfortunate reign of Ahaz, the Philiſtines made great havoc in the territories of Judah; but his ſon and ſucceſſor Hezekiah ſubdued them (2 Chr. xxviii. 18. and 2 Kings xviii. 8.) Laſtly, they regained their full liberty under the latter kings of Judah; and we may ſee by the menaces denounced againſt them by the prophets Iſaiah, Amos, Zephaniah, Jeremiah, and Ezekiel, that they brought a thouſand hardſhips and calamities upon the children of Iſrael: for which cruelties God threatened to puniſh them. Eſarhaddon beſieged Aſhdod or Azoth, and took it (Iſa. xx. 1.) And according to Herodotus, Pſammeticus king of Egypt took the ſame city, after a ſiege of 29 years. There is great probability, that Nebuchadnezzar, when he ſubdued the Ammonites, Moabites, Egyptians, and other nations, bordering upon the Jews, reduced alſo the Philiſtines. After this, they fell under the dominion of the Perſians; then under that of Alexander the Great, who deſtroyed the city of Gaza, the only city of Phœnicia that durſt oppoſe him. After the perſecution of Antiochus Epiphanes, the Aſmonæans ſubjected under their obedience ſeveral cities of the Philiſtines; and Tryphon gave to Jonathan Maccabæus the government of the whole coaſt of the Mediterrancan, from Tyre as far as Egypt, which included all the country of the Philiſtines.

PHILLYREA, MOCK PRIVET; a genus of the monogynia order, belonging to the diandria claſs of plants. Each flower contains two males and one female. Some ſay there are ſeven ſpecies, all of them ſhrubby plants, and natives of France or Italy. Others reckon only three ſpecies, which are as follow:

1. *Phillyrea media*, the *oval-leaved* phillyrea, or mock-privet, or the medial-leaved phillyrea, a tall evergreen ſhrub, native of the ſouth of Europe. 2. *Phillyrea latifolia*; the broad-leaved phillyrea or mock-privet, a tall evergreen ſhrub, native of the ſouth of Europe. 3. *Phillyrea anguſtifolia*; the narrow-leaved phillyrea, or mock-privet, a deciduous ſhrub, native of Spain and Italy.

The firſt has three varieties, *viz.* The *firſt* is the common ſmooth-leaved phillyrea. This plant grows to be 12 or 14 feet high, and the branches are very numerous. The older branches are covered with a dark brown bark, but the bark on the young ſhoots is of a fine green colour. They are oval, ſpear-ſhaped, and grow oppoſite, by pairs, on ſtrong ſhort footſtalks. The flowers are produced in cluſters from the wings of the young branches. They are ſmall, and of a kind of greeniſh-white colour; they appear in March, and are ſucceeded by berries, which are firſt green, then red, and black in the autumn when ripe. The *ſecond* variety is the privet-leaved phillyrea, which grows to be 10 or 12 feet high, and the branches of which are covered with a brown bark. The leaves a little reſemble the privet; they are of a fine green colour, and grow by pairs on the branches. They are of a lanceolate figure, and their edges are entire, or nearly ſo; for ſome ſigns of ſerratures ſometimes appear. The flowers grow like others in cluſters in March. They are whitiſh, and are ſucceeded by ſmall black berries. The *third* variety, or the olive-leaved phillyrea, is the moſt beautiful of all the ſorts. It will grow to be about 10 or 12 feet high; and the branches, which are not numerous, ſpread abroad in a free eaſy manner, which may not improperly be ſaid to give the tree a fine air. They are long and ſlender, and are covered with a light brown bark; and on theſe the leaves ſtand oppoſite by pairs at proper intervals on ſhort footſtalks. They reſemble thoſe of the olive-tree, and are of ſo delightful a green as to force eſteem. Their ſurface is exceeding ſmooth, their edges are entire, and the membrane of a thickiſh conſiſtence. The flowers are ſmall and white, and like the other ſorts make no ſhow. They are ſucceeded by ſingle roundiſh berries.

2. The *broad-leaved* phillyrea will grow to be about 12 feet high. The branches ſeem to be produced ſtronger and more upright than thoſe of the former ſpecies. The bark is of a grey colour, ſpotted with white, which has a pretty effect; and the leaves grow oppoſite by pairs. They are of a heart-ſhaped oval figure, of a thick conſiſtence, and a ſtrong dark-green colour. Their edges are ſharply ſerrated, and they ſtand on ſhort ſtrong footſtalks. The flowers grow from the wings of the leaves in cluſters in March. They are of a kind of greeniſh-white colour, make no ſhow, and are ſucceeded by ſmall round black berries. There are alſo three varieties of this ſpecies, *viz.* the ilex leaved phillyrea, the prickly phillyrea, and the olive phillyrea with ſlightly ferrated edges.

3. The *narrow-leaved* phillyrea is of lower growth, ſeldom riſing higher than 8 or 10 feet. The branches are few and ſlender, and they alſo are beautifully ſpotted with grey ſpots. The leaves, like the others, ſtand oppoſite by pairs. They are long and narrow, ſpear-ſhaped, and undivided, of a deep green colour, and of a thick conſiſtence. Their edges are entire, and they alſo ſtand on ſhort footſtalks. The flowers, like the others, make no ſhow. They are whitiſh, and grow in cluſters from the wings of the branches, in March; and are ſucceeded by ſmall round black berries. The varieties of this ſpecies are, the roſemary phillyrea, lavender phillyrea, ſtriped phillyrea, &c.

This vegetable is to be propagated by ſeeds or layers. 1. By ſeeds. Theſe ripen in the autumn, and ſhould be ſown ſoon after. The mould muſt be made fine; and if it is not naturally ſandy, if ſome drift ſand be added, it will be ſo much the better. The ſeeds for the moſt part remain until the ſe-

* "The Curetes ſacrificed their children to Saturn; and from the ſimilitude this name bears to Cherethites or Philiſtines, it has been advanced that they are the ſame people; but as we have no warrant for ſaying the Philiſtines practiſed ſo barbarous and unnatural a cuſtom, we may venture to pronounce, that they learned it not from them, but borrowed it elſewhere."

cond ſpring before they come up: and if they are not ſown ſoon after they are ripe, ſome will come up even the third ſpring after. They muſt be ſown about an inch deep; and during the following ſummer ſhould be kept clean from weeds. After they are come up, the ſame care muſt be obſerved, and alſo watering in dry weather; and if the beds are hooped, and the plants ſhaded in the hotteſt ſeaſon, they will be ſo much the better for it. However, at the approach of winter they muſt be hooped, and the beds covered with mats in the hardeſt froſts, otherwiſe there will be danger of loſing the whole crop; for theſe trees, though they are very hardy when grown tolerably large, are rather tender whilſt ſeedlings. It will be proper to let them remain in the ſeed-beds with this management for two ſummers; and then waiting for the firſt autumnal rains, whether in September or October (and having prepared a ſpot of ground), they ſhould at that juncture be planted out, and this will occaſion them immediately to ſtrike root. The diſtance they ſhould be planted from each other need not be more than a foot, if they are not deſigned to remain long in the nurſery. If there is a probability of their not being wanted for ſome years, they ſhould be allowed near double that diſtance; and every winter the ground in the rows ſhould be well dug, to break their roots, and cauſe them to put out freſh fibres, otherwiſe they will be in danger of being loſt when brought into the ſhrubbery quarters. 2. By layers they will eaſily grow. The autumn is the beſt time for this operation, and the young ſhoots are fit for the purpoſe. The beſt way of layering them is by making a ſlit at the joint; though they will often grow well by a twiſt being only made. When the gardener chooſes the method of twiſting a young branch for the layers, he muſt be careful to twiſt it about a joint ſo as only to break the bark; for, if it is too much twiſted, it will die from that time, and his expectations wholly vaniſh. But if it be gently twiſted with art and care, it will at the twiſted parts be preparing to ſtrike root, and by the autumn following, as well as thoſe layers that had been ſlit, will have good roots; the ſtrongeſt of which will be fit for planting where they are wanted to remain, whilſt the weaker and worſt-rooted layers may be planted in the nurſery-ground like the ſeedlings, and treated accordingly.

PHILO, an ancient Greek writer, was of a noble family among the Jews, and flouriſhed at Alexandria during the reign of Caligula. He was the chief of an embaſſy ſent to Rome about the year 42, to plead the cauſe of the Jews againſt Apion, who was ſent by the Alexandrians to charge them with neglecting the honours due to Cæſar. Caligula, however, would not allow him to ſpeak, and behaved to him in ſuch a manner that Philo was in conſiderable danger of loſing his life. Others again tell us that he was heard; but that his demands were refuſed. He afterwards went to Rome in the reign of Claudius; and then, Euſebius and Jerome inform us, he became acquainted with St. Peter, with whom he was on terms of friendſhip. Photius adds, that he became a Chriſtian, and afterwards, from ſome motive of reſentment, renounced it. Great part of this, however, is uncertain; for few believe that St. Peter was at Rome ſo early as the reign of Claudius, if he ever was there at all.

Philo was educated at Alexandria, and made very great progreſs in eloquence and philoſophy. After the faſhion of the time, he cultivated, like many of his nation and faith, the philoſophy of Plato, whoſe principles he ſo thoroughly imbibed, and whoſe manner he ſo well imitated, that it became a common ſaying, "Aut Plato philonizat, aut Philo platonizat." Joſephus ſays, he was a man "eminent on all accounts:" and Euſebius deſcribes him, "copious in ſpeech, rich in ſentiments, and ſublime in the knowledge of holy writ." He was, however, ſo much immerſed in philoſophy, particularly the Platonic, that he neglected the Hebrew language, and the rites and cuſtoms of his own people. Scaliger ſays, that Philo "knew no more of Hebrew and Syriac than a Gaul or a Scythian." Grotius is of opinion, that "he is not fully to be depended on, in what relates to the manners of the Hebrews:" and Cudworth goes further; for, "though a Jew by nation (ſays he), he was yet very ignorant of Jewiſh cuſtoms." Fabricius thinks differently; for, though he allows ſome inadvertencies and errors of Philo with regard to theſe matters, yet he does not ſee a ſufficient foundation on which to charge ſo illuſtrious a doctor of the law with ignorance. He allows, however, that Philo's paſſion for philoſophy had made him more than half a Pagan; for it led him to interpret the whole law and the prophets upon Platonic ideas; and to admit nothing as truly interpreted which was not agreeable to the principles of the academy. Beſides, this led him farther; he turned every thing into allegory, and deduced the darkeſt meanings from the plaineſt words. This moſt pernicious practice ORIGEN, it is known, imitated, and expoſed himſelf by it to the ſcoffs of Celſus and of Porphyry. Philo's writings abound with high and myſtical, new and ſubtile, far-fetched and abſtracted notions; and indeed the doctrines of Plato and Moſes are ſo promiſcuouſly blended, that it is not an eaſy matter to aſſign to each his principles. There are certainly, however, in his works many excellent things. Though he is continually platoniſing and allegoriſing the Scriptures, he abounds with fine ſentiments and leſſons of morality; and his morals are rather the morals of a Chriſtian than of a Jew. Hiſtory, together with his own writings, give us every reaſon to believe that he was a man of great prudence, conſtancy, and virtue.

His works were firſt publiſhed in Greek by Turnebus at Paris 1552. A Latin tranſlation made by Gelenius was afterwards added, and printed ſeveral times with it. The Paris edition of 1640 in folio was the beſt for a whole century; which made Cotelerius ſay, that "Philo was an author that deſerved to have a better text and a better verſion." In 1742, a handſome edition of his work was publiſhed at London by Dr. Mangey in two volumes folio; which is certainly preferable if it were only for the paper and print, but it is not ſo good a one as Philo deſerves.

Many of our readers may be deſirous of further details reſpecting this celebrated man; we refer ſuch therefore to *Joſephus's Antiquities*, *Euſebius's Eccleſiaſtical Hiſtory*, St. Jerome's work *De Scriptoribus Eccleſiaſticis*, *Fabricii Bibl. Græc.* *Cave Hiſt. Liter.* and Vol. II. of *Monuments of the Greek Church*.

PHILOCLES, an admiral of the Athenian fleet during the Peloponneſian war. He recommended to his countrymen to cut off the right hand of ſuch of the enemies as were taken, that they might be rendered unfit for ſervice. His plan was adopted by all the ten admirals except one; but their expectations were fruſtrated, and inſtead of being conquerors they were totally defeated at Ægoſpotamos by Lyſander, and Philocles was put to death with the reſt of his colleagues.

PHILOCTETES, in fabulous hiſtory, the ſon of Pæan, was the faithful companion of Hercules; who at his death obliged him to ſwear not to diſcover the place where his aſhes were interred, and preſented him with his arrows dipt in the Hydra's blood. The Greeks at the ſiege of Troy being informed by an oracle that they could never take that city without thoſe fatal arrows, went to Philoctetes, and inſiſted upon his diſcovering where he had left his friend; when Philoctetes, to evade the guilt of perjury, let them know where Hercules was intombed, by ſtamping upon the place: but he was puniſhed for the violation of his oath, by dropping an arrow upon that foot; which, after giving him great agony, was at length cured by Macaon. He was afterwards taken by Ulyſſes to the ſiege of Troy, where he killed Paris with one of his arrows.

PHILOLAUS, of Crotona, was a celebrated philoſopher of antiquity, of the ſchool of Pythagoras, to whom that philoſopher's *Golden Verſes* have been aſcribed. He made the heavens his principal object of contemplation; and has been idly ſuppoſed to have been the author of that true ſyſtem of the world which Copernicus afterwards revived. This made Bullialdus place the name of Philolaus at the head of two works written to illuſtrate and confirm that ſyſtem.

"He was (ſays Dr. Enfield) a diſciple of Archytas, and flouriſhed in the time of Plato. It was from him that Plato purchaſed the written records of the Pythagorean ſyſtem, contrary to an expreſs oath taken by the ſociety of Pythagoreans, pledging themſelves to keep ſecret the myſteries of their ſect. It is probable, that among theſe books were the writings of Timæus, upon which Plato formed the dialogue which bore his name. Plutarch relates, that Philolaus was one of the perſons who eſcaped from the houſe that was burned by Cylon, during the life of Pythagoras; but this account cannot be correct. Philolaus was contemporary with Plato, and therefore certainly not with Pythagoras. Interfering in affairs of ſtate, he fell a ſacrifice to political jealouſy.

"Philolaus treated the doctrine of nature with great ſubtlety, but at the ſame time with great obſcurity; referring every thing that exiſts to mathematical principles. He taught, that reaſon, improved by mathematical learning, is alone capable of judging concerning the nature of things; that the whole world conſiſts of infinite and finite; that number ſubſiſts by itſelf, and is the chain which by its power ſuſtains the eternal frame of things; that the Monad is not the ſole principle of all things, but that the Binary is neceſſary to furniſh materials from which all ſubſequent numbers may be produced; that the world is one whole, which has a fiery centre, about which the ten celeſtial ſpheres revolve, heaven, the ſun, the planets, the earth, and the moon; that the ſun has a vitreous ſurface, whence the fire diffuſed through the world is reflected, rendering the mirror from which it is reflected viſible; that all things are preſerved in harmony by the law of neceſſity; and that the world is liable to deſtruction both by fire and water. From this ſummary of the doctrine of Philolaus, it appears probable, that, following Timæus, whoſe writings he poſſeſſed, he ſo far differed from the Pythagorean ſyſtem, as to conceive two independent principles in nature, God and Matter; and that it was from the ſame ſource that Plato derived his doctrine upon this ſubject."

PHILOLOGY.

UNDER the term PHILOLOGY, ſome comprehend univerſal literature; ſo that each one may there include whatever he thinks proper; as grammar, rhetoric, poetry, antiquities, hiſtory, criticiſm, the interpretation of authors, &c. This ſeems to be not only making an abuſe of words, but creating confuſion in thoſe matters where too much regularity and preciſion cannot be obſerved. The term *philology* is compoſed of the Greek words φιλος and λογος, which imply "a love or ſtudy of lan-"guages." It appears, therefore, that philology is nothing more than a general knowledge of languages, of the natural and figurative ſignification of their words and phraſes, and, in ſhort, of all that relates to expreſſion in the different dialects of nations, as well ancient as modern.

As, in treating of GRAMMAR, we have given thoſe general rules which are applicable to all poſſible languages; we ſhall here confine our obſervation to the languages themſelves, and to thoſe general ideas which philology offers, without leading our readers through all the paths of an immenſe labyrinth.

Languages in general may be divided into,

1. *Ancient languages;* which are thoſe that have become extinct with the people who ſpoke them, or have been ſo altered and diſfigured that they no longer reſemble the languages which were ſpoken by thoſe people.

2. *Oriental languages;* the ſtudy of which is neceſſary in order to the underſtanding of the text of the holy ſcriptures, eſpecially the Old Teſtament.

3. *Learned languages;* which are thoſe that are indiſpenſably neceſſary in the ſtudy of erudition, and particularly literature; which, while there were people in the world who made them their common language, were called *living;* but as no nation now makes uſe of them, they are called *dead languages*, and are therefore to be learned from books or in ſchools.

4. *Modern languages:* in which are diſtinguiſhed, firſt, the common languages of the European nations; and ſecondly, the languages of the people who inhabit the three other parts of the world.

SECT. I. *Ancient Languages.*

1. OF the languages that were ſpoken by the firſt inhabitants of the world, till the deſtruction of the tower of Babel, there are not now the leaſt traces remaining; though ſome zealous theologians pretend that it was the Hebrew as it is found in the Bible, or at leaſt the ancient Chaldean: but all this is mere conjecture; and it is certain, on the contrary, that every veſtige of thoſe languages has been totally deſtroyed by time. The ancient languages that have been in uſe in the different parts of the world ſince that period, and the knowledge of which, more or leſs imperfect, has come down to us, are,

1. The Chaldean.
2. The Syriac and Eſtrangetic.
3. The Arabic.
4. Coptic or ancient Egyptian.
5. Ancient Ethiopian.
6. Ancient Indian.
7. Ancient Phœnician, which is alſo called the *Ionic Phœnician.*
8. Punic or Carthaginian.
9. Scythian, and the Scythian of the Huns.
10. Cyrillian.
11. Glagolitic.
12. Braminian, or Brahmanian.
13. Æolian or Æolic.
14. Jacobitian.
15. Celtic.
16. Saracen.
17. Ancient Eſclavonian.
18. Gothic.
19. Hetruſcan.
20. Mangiurian; of which the Maronites, Neſtorians, and ſometimes the Jacobites, made uſe.
21. Hieroglyphic.
22. Runic.
23. Ancient Vandalian.
24. Ancient Germanic.

And perhaps ſome others that may be known to philologiſts. To theſe may be added,

25. The different alphabets, idioms, and methods of ſpeaking and writing in the middle age.

Philology is therefore employed in making learned reſearches not only into theſe languages, but into many others, which we ſhall enumerate in the courſe of this article. It preſcribes rules, lays down precepts, points out principles, furniſhes etymologies, and makes all the neceſſary remarks for the underſtanding and

attainment of every known language. It ſhows the uſe that may be made of each particular language; in what country, and by what people, it has been ſpoken; and explains, as far as is poſſible, all the obſcurities and ambiguities that attend the ſtudy of each language.

When the alphabet of a language is once diſcovered and well underſtood, we may eaſily attain, or at leaſt with much leſs difficulty, the knowledge of the reſt. Beſide numberleſs philological works, with which each library is crowded, they have, in Germany, a ſmall treatiſe that is very curious and very inſtructive, entitled, *The new A. B. C. in a hundred languages:* or, "Fundamental inſtructions for teaching the youngeſt ſcholars not only German, Latin, French, and Italian, but alſo the oriental and other languages, as well as the pronunciation and knowledge of theſe different languages:" Leipſic, publiſhed by Geſner, 1743. In this book are contained the alphabets and firſt elements of a hundred different languages, as well ancient as modern. This work was reprinted in 1740, and very conſiderably augmented under the title of *The maſter of the oriental and occidental languages*. To this has been added the Lord's prayer, in two hundred languages ancient and modern, in the characters proper to each, with the dialect or manner of pronouncing the prayer; which contributes greatly to facilitate the attaining an idea of theſe languages. The author of this equally curious and inſtructive book is M. John Frederic Frits; and he was aſſiſted by the Daniſh miſſionary Schults of Hall. The ſucceſſors of Homann of Nurenburg have alſo publiſhed four geographico-philological maps, deſigned by Godfrey Henſel, which bear the following titles: 1. *Europa polyglotta, linguarum genealogiam exhibens, una cum litteris ſcribendique modis omnium gentium:* 2. *Aſia;* 3. *Africa*, with the ſame title: and, 4. *America, cum ſupplementis polyglottis*. The four parts of the world are engraved and coloured on theſe maps; but in every country, inſtead of the names of its cities and provinces, is ſeen the beginning of the Lord's prayer, in the characters uſed in that country; ſo that, with a ſingle glance of the eye, we ſee all the languages that are in uſe in all parts of the known world. Theſe maps are highly curious, and have doubtleſs coſt the inventors immenſe labour.

Books which teach the particular rules of a language, called *grammars, rudiments*, &c.; and thoſe that contain the words and phraſes, *dictionaries, lexicons, lexical manuals, vocabularies*, &c. Philology ſhews the manner in which theſe books are to be made, and the precautions that are to be obſerved to render them inſtructive and agreeable; the method of treating ſynonymous terms, the gradations that are among words ſeemingly ſynonymous, and many other like matters. It ſhews alſo the reciprocal influence which the genius and manners of a people have on their language; and their language on their general method of thinking; their manners, urbanity, and refinement.

But as it is impoſſible to perceive all the force and elegance of the various alluſions, metaphors, and compariſons in a language, eſpecially in an ancient language, if we are not properly inſtructed in their manners, cuſtoms, ceremonies, laws, arts, ſciences, and profeſſions, and other peculiarities of the nation by whom they have been uſed, and whoſe natural idiom they formed; Philology, in order to know the true origin, etymology, and ſignification of the words, terms, and phraſes of a language, remounts to the moſt diſtant ages, and, employing all the aids it can receive from literature, it makes uſe of antiquities, numiſmatics, and diplomatics, in fixing the meaning of each term and mode of expreſſion, and by theſe means renders languages and authors intelligible, clear, and agreeable.

Theſe languages, which are no longer in common uſe, can only be learned by books or manuſcripts. But as theſe have come down to us by the means of copying, they have conſequently been frequently mutilated, altered, diminiſhed and diſfigured, by thoſe who have copied them; the text, in general, or at leaſt many paſſages of theſe books and manuſcripts, is unintelligible at the firſt reading. From hence there has ariſen in modern Europe a particular ſcience, that is called the *Criticiſm of Languages*, which makes a part of philology, and is employed, 1. In examining the authenticity and truth of the text; 2. In diſcovering and pointing out the means of correcting the text; 3. In reſtoring ſuch paſſages as have been altered, omitted, or mutilated; 4. In explaining the true ſenſe of the text; and, 5. In eſtabliſhing a language by theſe means in its full primitive perfection, and making it perfectly intelligible to modern times. The celebrated M. le Clerc has given us an admirable work on this ſubject, entitled *Ars Critica*, in which he explains, with equal genius and ſolidity, the rules of ſound philological criticiſm.

That which is of the greateſt uſe in underſtanding and interpreting an obſcure or imperfect paſſage, or an unintelligible word or phraſe, is *confrontation*. The beſt confrontation is that which is made by comparing an author, book, or manuſcript, with itſelf; by examining if the ſame word, matter, or phraſe, is not repeated elſewhere, or in equivalent expreſſions. This is the moſt certain method, and produces an authentic interpretation. The ſecond method is to confront a writer with his cotemporaries of the ſame nation: and the third conſiſts in comparing him with other authors who have written at different times, and in the ſame language.

Sect. II. *Oriental Languages.*

Though moſt of the languages we have enumerated in the preceding ſection, and many of thoſe we ſhall mention in the fourth, have been, or are ſtill, in uſe in the eaſtern countries, we here underſtand, however, by the term *oriental*, thoſe only which are eſſentially neceſſary to the underſtanding, and interpreting, in an exegetic manner, the holy writings, eſpecially thoſe of the Old Teſtament; and for this reſtriction of the term we have the authority of a great number of learned men, who by the oriental languages underſtand only the Hebrew, Chaldean, Syriac, Arabic, and Coptic; to which we ſhall add the Samaritan, Rabbinic, and Talmudic. Theſe eight languages merit a more particular examen, as they ſerve to eſtabliſh the foundations of the Chriſtian religion, and make a conſiderable part of the ſtudy of a Theologian.

I. The Hebrew, Arabic, and Chaldean, reſpectively claim the right of ſeniority: each of them has its advocates; and the point is not eaſy to be decided. Moſt zealous divines are inclined to favour the Hebrew; and there are ſome of them who pretend that it was the language in which God talked with Adam in paradiſe, and that the ſaints will make uſe of it in heaven in thoſe praiſes which they will eternally offer to the Almighty. Theſe doctors ſeem to be as certain with regard to what is paſſed as what is to come. Some philologiſts give the priority to the Arabic, and others to the Chaldean. This difference is the more difficult to be reconciled, as Moſes was not born till 2464 years after the creation, and in Egypt; that is to ſay, 700 years after the deſtruction of the tower of Babel, when all languages were mixed and confounded; for we have no proof, nor even any account, that the Hebrew was exempted, and preſerved its purity amidſt the general confuſion. There is not, moreover, at this time, any one work of antiquity exiſting that is wrote in Hebrew, except the Old Teſtament; and of that there are even ſome parts in Chaldaic; and words of that and other languages are to be found diſperſed in different parts of it.

There is one more remark we muſt here make. The firſt time we find the word *Hebrew* in the Bible, is in the 13th verſe of the xivth chapter of Geneſis; and it is manifeſt that Abraham and his deſcendants took that name from the patriarch *Heber*,

the ſon of Salah, and third grandfather of Abraham: it is therefore evident, that in the time of Abraham this name was that of a family, and not of a people who had a ſeparate language. We are therefore to ſuppoſe, that Abraham, and the patriarchs after him, ſpoke the cuſtomary language of the country where they lived: that this language changed by degrees, as all living languages have done and ever will do: that Jacob and his ſons having paſſed into Egypt, they and their deſcendants, under the name of the *Children of Iſrael*, did not preſerve the language of their fathers in all its purity; but that they mixed with it many expreſſions borrowed from foreign languages, and eſpecially from the Egyptian and Coptic: that Moſes wrote in the Hebrew language, as the children of Iſrael then ſpoke it: that the other books of the Old Teſtament were wrote ſtill later; and that it is almoſt impoſſible for this language to have been preſerved without any alteration.

As we have no Hebrew but what is contained in the Holy Bible, this language muſt naturally be deficient of many words; not only becauſe all the ancient languages, but eſpecially thoſe of the firſt ages, were not ſo copious as the modern; but there were in thoſe times fewer objects to be named; and the ſacred authors, moreover, had not occaſion to treat on all ſubjects. The Hebrew language, however, is ſuſceptible of all the ornaments of diction, and is very expreſſive. It is not, beſide, ſo difficult to learn as ſome have imagined. The ſtyle of the Pſalms, of the book of Job, and of all that is written in a poetic manner, is the moſt difficult to underſtand. That of Iſaiah is noble and elegant, worthy of an author who was of the houſe of David, and the nephew and grandſon of a king. But, notwithſtanding all the labours of the learned for ſo many centuries, we are very far from having a perfect knowledge of the Hebrew language: this inconvenience is the greater, as it gives occaſion to many imperfect tranſlations, which diſfigure the true ſenſe of the original text; and, what is ſtill more, they have founded, on theſe paſſages wrong interpreted, a belief of events that have never arrived in the manner predicted; and even ſometimes religious dogmas.

The Hebrew language had originally no vowels. They are marked in the maſſorets by points under the conſonants. This language is written and read from the right to the left: it has thirteen letters, which grammarians divide into guttural, palatic, dental, labial, and gingival. They now diſtinguiſh only five vowels in Hebrew, which are the ſame as ours, *a, e, i, o, u*. But they divide each vowel into two or three; as *long, ſhort, ſhorteſt*. The articles, pronouns, &c. are placed after the ſubſtantive; and the ſame word is ſometimes ſubſtantive, adjective, and verb. The punctuation and accent are the objects that require the greateſt attention in the Hebrew language: they count near forty accents; and there are many whoſe uſe is ſtill unknown. They ſerve in general to diſtinguiſh, 1. The period and its members, as the points do in other languages; 2. To determine the quantity of ſyllables; and, 3. To mark the tone that is to be obſerved in chanting them. Nineteen of theſe accents are alſo called by grammarians, *diſtinctivi* or *accentus regii;* and the others *conjunctivi, ſervi*, or *miniſtri*. There is, properly ſpeaking, only one conjugation in this language, which is of itſelf ſimple, but is varied in each verb by ſeven or eight different manners, that form in fact ſo many different conjugations, and give a great number of expreſſions, to repreſent by one word the various modifications of a verb. Theſe are the principal characteriſtics of the Hebrew, as we find it in the Holy Scriptures; and which, taken all together, forms a very regular and analogous language.

II. The *Chaldean* is that which was ſpoken in Chaldea. Some ſay that it is a dialect derived from the Hebrew, and others that the Hebrew is a dialect of the Chaldean. This language has twenty-five letters; the forms of which are very different from the Hebrew. It is in like manner wrote from the right to the left.

The *Syriac* is alſo conſidered as a dialect of the Hebrew. It has twenty-two letters, which have the ſame names with the Hebrew, but are of very different forms.

The *Arabic*, or the language of the Arabians, is in like manner a dialect of the Hebrew. It has twenty-eight letters, the names of which have a good deal of reſemblance to the Hebrew; but their characters are alſo very different.

The *Coptic* is the ancient language of the Egyptians, but mixed in proceſs of time with much of the Greek. We have already ſaid, in the preceding ſection, that the late M. de la Croſe has in a manner re-eſtabliſhed this language, when we ſcarce knew more than the name of it; and that he has compoſed a Coptic grammar and dictionary. F. Kircher, it is true, had before publiſhed a Coptic vocabulary and kind of grammar, but very incomplete. There are thirty-two letters in its alphabet, but the characters are almoſt entirely Greek. There has been no book found in this language but tranſlations of the Holy Scriptures, or eccleſiaſtic offices, &c.

III. The *Samaritan* is another dialect of the Hebrew. The Samaritans were Jews, and their city Samaria was in Judea. They followed the law of Moſes with more rigour, more after the letter than the Hebrews. There is a Samaritan copy of the Pentateuch, which differs indeed but little from that of the Jews in Hebrew: but it is written in different characters, that are commonly called *Samaritan;* and which Origen, St. Jerom, and many other writers, as well ancient as modern, ſuppoſe to be the firſt letters of the Hebrews. There are alſo medals that are called *Samaritan;* they have Hebrew inſcriptions, in characters different from thoſe of our Hebrew Bible, and which are called *ſquare Hebrew*. For a further account of the Samaritan language, conſult M. Simon in his Cuſtoms and Ceremonies of the Jews, Eduardi Bernhardi Lexicon Samaritanum, F. Kircher, M. Buxtorff, M. de Spanheim, F. Morin, M. Walton, and a great number of other writers.

IV. The *Rabbinic*, or the Hebrew of the Rabbins, is the language of which they have made uſe in their works. The body of it is compoſed of Hebrew and Chaldaic, with divers alterations in the words of thoſe two languages, whoſe ſignifications they have much extended. They have likewiſe borrowed greatly from the Arabic. The reſt is compoſed of words taken for the moſt part from the Greek, with ſome from the Latin, and others from various modern languages, eſpecially that of the country in which each rabbin lived. For we ſhould remember here, that after the return from the laſt captivity, they ſpoke ſcarce any pure Hebrew at Jeruſalem and in Judea, but Greek mixed with ſome Hebraic expreſſions: the Romans afterward entering Paleſtine, and becoming conquerors of that country, ſpoke their own language there; and at laſt the Jewiſh nation was totally diſperſed. We ſhall only add, that the Rabbinic is a very copious language; and that there is ſcarce any part of ſcience of which the Rabbins have not treated, but always with an enthuſiaſm that is natural to them: there have been among them even poets and orators.

V. The *Talmudic* is another dialect or particular idiom of the Hebrew, in which the Talmud, or the book compoſed by the Jews, that contains all the explications of their law, is written. This language differs greatly from the pure Hebrew. M. Buxtorff has compoſed a Chaldaic, Talmudic, and Rabbinic dictionary. We have alſo a work of the emperor Conſtantine, entitled *Clavis Talmudica;* and one of Otto, called *Vitæ doctorum miſnicorum;* beſide ſeveral others.

Sect. III. *Of thoſe Languages that are called dead.*

Languages in general, properly ſpeaking, form no ſcience that can enrich the mind with real knowledge, but are to be

conſidered as introductions to the ſciences; as keys that open to us the ſanctuaries of erudition. In order to attain the knowledge of antiquity in its full extent, the knowledge of thoſe languages that were then in uſe is of great utility: and properly to judge of modern nations, it is almoſt indiſpenſably neceſſary to be acquainted with the principal languages which are now uſed in the world. There are two languages, however, which are called *learned* by way of eminence, and thoſe are the Greek and the Latin. The former of theſe not only enables us to read the maſterly productions of genius of ancient Greece, but alſo to form a true judgment of all its antiquities, and of its different ages, which form the moſt entertaining and intereſting periods for the ſciences and polite arts of all ancient times. The latter affords us the means of underſtanding the original texts of all the admirable works of the moſt celebrated Latin authors, and of becoming acquainted with the city, republic, and monarchy of Rome, as if we had been preſent with them; and of forming a ſolid judgment of thoſe precious Roman antiquities of every kind that are ſtill remaining among us.

But that which has given the Latin an advantage even over the Greek itſelf, that has rendered it indiſpenſable to every man of letters, and has made it the baſis of erudition, is, that during the middle age, and in general in all modern times, the learned of all Europe have made it their common and univerſal language; ſo that the Latin forms, if we may uſe the expreſſion, the natural language of the ſciences.

I. All that is written in *Greek* cannot be properly ſaid to be in the ſame language; for we ſhould carefully diſtinguiſh,

(1.) The ancient or literal Greek; an admirable language, in which are written the works of Xenophon, Thucydides, Demoſthenes, Plato, Ariſtotle, Homer, Sophocles, &c. works that have preſerved this language in all its purity, and that will make it, with themſelves, immortal. There are, however, ſeveral idioms or dialects in this tongue, among which four are reckoned principal; and theſe are, 1. The Attic, which is the moſt eſteemed; 2. The Ionic; 3. The Æolic; and, 4. The Doric; which was a kind of ruſtic dialect, and in which are written eclogues, idyls, and other paſtorals. We muſt obſerve by the way, that all theſe four dialects are to be found in Homer, and produce an odd effect in an heroic poem, notwithſtanding the univerſal approbation that is given to this poet. The Greek language is very copious in words, and its inflexions are as various as they are ſimple in moſt modern languages. It has three numbers; the ſingular, dual, and plural; and many tenſes in its verbs, which afford great variety of expreſſion. The uſe of the participles of the aoriſt, and of the preterite, and of compound words, which are very numerous in this language, give it force and brevity, without in the leaſt diminiſhing its perſpicuity. Proper names have alſo a meaning in this as in the oriental languages; and the learned there find likewiſe the character of their origin. The dialect itſelf, or the pronunciation, is ſonorous, ſoft, harmonious, and delightful: in a word, the Greek is the language of a polite nation, that had a taſte for all the arts and ſciences.

(2.) The Greek of the middle age. The ancient Greek ended at the time that Conſtantinople became the capital of the Roman empire; though there were after that time ſeveral works, and ſome by the fathers of the church, which were wrote in Greek, and with ſufficient purity: but as theology, law, civil and military policy, the alteration of cuſtoms and manners, &c. introduced ſucceſſively a great number of words that were before unknown, theſe novelties by degrees altered and corrupted the language. The natural elegance of the ancient Greek was no longer to be found. Thoſe men of exalted genius, who conſtantly give a true beauty to a language, were no more. And what could be expected from a barbarous age, and from authors that were even below a moderate capacity?

(3.) The modern or vulgar Greek. It commenced at the taking of Conſtantinople by the Turks, and is the language that is now commonly ſpoke in Greece, without any regard to improvement. The wretched ſtate to which the Greeks are reduced by the Turks, renders them indolent, and, by a neceſſary conſequence, ignorant. The policy of the Ottoman Porte does not permit its ſubjects to apply themſelves to ſtudy; and that ſame ſpirit which has deſtroyed the fineſt monuments of antiquity, which has made, of columns of porphyry and granite, balls for their cannons, has cauſed the decadency and total deſtruction of the ſciences. The principal difference between the ancient and vulgar Greek conſiſts in the terminations of their nouns, pronouns, verbs, and other parts of ſpeech. There are alſo in the modern many words that are not to be found in the ancient Greek; particles that appear to be expletives, and which cuſtom alone has introduced to diſtinguiſh certain tenſes of their verbs; names of employments and dignities unknown to the ancient Grecians, and a great number of words taken from modern tongues: which altogether form a ſpurious language, a kind of jargon. There is a gloſſary of this language compoſed by Du Cange.

(4.) The Greek of the New Teſtament. The Greek of the Evangeliſts and Apoſtles is very different from that of Thucydides, Xenophon, and Demoſthenes. At the time of the birth of our Saviour, Greek was commonly ſpoken in Judea; for, after the laſt captivity, the people no longer underſtood Hebrew: their Greek, however, was corrupted; mixed with a great number of Hebraiſms; with words and terms that related to the worſhip, to the laws, policy, manners, and cuſtoms of the Jews; by which means it became a vulgar language, a provincial and rude dialect, in compariſon of the ancient or literal Greek. He that underſtands the New Teſtament will not in conſequence underſtand Homer. It may appear ſurpriſing, that Joſephus, the Jewiſh hiſtorian, who lived at the time of the deſtruction of Jeruſalem, about 40 years after the death of Chriſt, ſhould be able to write Greek with ſo much purity and elegance: but he was at once a courtier, a miniſter, a general, and a man of letters; had ſtudied the Greek language, and had ſpoken it at the court of Veſpaſian in Rome. For the ſame reaſon St. Paul alſo wrote better Greek than the Evangeliſts and other Apoſtles.

From all that has been ſaid, it is apparent how much utility attends the ſtudy of the Greek tongue, and how much reaſon the Engliſh have for applying themſelves to it in their early youth. There are, moreover, in modern languages, an infinity of terms in the arts and ſciences, as moſt of thoſe in aſtronomy, mathematics, phyſic, anatomy, botany, and the names of many machines, inſtruments, and other modern inventions, that are either altogether Greek, or derived from it; which renders this language in a manner indiſpenſable to a man of real learning. We cannot, laſtly, determine if modern nations pronounce the Greek language in the manner that the ancient inhabitants of Greece did; but it is very probable, that if Demoſthenes or Ariſtides were now to come upon the earth, they would be very far from underſtanding what our learned men ſhould ſay to them in Greek.

II. The *Latin* is the ſecond of thoſe languages that are called dead. It was firſt ſpoke in Latium, afterwards at Rome; and by means of the Latin church, and of the labours of the learned, has come down to us. The Latin is not an original tongue; but is formed of the Greek, and eſpecially of the Æolian dialect, and of many words taken from the languages of the Oſci, the Hetrurians, and ſeveral other ancient nations of Italy. It has had different periods of improvement and decadency, which form its different ages.

1. The firſt age comprehends the ancient Latin that was ſpoke in Latium, and cultivated at Rome from its firſt founda-

tion, under the reigns of its kings, and in the firſt ages of its republic. At the beginning, the Latin tongue was, ſo to ſay, incloſed within the walls of Rome; for the Romans did not commonly permit the uſe of it to their neighbours, or the people they conquered: but when they came to perceive how neceſſary it was for facilitating their commerce, that the Latin tongue ſhould be ſpoken every where, and that all nations in ſubjection to their empire ſhould be united by one common language, they then obliged thoſe they conquered to adopt their language. It is eaſy to conceive what muſt have been the original language of a ſet of freebooters, without manners, and without arts or ſciences: this jargon muſt beſide have been neceſſarily mixed with the language of the Sabines, from whom they ſtole their wives, and with thoſe of ſeveral other foreign nations whom they had conquered, or who were incorporated with their republic. But in proportion as the Romans became poliſhed, their language became refined. There are but very few works of the firſt age now remaining; among which are reckoned thoſe of Ennius, &c.

2. The ſecond age of the Latin language began about the time of Cæſar, and ended with Tiberius. This is what is called the *Auguſtan age*, which was perhaps of all others the moſt brilliant; a period at which it ſhould ſeem as if the greateſt men, and the immortal authors, had met together upon the earth, in order to write the Latin language in its utmoſt purity and perfection. This age, and the language of this age, are ſo well known, and we have ſo great a number of works produced at this period, as makes it unneceſſary for us to ſay any thing further of it here.

3. The third age begins with the reign of Tiberius. Seneca ſeems to have contributed not a little to have deprived the Latin language of its energy and dignity, and to have ſubſtituted the little tricks of ſtyle in its ſtead, and ſometimes thoſe childiſh expreſſions which the Italians call *concetti*. Even Tacitus appears not to have been quite free from theſe faults; for his conciſe and ſententious ſtyle is not that of the golden age; nor likewiſe is that of the poet Lucian.

4. The fourth age of the Latin tongue is that of the remainder of the middle age, and the firſt centuries of modern times; during which this language fell by degrees into ſo great a decadency, that it became nothing better than a barbarous jargon. It is to the ſtyle of theſe times that is given the name of *low Latin*; and in fact it was ſo corrupted, altered, and mixed with foreign expreſſions, that M. du Cange has formed a voluminous gloſſary, which contains thoſe words and phraſes only that are uſed in the Low Latin, and which we ſhould not be able to underſtand without ſuch helps. What indeed could be expected from this language, at a time when the barbarians had taken poſſeſſion of all Europe, but eſpecially of Italy; when the empire of the Eaſt was governed by idiots; when there was a total corruption of morals; when the arts and ſciences were in a manner annihilated; when the prieſts and monks were the only men of letters, and were at the ſame time the moſt ignorant and futile mortals in the world? Under theſe times of darkneſs, we muſt therefore rank that Latin which is called *lingua eccleſiaſtica*, and which we cannot read without diſguſt.

5. The fifth and laſt age of the Latin tongue is that which began with the 16th century, and was that of Leo X. Cha. V. Francis I. Henry VIII. of England, &c. A happy period, and ever memorable for the reſtoration of letters, of arts and ſciences, of manners, and of the powers of the human mind, which till then ſeemed to have remained in a perpetual ſtupor. It is neceſſary to remember here, that the art of printing was not invented till about the year 1441; and that the manuſcripts of the ancient Greek and Latin authors were become extremely ſcarce, and highly valuable; ſo that but few private perſons were able to procure them, and to ſtudy the Latin of the Auguſtan age. But ſince that time we have had many Latin works, as well in verſe as proſe, in a ſtyle that we cannot ſufficiently admire; and which, though not altogether ſo pure and elegant as thoſe of the golden age, yet are not much inferior.

There are, however, in the Latin, and in all dead languages, two great inconveniences which continually attend them with regard to modern ages. The firſt conſiſts in the pronunciation. As to what concerns the Latin, each nation pronounces it after the manner of its own language, and each of them imagines their pronunciation to be the beſt. It may be proved, however, by many arguments, that no man now upon earth pronounces Latin in the ſame manner as did Horace and Cicero. The ſecond inconvenience is the deficiency of the Latin language with regard to us, as it has not terms whereby to expreſs thoſe inventions and diſcoveries of every kind that have been made ſince the exiſtence of the Roman empire. There are no Latin words for any of the furniture that ſurrounds us, for three-fourths of the diſhes that come upon our tables, for the dreſs we wear, for our inſtruments of war and navigation, for civil and military employments, and, in a word, for all our daily occupations. It is droll enough to hear our authors call a cannon *bombarda*; a peruke, *capilamentum*; and a button of our clothes, *globulus*, &c. Whoever ſhall doubt the propriety of this obſervation, need only read the eſſays that ſome able Latiniſts have made in our days to write gazettes in that language, and they will there ſee the pains thoſe writers have taken, and the ill ſucceſs they have had. We ſhall ſay no more of a language which every ſcholar learns from his infancy, which is taught over all Europe in ſchools and colleges, and of which there are grammars, dictionaries, and other inſtructive books without number.

Sect. IV. *Modern Languages.*

If we call all the different dialects of the various nations that now inhabit the known earth, languages, the number is truly great; and vain would be his ambition who ſhould attempt to learn them, though but imperfectly. We will begin with naming the principal of them: There are three which may be called original or mother-languages, and which ſeem to have given birth to all that are now ſpoken in Europe. Theſe are the *Latin*, *German*, and *Sclavonian*. From the Latin are derived the languages of all thoſe nations which inhabit the ſouthern and moſt weſtern countries of this part of the world; from the German, all thoſe of the nations who inhabit the centre and the northern regions; and from the Sclavonian, all the languages of the people who dwell in the moſt eaſtern part of Europe. The Sclavonian is extended even to Aſia, and is ſpoken from the Adriatic ſea to the northern ocean, and almoſt from the Caſpian ſea to Saxony. But it muſt not be imagined, from the term *original* which is given to theſe languages, that they have come down to us from the confuſion at Babel without any alteration. No; we have already ſhown, in the preceding ſection, of what languages the Latin was formed. With regard to the German, it may be very juſtly ſuppoſed to have been the ancient language of the inhabitants of Germany, as the names of their divinities and heroes (*Mann*, *Erta*, *Hermann*, &c. appellative names; which ſtill ſignify "man, earth, chief of an army," &c.) ſeem to confirm that opinion. But it is indubitable, that the ancient German has been mixed and corrupted by the languages of thoſe northern nations which in the fourth century deluged Europe; and who, when they penetrated Italy and Africa, did not merely paſs through Germany as an army that marches in regular order, but remained there a conſiderable time, and mixed with the natives of the

country. All these Scythian or Celtic people acquired likewise in Germany the name of *Allamands*, or "Germans;" some were called *Goths*, that is, "good;" others *Quades*, or "bad;" others *Huns*, or "dogs;" others *Normans*, or "men from the north;" and so of the rest. And those nations were from that time known and distinguished by these denominations.

I. With regard to the Sclavonian, it is supposed to be in part the ancient language of the Celtes or Scythians, mixed with some particular dialects of different eastern nations. But be that as it may, these three languages appear to have produced the following modern tongues:

From the *Latin* came,

1. The Portuguese.
2. Spanish.
3. French.
4. Italian.

From the *German* or *Allamand*,

5. The modern German; which so little resembles the ancient, that it is with difficulty we read the authors of the 14th century.
6. The low Saxon or low German.
7. The Dutch.
8. The English; in which almost all the noun-substantives are German, and many of the verbs French, Latin, &c. and which is enriched with the spoils of all other languages.
9. The Danish.
10. The Norwegian.
11. Swedish.
12. Dalecarlian.
13. Laplandish.

From the *Sclavonian*,

14. The Polonese, with a mixture of the ancient Sarmatian.
15. The Lithuanian.
16. Bohemian.
17. Hungarian.
18. Transylvanian.
19. Moravian.
20. The modern Vandalian, as it is still spoken in Lusatia, Prussian Vandalia, &c.
21. The Croatian.
22. The Russian or Muscovite.
23. The language of the Calmucs and Cossacs.
24. Thirty-two different dialects of nations who inhabit the north-eastern parts of Europe and Asia, and who are descended from the Tartars and Huno-Scythians. There are polyglott tables which contain not only the alphabets, but also the principal distinct characters of all these languages.

To all these may be added,

25. The modern Greek, or that which is now spoken in Greece.
26. The modern Hebrew, or vulgar language of the Jews, which is also called the *German Hebrew*, &c. And,
27. The jargon that is called *Lingua Franca*.

II. The common languages of Asia are,

28. The Turkish and Tartarian, with their different dialects.
29. The Persian.
30. The Georgian or Iberian.
31. The Colchic or Mingrelian.
32. The Albanian or Circassian.
33. The Armenian.

(29–33: These languages are spoke by the Greek Christians in Asia, under the patriarch of Constantinople.)

34. The language of the Jews in Persia, Media, and Babylon.
35. The modern Indian.
36. The Formosian.
37. The Indostanic.
38. The Malabarian.
39. The Warugian.
40. The Talmulic or Damulic.

(36–40: The Dutch missionaries who go to Tranquebar, print books at Halle in these languages.)

41. The modern Arabic.
42. The Tangutian.
43. The Mungalic.
44. The language of Balabandu, and the Nigarian or Akar Nigarian.
45. The Grusinic or Grusinian.
46. The Chinese.
47. The Japonese.

We have enumerated here those Asiatic languages only of which we have some knowledge in Europe, and even alphabets, grammars, or other books that can give us information concerning them. There are doubtless other tongues and dialects in those vast regions and adjacent islands; but of these we are not able to give any account.

III. The principal languages of Africa are,

48. The modern Egyptian.
49. The Fetuitic, or the language of the kingdom of Fetu.
50. The Moroccan; and,
51. The jargons of those savage nations who inhabit the desert and burning regions. The people on the coast of Barbary speak a kind of Turkish. To these may be added the Chilhic language, otherwise called *Tamazeght*; the Negritian, and that of Guinea; the Abyssinian; and the language of the Hottentots.

IV. The languages of the American nations are but little known in Europe. Every one of these, though distant but a few days journey from each other, have their particular language or rather jargon. The languages of the Mexicans and Peruvians seem to be the most regular and polished. There is also one called *Poconchi* or *Pocomana*, that is used in the bay of Honduras and toward Guntimal, the words and rules of which are most known to us. The languages of North America are in general the Algonhic, Apalachian, Mohogic, Savanahamic, Virginic, and Mexican: and in South America, the Peruvian, Caraibic, the language of Chili, the Cairic, the Tucumanian, and the languages used in Paraguay, Brasil, and Guiana.

V. We have already said, that it would be a vain and senseless undertaking for a man of letters to attempt the study of all these languages, and to make his head an universal dictionary of languages; but it would be still more absurd in us to attempt the analysis of them in this place: some general reflections therefore must here suffice. Among the modern languages of Europe, the French seems to merit great attention; as it is elegant and pleasing in itself; as it is become so general, we may travel from one end of Europe to the other without scarce having any occasion for an interpreter; and as in it are to be found excellent works of every kind, both in verse and prose, useful and agreeable. There are, besides, grammars and dictionaries of this language which give us every information concerning it, and very able masters who teach it; especially such as come from those parts of France where it is spoke correctly; for, with all its advantages, the French language has this inconvenience, that it is pronounced scarce any where purely but at Paris and on the banks of the Loire. The language of the court, of the great world, and of men of letters, is moreover very different from that of the common people: and the French tongue, in general, is subject to great alteration and novelty. What pity it is that the style of the great Corneille, and that of Moliere, should already begin to be obsolete, and that it will be but a little time before the inimitable *chefs*

d'œuvres of thoſe men of ſublime genius will be no longer ſeen on the ſtage! The moſt modern ſtyle of the French, moreover, does not ſeem to be the beſt. We are inclined to think, that too much conciſion, the epigrammatic point, the antitheſis, the paradox, the ſententious expreſſion, &c. diminiſh its force; and that, by becoming more poliſhed and refined, it loſes much of its energy.

VI. The German and Italian languages merit likewiſe a particular application; as does the Engliſh, perhaps above all, for its many and great excellencies. (See LANGUAGE.) Authors of great ability daily labour in improving them; and what language would not become excellent, were men of exalted talents to make conſtant uſe of it in their works? If we had in Iroquois, books like thoſe which we have in Engliſh, Italian, French, and German, ſhould we not be tempted to learn that language? How glad ſhould we be to underſtand the Spaniſh tongue, though it were only to read the Araucana of Don Alonzo D'Ercilia, Don Quixote, ſome dramatic pieces, and a ſmall number of other Spaniſh works, in the original; or the poem of Camoens, in Portuguese!

VII. The other languages of Europe have each their beauties and excellencies. Among theſe, we muſt not omit to mention the *Gaelic*: a language unnoticed by the learned, and almoſt unknown, or known only to be deſpiſed under a barbarous name (Erſe), beyond the mountains where it is ſpoken, till the tranſlation of the beautiful poems of Oſſian brought it out of obſcurity, and preſented it as an object of ſtudy not unworthy the attention either of the polite ſcholar or the learned philologiſt. See the article OSSIAN; alſo the article GAELIC, in the APPENDIX.

VIII. The greateſt difficulty in all living languages conſtantly conſiſts in the pronunciation, which it is ſcarce poſſible for any one to attain unleſs he be born or educated in the country where it is ſpoken: and this is the only article for which a maſter is neceſſary, as it cannot be learned but by teaching, or by converſation: all the reſt may be acquired by a good grammar and other books. In all languages whatever, the poetic ſtyle is more difficult than the proſaic: in every language we ſhould endeavour to enrich our memories with great ſtore of words, (*copia verborum*,) and to have them ready to produce on all occaſions: in all languages it is difficult to extend our knowledge ſo far as to be able to form a critical judgement of them. All living languages are pronounced rapidly, and without dwelling on the long ſyllables (which the grammarians call *moram*): almoſt all of them have articles which diſtinguiſh the genders: all the European languages are written from the left to the right, and almoſt all the Aſiatic from the right to the left.

VIII. Thoſe languages that are derived from the Latin have this further advantage, that they adopt without reſtraint, and without offending the ear, Latin and Greek words and expreſſions, and which, by the aid of a new termination, appear to be natives of the language. This privilege is forbid the Germans, who in their beſt tranſlations dare not uſe any foreign word, unleſs it be ſome technical term in caſe of great neceſſity.

PHI

PHILOMATHES, a lover of learning or ſcience.

PHILOMELA, in fabulous hiſtory, the daughter of Pandeon king of Athens, was the ſiſter of Progne the wife of Tereus king of Thrace. That prince having raviſhed Philomela, cut out her tongue; and to conceal the knowledge of his inceſt, ſhut her up in a cloſe priſon: but the princeſs finding means to embroider her ſtory, ſent it to her ſiſter Progne; who thus becoming acquainted with her ſiſter's misfortunes, delivered her from priſon, and took her to the palace: then killing Itys, her ſon by Tereus, ſhe ſerved up his fleſh to his father; and after he had done, expoſed the child's head to his view. Tereus, in a tranſport of fury, purſued the ſiſters; but was changed into a lapwing, Progne into a ſwallow, Itys into a pheaſant, and Philomela into a nightingale.

PHILONIUM, in the materia medica, a compoſition of cordial ingredients with opium. The laſt diſpenſatory of the London college retains it under the name of *confectio opiata*.

PHILOSOPHER, a perſon verſed in philoſophy; or one who makes profeſſion of, or applies himſelf to the ſtudy of nature and morality.

PHILOSOPHER'S *Stone*, the greateſt object of alchemy, is a long-ſought for preparation, which, when found, is to convert all the true mercurial part of metal into pure gold, better than any that is dug out of mines or perfected by the refiner's art.

Some Greek writers in the fourth and fifth centuries ſpeak of this art as being then known; and towards the end of the 13th century, when the learning of the Eaſt had been brought hither by the Arabians, the ſame pretenſions began to ſpread through Europe. It is ſuppoſed that this art, called *alchemy*, was of Egyptian origin; and that, when the ancient Greek philoſophers travelled into Egypt, they brought back ſome of the allegoric language of this Egyptian art, ill underſtood, which afterwards paſſed into their mythology. Alchemy was the earlieſt branch of chemiſtry, conſidered as a philoſophical ſcience: in the other parts of chemical knowledge, facts preceded reaſoning or ſpeculation; but alchemy was originally ſpeculative. See TRANSMUTATION.

The alchemiſts ſuppoſed the general principles of metals to be chiefly two ſubſtances, which they called mercury and ſulphur; they apprehended alſo, that the pure mercurial, ſulphureous, or other principles of which they imagined gold to be compoſed, were contained ſeparately in other bodies: and theſe principles, therefore, they endeavoured to collect, and to concoct and incorporate by long digeſtions; and by thus conjoining the principles of gold, if they could be ſo procured and conjoined, it might be expected that gold would be produced. But the alchemiſts pretend to a product of a higher order, called *the elixir, the medicine for metals, the tincture, the philoſopher's ſtone*; which, by being projected on a large quantity of any of the inferior metals in fuſion, ſhould change them into fine gold; which being laid on a plate of ſilver, copper, or iron, and moderately heated, ſhould ſink into the metal and change into gold all the parts to which it was applied; which, on being properly heated with pure gold, ſhould change the gold into a ſubſtance of the ſame nature and virtue with itſelf, ſo as thus to be ſuſceptible of perpetual multiplication; and which, by continued coction, ſhould have its power more and more exalted, ſo as to be able to tranſmute greater and greater quantities of the inferior metals, according to its different degrees of perfection.

Alchemiſts have attempted to arrive at the making of gold by three methods: the firſt by ſeparation; for every metal yet known, it is affirmed, contains ſome quantity of gold; only, in moſt, the quantity is ſo little as not to defray the expence of getting it out.

The ſecond is by maturation; for the alchemiſts think mercury is the baſis and matter of all metals; that quickſilver purged from all heterogeneous bodies would be much heavier, denſer, and ſimpler, than the native quickſilver; and that by

ſubtilizing, purifying, and digeſting it with much labour, and long operations, it is poſſible to convert it into pure gold.

This method is only for mercury. With reſpect to the other metals, it is ineffectual, 1. Becauſe their matter is not pure mercury, but has other heterogeneous bodies adhering to it; and, 2. Becauſe the digeſtion, whereby mercury is turned into gold, would not ſucceed in other metals, becauſe they had not been long enough in the mines.

Weight is the inimitable character of gold, &c. Now mercury, they ſay, has always ſome impurities in it, and theſe are lighter than mercury. Could they be purged away, which they think is not impoſſible, mercury would be as heavy as gold; and what is as heavy as gold is gold, or at leaſt might very eaſily be made gold.

The third method is by tranſmutation, or by turning all metals readily into pure gold, by melting them in the fire, and caſting a little quantity of a certain preparation into the fuſed matter; upon which the fæces retire, are volatilized and burnt, and carried off, and the reſt of the maſs is turned into pure gold. That which works this change in the metals is called the *philoſopher's ſtone*. See TRANSMUTATION.

Whether this third method be poſſible or not, it is difficult to ſay. We have ſo many teſtimonies of it from perſons who on all other occaſions ſpeak truth, that it is hard to ſay they are guilty of direct falſehood, even when they ſay that they have been maſters of the ſecret. We are told, that it is only doing that by art which nature does in many years and ages. For, as lead and gold differ but little in weight, therefore there is not much in lead beſide mercury and gold. Now, if we had any body which would ſo agitate all the parts of lead as to burn all that is not mercury therein, and had alſo ſome ſulphur to fix the mercury, would not the maſs remaining be converted into gold? There is nothing in nature ſo heavy as lead except gold, mercury, and platina, which was not known to theſe reaſoners; it is evident, therefore, there is ſomething in lead that comes very near to gold. But in lead there is likewiſe ſome heterogeneous matter different both from mercury and gold. If therefore 19 ounces of lead be diſſolved by the fire, and 8 ounces be deſtroyed by theſe means, it is argued that we ſhall have the reſt good gold; the ratio of lead to gold being as 11 to 19. If then the philoſopher's ſtone can purify the mercurial matter in lead, ſo as that nothing ſhall remain but the pure mercurial body, and you can fix and coagulate this by means of ſulphur, out of 19 ounces of lead you will have 11 of gold: or, if you reduce the lead from 18 to 14, you will then have converted it into mercury; and if you farther purify this mercury to the proper ſtandard, you will have gold; provided you have but a ſulphur with which to fix and coagulate it. Such is the foundation of the opinion of the philoſopher's ſtone; which the alchemiſts contend to be a moſt ſubtile, fixed, concentrated fire, which, as ſoon as it melts with any metal, does, by a magnetic virtue, immediately unite itſelf to the mercurial body of the metal, volatilize and cleanſe off all that is impure therein, and leave nothing but a maſs of pure gold. Many frauds and artifices have unqueſtionably been practiſed in this operation, and there might be political reaſons why princes and others ſhould encourage thoſe who pretended to a power of furniſhing this inexhauſtible ſource of wealth; but it would be wrong to cenſure as impoſtors all thoſe who have declared themſelves convinced, from their own experiments, of the tranſinutability of baſe metals into gold. There are ſtrong reaſons, however, to believe that the authors have been deceived themſelves by fallacious appearances. Mr. Boyle gives an account of a proceſs by which he imagines part of the ſubſtance of gold to have been tranſmuted into ſilver. He alſo relates a very extraordinary experiment, under the title of the degradation of gold by an anti-elixir, which was publiſhed in his own life-time, and ſince reprinted in 1739. Hence many have been led to conclude in favour of the alchemical doctrine of the tranſmutability of metals. See an account of the experiment, with remarks upon it by Dr. Lewis, in his *Commerce of Arts*, ſect. 12. p. 297, &c.

"The opinion (ſays Holt in his 'Characters of the kings and queens of England,') that one metallic or other foreign ſubſtance might be changed into another, was, it ſeems, at this time (reign of Henry VI. of England) propagated by certain chemiſts, whoſe obſervations on the ſurpriſing effects and alterations produced in certain ſubſtances by the force of heat carried their imaginations beyond what ſound judgment might warrant. The firſt inſtance of which on record is in vol. xi. p. 68, of the *Fœdera*; wherein Henry VI. grants a licence to John Cobbe, freely to work in metals; he having, by philoſophical art, found out a method of transferring imperfect metals into perfect gold and ſilver.

"This pretended ſecret, known afterwards by the name of the *philoſopher's ſtone* or *powder*, was encouraged by four licences, granted to different projectors during this reign, and at ſundry times after, during this century particularly, and in ſucceeding times all over Europe. The phrenſy has not entirely ceaſed even to this day, although it meets with neither public encouragement nor countenance from men of ſober reaſon; the projectors having yet found nothing from their airy ſchemes in this mode of ſearch but certain ruin to their property."

The ſame author, when ſpeaking of the commerce of the kingdom, and the wonderful increaſe and riches of commercial cities, ſpeaks thus: "This is the true philoſopher's ſtone, ſo much ſought after in former ages, the diſcovery of which has been reſerved to genius, when ſtudying to improve the mechanic arts. Hence a pound of raw materials is converted into ſtuffs of fifty times its original value. And the metals too are not, indeed, tranſmuted into gold—they are more; for the labour of man has been able to work the baſer metal, by the ingenuity of art, ſo as to become worth more than many times its weight in gold."

PHILOSOPHIC, or PHILOSOPHICAL, ſomething belonging to PHILOSOPHY.

PHILOSOPHICAL EGG, among chemiſts, a thin glaſs body or bubble, of the ſhape of an egg, with a long neck or ſtem, uſed in digeſtions.

PHILOSOPHIZING, rules of. See NEWTONIAN *Philoſophy*, and the following article.

PHILOSOPHY,

IS a word derived from the Greek, and literally ſignifies the *love of wiſdom* *. In its uſual acceptation, however, it denotes a ſcience, or collection of ſciences, of which the univerſe is the object; and of the term thus employed many de-

* The origin uſually attributed to the term *philoſophy* has been already aſſigned in the article PHILOLOGY. M. Chauvin gives it a turn ſomewhat different. According to him, the term is derived from φιλια, *deſire* or *ſtudy*, and σοφια, *wiſdom*; and therefore he underſtands the word to mean *the deſire or ſtudy of wiſdom*; for (ſays he) Pythagoras, conceiving that the application of the human mind ought rather to be called *ſtudy* than *ſcience*, ſet aſide the appellation of *wiſe* as too aſſuming, and took that of *philoſopher*.

finitions have been given, differing from one another according to the different views of their feveral authors. By Pythagoras, philoſophy is defined *επιστημη των ὀντων*, "the knowledge of things exiſting;" by Cicero, after Plato, *ſcientia rerum divinarum et humanarum cum* CAUSIS; and by the illuſtrious Bacon, *interpretatio naturæ*. Whether any of theſe definitions be ſufficiently preciſe, and at the ſame time ſufficiently comprehenſive, may be queſtioned; but if philoſophy in its utmoſt extent be capable of being adequately defined, it is not here that the definition ſhould be given. "Explanation," ſays an acute writer, (Tatham) is the firſt office of a teacher; definition, if it be good, is the laſt of the inquirer after truth; but explanation is one thing, and definition quite another." It may be proper, however, to obſerve, that the definition given by Cicero is better than that of Pythagoras, becauſe the chief object of the philoſopher is to aſcertain the *cauſes* of things; and in this conſiſts the difference between his ſtudies and thoſe of the natural hiſtorian, who merely enumerates phenomena, and arranges them into ſeparate claſſes.

The principal objects of philoſophy are, God, nature, and man. That part of it which treats of God is called *theology*; that which treats of nature, *phyſics* and *metaphyſics*; and that which treats of man, *logic* and *ethics*. That theſe are not ſeparate and independent ſciences, but, as Bacon expreſſes it *, branches from the ſame trunk, we ſhall endeavour to ſhow, after we have given, agreeably to our uſual plan, a ſhort hiſtory of philoſophy from the earlieſt ages to the preſent day.

To attempt to aſſign an *origin* to philoſophy, would be ridiculous; for every man endeavours to aſcertain the cauſes of thoſe changes which he obſerves in nature; and even children themſelves are inquiſitive after that which produces the ſound of their drums and their rattles. Children, therefore, and the moſt illiterate vulgar, have in all ages been philoſophers. But the firſt people among whom philoſophy was cultivated as a profeſſion, was probably the Chaldeans. We certainly read of none earlier; for, though we have more authentic accounts of the Hebrews than of any other nation of remote antiquity, and have reaſon to believe that no people was civilized before them; yet the peculiar circumſtances in which they were placed rendered all philoſophical inveſtigation to them uſeleſs, and even tended to ſuppreſs the very ſpirit of inquiry. The Egyptians indeed pretended to be the firſt of nations, and to have ſpread the bleſſings of religion and the light of ſcience among every other people; but, from the earlieſt records now extant, there is reaſon to believe that the Chaldeans were a civilized and powerful nation before the Egyptian monarchy was founded.

Of the Chaldean philoſophy much has been ſaid, but very little is known. Aſtronomy ſeems to have been their favourite ſtudy; and at the era of Alexander's conqueſt of their country, they boaſted that their anceſtors had continued their aſtronomical obſervations through a period of 470,000 years. Extravagant claims to antiquity have been common in all nations †. Caliſthenes, who attended the Macedonian conqueror, was requeſted by Ariſtotle to inform himſelf concerning the origin of ſcience in Chaldea; and upon examining into the grounds of this report, he found that their obſervations reached no farther backwards than 1903 years, or 2234 years before the Chriſtian era. Even this is a remoter antiquity than Ptolemy allows to their ſcience; for he mentions no Chaldean obſervations prior to the era of Nabonaſſar, or 747 years before Chriſt. That they cultivated ſomething which they called philoſophy at a much earlier period than this, cannot be queſtioned; for Ariſtotle, on the credit of the moſt ancient records, ſpeaks of the Chaldean magi as prior to the Egyptian prieſts, who were certainly men of learning before the time of Moſes. For any other ſcience than that of the ſtars, we do not read that the Chaldeans were famous; and this ſeems to have been cultivated by them merely as the foundation of judicial aſtrology. Perſuading the multitude that all human affairs are influenced by the ſtars, and profeſſing to be acquainted with the nature and laws of this influence, their *wiſe men* pretended to calculate nativities, and to predict good and bad fortune. This was the ſource of idolatry and various ſuperſtitions; and whilſt the Chaldeans were given up to ſuch dotages, true ſcience could not be much indebted to their labours. If any credit be due to Plutarch and Vitruvius, who quote Beroſus, it was the opinion of the Chaldean *wiſe men*, that an eclipſe of the moon happens when that part of its body which is deſtitute of fire is turned towards the earth. "Their coſmogony, as given by Beroſus, and preſerved by Syncellus, ſeems to be this, that all things in the beginning conſiſted of darkneſs and water; that a divine power dividing this humid maſs, formed the world; and that the human mind is an emanation from the Divine nature."

The large tract of country which comprehended the empires of Aſſyria and Chaldea, was the firſt peopled region on earth. From that country, therefore, the rudiments of ſcience muſt have been propagated in every direction through the reſt of the world; but what particular people made the earlieſt figure, after the Chaldeans, in the hiſtory of philoſophy, cannot be certainly known. The claim of the Egyptians is probably beſt founded; but as their ſcience was the immediate ſource of that of the Greeks, we ſhall defer what we have to ſay of it, on account of the connection between the parent and the offſpring, and turn our attention from Chaldean to Indian philoſophy, as it has been cultivated from a very early period by the Brachmans and Gymnoſophiſts. We paſs over Perſia, becauſe we know not of any ſcience peculiar to that kingdom, except the doctrines of the magi, which were religious rather than philoſophical; and of them the reader will find ſome account under the words MAGI, POLYTHEISM, and ZOROASTER.

From whatever quarter India received its wiſdom, we are certain that its philoſophers were held in high repute at a period of very remote antiquity, ſince they were viſited by Pythagoras and other ſages of ancient Greece, who travelled in purſuit of knowledge. Yet they ſeem to have been in that early age, as well as at preſent, more diſtinguiſhed for the ſeverity of their manners than for the acquiſition of ſcience; and, as Dr. Enfield obſerves, to have more reſembled modern monks than ancient philoſophers. The brachmans or bramins, it is well known, are all of one tribe; and the moſt learned of them are in their own language called *Pundits* or *Pandits*. The Greek writers, however, mention a ſociety called *Samanæans*, who, voluntarily devoting themſelves to the ſtudy of divine wiſdom, gave up all private property, committed their children to the care of the ſtate, and their wives to the protection of their re-

* Convenit igitur partiri *philoſophiam* in *doctrinas* tres; *doctrinam* de *numine*, *doctrinam* de *naturâ*, *doctrinam* de *homine*. Quoniam autem partitiones *ſcientiarum* non ſunt lineis diverſis ſimiles, quæ coeunt ad unum angulum; ſed potius ramis arborum, qui conjunguntur in uno trunco, qui etiam truncus ad ſpatium nonnullum integer eſt et continuus, antequam ſe partiatur in ramos. *De aug. Scient.* lib. iii. cap. 1.

† This claim of the Babylonians is thus rejected with contempt by Cicero; "Contemnamus Babylonios, et eos, qui e Caucaſo cœli ſigna ſervantes, numeris, et motibus, ſtellarum curſus perſequuntur: Condemnemus, inquam, hos aut *ſtultitiæ*, aut *vanitatis*, aut *imprudentiæ*, qui 470 millia annorum, ut ipſi dicunt, monumentis comprehenſa continent, et mentiri judicemus, nec *fecutorum* reliquorum *judicium*, quod de ipſis futurum ſit, *pertimeſcere*." *De Divinatione*, lib. i. § 19.

lations. This ſociety was ſupported at the public expence; and its members ſpent their time in contemplation, in converſation on divine ſubjects, or in acts of religion.

The philoſophy of the Indians has indeed from the beginning been engraſted on their religious dogmas, and ſeems to be a compound of fanatic metaphyſics and extravagant ſuperſtition, without the ſmalleſt ſeaſoning of rational phyſics. Very unlike the philoſophers of modern Europe, of whom a great part labour to exclude the agency of mind from the univerſe, the Pandits of Hindoſtan allow no powers whatever to matter, but introduce the Supreme Being as the immediate cauſe of every effect, however trivial. "Brehm, *the Spirit of God*, (ſays one of their moſt revered Bramins,) is abſorbed in ſelf-contemplation. The ſame is the mighty Lord, who is preſent in every part of ſpace, whoſe omnipreſence, as expreſſed in the Reig Beid or Rigveda, I ſhall now explain. Brehm is one, and to him there is no ſecond; ſuch is truly Brehm. His omniſcience is ſelf-inſpired or ſelf-intelligent, and its comprehenſion includes every poſſible ſpecies. To illuſtrate this as far as I am able; the moſt comprehenſive of all comprehenſive faculties is omniſcience; and being ſelf-inſpired, it is ſubject to none of the accidents of mortality, *conception*, *birth*, *growth*, *decay*, or *death*; neither is it ſubject to paſſion or vice. To it the three diſtinctions of time, *paſt*, *preſent*, and *future*, are not. To it the three modes of being * are not. It is ſeparated from the univerſe, and independent of all. This omniſcience is named *Brehm*. By this omniſcient Spirit the operations of God are enlivened. By this Spirit alſo the 24 powers † of nature are animated. How is this? As the eye by the ſun, as the pot by the fire, as iron by the magnet ‡, as variety of imitations by the mimic, as fire by the fuel, as the ſhadow by the man, as duſt by the wind, as the arrow by the ſpring of the bow, and as the ſhade by the tree; ſo by this Spirit the world is endued with the powers of intellect, the powers of the will, and the powers of action: ſo that, if it emanates from the heart by the channel of the ear, it cauſes the perception of ſounds; if it emanates from the heart by the channel of the ſkin, it cauſes the perception of touch; if it emanates from the heart by the channel of the eye, it cauſes the perception of viſible objects; if it emanates from the heart by the channel of the tongue, it cauſes the perception of taſte; if it emanates from the heart by the channel of the noſe, it cauſes the perception of ſmell. This alſo invigorating the five members of action, and invigorating the five members of perception, and invigorating the five elements, and invigorating the five ſenſes, and invigorating the three diſpoſitions of the mind, &c. cauſes the creation or the annihilation of the univerſe, while itſelf beholds every thing as an indifferent ſpectator." Prelim. Diſc. of Halhed's Gentoo Laws.

From this paſſage it is plain that all the motions in the univerſe, and all the perceptions of man, are, according to the Bramins, cauſed by the immediate agency of the Spirit of God, which ſeems to be here conſidered as the ſoul of the world. But it appears from ſome papers in the Aſiatic Reſearches, that the moſt profound of theſe oriental philoſophers, and even the authors of their ſacred books, believe not in the exiſtence of matter as a ſeparate ſubſtance, but hold an opinion reſpecting it very ſimilar to that of the celebrated Berkeley. The Védantis (ſays Sir William Jones), unable to form a diſtinct idea of brute matter independent of mind, or to conceive that the work of Supreme Goodneſs was left a moment to itſelf, imagine that the Deity is ever preſent to his work, and conſtantly ſupports a ſeries of perceptions, which in one ſenſe they call *illuſory*, though they cannot but admit the reality of all created forms, as far as the happineſs of creatures can be affected by them.

This is the very immaterialiſm of Berkeley; and in proof that it is the genuine doctrine of the Bramins, the learned preſident quotes the *Bhágavat*, which is believed to have been pronounced by the Supreme Being, and in which is the following ſentence:

"Except the *firſt cauſe*, whatever may appear, and may not appear, in the mind, know that to be the mind's *Máyá*, or "deluſion," as light, as darkneſs."

We have ſhown elſewhere (ſee METAPHYSICS,) that the metaphyſical doctrines of the Bramins reſpecting the human ſoul differ not from thoſe of Pythagoras and Plato; and that they believe it to be an emanation from the great ſoul of the world, which, after many tranſmigrations, will be finally abſorbed in its parent ſubſtance. In proof of their believing in the metempſychoſis, Mr. Halhed gives us the following tranſlation of what (he ſays) is a beautiful ſtanza in the Gēētā: "As throwing aſide his old clothes, a man puts on others that are new; ſo our lives, quitting the old, go to other newer animals."

From the Bramins believing in the ſoul of the world not only as the *ſole agent*, but as the *immediate* cauſe of every motion in nature, we can hardly ſuppoſe them to have made any great progreſs in that ſcience which in Europe is cultivated under the name of *phyſics*. They have no inducement to inveſtigate the laws of nature; becauſe, according to the firſt principles of their philoſophy, which, together with their religion, they believe to have been revealed from heaven, every phenomenon, however regular, or however anomalous, is produced by the voluntary act of an intelligent mind. Yet, if they were acquainted with the uſe of fire-arms 4000 years ago, as Mr. Halhed ſeems to believe, he who made that diſcovery muſt have had a very conſiderable knowledge of the powers of nature; for, though gunpowder may have been diſcovered by accident in the Eaſt, as it certainly was in the Weſt many ages afterwards, it is difficult to conceive how mere accident could have led any man to the invention of a gun. In aſtronomy, geometry, and chronology too, they appear to have made ſome proficiency at a very early period. (See ASTRONOMY.) Their chronology and aſtronomy are indeed full of thoſe extravagant fictions which ſeem to be eſſential to all their ſyſtems; but their calculation of eclipſes, and their computations of time, are conducted upon ſcientific principles.

"It is ſufficiently known (ſays Mr. Davis in his Aſiatic Reſearches, vol. ii.) that the Hindoo diviſion of the ecliptic into ſigns, degrees, &c. is the ſame as ours; that their aſtronomical year is ſidereal, or containing that ſpace of time in which the ſun, departing from a ſtar, returns to the ſame; that it commences on the inſtant of his entering the ſign Aries, or rather the Hindoo conſtellation Méſha; that each aſtronomical month contains as many even days and fractional parts as he ſtays in each ſign; and that the civil differs from the aſtronomical account of time only in rejecting thoſe fractions, and beginning the year and month at ſunriſe, inſtead of the intermediate in-

* To be awake, to ſleep, and to be abſorbed in a ſtate of unconſciouſneſs—a kind of trance.

† The 24 powers of nature, according to the Bramins, are the five elements, *fire*, *air*, *earth*, *water*, and *akaſh* (a kind of ſubtile æther); the five members of action, the *hand*, *foot*, *tongue*, *anus*, and *male-organ of generation*; the five organs of perception, the *ear*, *eye*, *noſe*, *mouth*, and *ſkin*; the five ſenſes, which they diſtinguiſh from the organs of ſenſation; the three diſpoſitions of the mind, *deſire*, *paſſion*, and *tranquillity*; and the power of *conſciouſneſs*.

‡ If the work from which this extract is quoted be of as great antiquity as Mr. Halhed ſuppoſes, the Bramins muſt have been acquainted with the phenomena of magnetiſm at a much earlier period than any other philoſophers of whom hiſtory makes mention.

ſtant of the artificial day or night. Hence ariſes the unequal portion of time aſſigned to each month dependent on the ſituation of the ſun's apſis, and the diſtance of the vernal equinoctial colure from the beginning of Méſha in the Hindoo ſphere; and by theſe means they avoid thoſe errors which Europeans, from a different method of adjuſting their kalendar by intercalary days, have been ſubject to."

Mr. Davis obſerves, that an explanation of theſe matters would have led him beyond his purpoſe, which was only to give a general account of the method by which the Hindoos compute eclipſes, and to ſhow that the ſcience of aſtronomy is as well known among them now as ever it was among their anceſtors. This he does very completely; but in the preſent ſhort hiſtorical ſketch, we can neither copy nor abridge his memoir. Suffice it to ſay, that he has ſhown the practical part of the Hindoo aſtronomy to be founded on mathematical principles; and that the learned Pandits appear to have truer notions of the form of the earth, and the economy of the univerſe, than thoſe which are aſcribed to their countrymen in general.

The ſame writer ſhows likewiſe, that the prodigious duration which the Hindoos attribute to the world, is the reſult of a ſcientific calculation, founded indeed on very whimſical principles. "It has been common with aſtronomers to fix on ſome epoch, from which, as from a radix, to compute the planetary motions; and the ancient Hindoos choſe that point of time counted back, when, according to their motions as they had determined them, they muſt have been in conjunction in the beginning of Meſha or Aries, and coeval with which circumſtance they ſuppoſed the *creation*. This, as it concerned the planets only, would have produced a moderate term of years compared with the enormous antiquity that will be hereafter ſtated: but having diſcovered a ſlow motion of the nodes and apſides alſo, and taken it into the computation, they found it would require a length of time correſponding with 195,884890 years now expired, when they were ſo ſituated, and 2364115110 years more before they would return to the ſame ſituation again, forming together the grand anomaliſtick period denominated a *Calpa*, and fanciſully aſſigned as the day of Brahmá."

But though the mathematical part of the aſtronomy of the Pandits is undoubtedly reſpectable, their phyſical notions of the univerſe are in the higheſt degree ridiculous and extravagant. In the Vedas and Puranas, writings of which no devout Hindoo can diſpute the divine authority, eclipſes are ſaid to be occaſioned by the intervention of the monſter *Rahu*; and the earth to be ſupported by a ſeries of animals. "They ſuppoſe (ſays Mr. Halhed) that there are 14 ſpheres, ſeven below and ſix above the earth. The ſeven inferior worlds are ſaid to be altogether inhabited by an infinite variety of ſerpents, deſcribed in every monſtrous figure that the imagination can ſuggeſt. The firſt ſphere above the earth is the immediate vault of the viſible heavens, in which the ſun, moon and ſtars are placed. The ſecond is the firſt paradiſe, and general receptacle of thoſe who merit a removal from the lower earth. The third and fourth are inhabited by the ſouls of thoſe men who, by the practice of virtue and dint of prayer, have acquired an extraordinary degree of ſanctity. The fifth is the reward of thoſe who have all their lives performed ſome wonderful act of penance and mortification, or who have died martyrs for their religion. The higheſt ſphere is the reſidence of Brahma and his particular favourites, ſuch as thoſe men who have never uttered a falſehood during their whole lives, and thoſe women who have voluntarily burned themſelves with their huſbands. All theſe are abſorbed in the divine eſſence."

On ethics, the Hindoos have nothing that can be called philoſophy. Their duties, moral, civil, and religious, are all laid down in their *Vedas* and *Shaſters*; and enjoined by what they believe to be divine authority, which ſuperſedes all reaſoning concerning their fitneſs or utility. The buſineſs of their Pandits is to interpret thoſe books, which are extremely ancient, and written in a language that has long been unintelligible to every other order of men; but no Pandit will alter the text, however impoſſible to be reconciled to principles eſtabliſhed in his own practice of aſtronomy. On ſuch occaſions, the uſual apology for their ſacred books is, that "ſuch things may have been ſo formerly, and may be ſo ſtill; but that for aſtronomical purpoſes, aſtronomical rules muſt be followed." The great duties of morality have been preſcribed in every religious code, and they are not overlooked in that of the Hindoos, though the higheſt merit that a Bramin can have conſiſts in voluntary acts of abſtinence and mortification, and in contempt of death.

Of the ancient philoſophy of the Arabians and Chineſe nothing certain can be ſaid; and the narrow limits of ſuch an abſtract as this, do not admit of our mentioning the conjectures of the learned, which contradict each other, and are all equally groundleſs.

There is indeed ſufficient evidence that both nations were at a very early period obſervers of the ſtars; and that the Chineſe had even a theory by which they foretold eclipſes (ſee ASTRONOMY); but there is reaſon to believe that the Arabians, like other people in their circumſtances, were nothing more than judicial aſtrologers, who poſſeſſed not the ſmalleſt portion of aſtronomical ſcience.

Pliny makes mention of their magi, whilſt later writers tell us, that they were famous for their ingenuity in ſolving enigmatical queſtions, and for their ſkill in the arts of divination: but the authors of Greece are ſilent concerning their philoſophy, and there is not an Arabian book of greater antiquity than the Koran extant. See PHILOLOGY.

Leaving therefore regions ſo barren of information, let us paſs to the Phœnicians, whoſe commercial celebrity has induced many learned men to allow them great credit for early ſcience. If it be true, as ſeems highly probable, that the ſhips of this nation had doubled the Cape and almoſt encompaſſed the peninſula of Africa long before the era of Solomon (ſee OPHIR), we cannot doubt but that the Phœnicians had made great proficiency in the art of navigation, and in the ſcience of aſtronomy, at a period of very remote antiquity. Nor were theſe the only ſciences cultivated by that ancient people: the learned Cudworth has, in our opinion, ſufficiently proved that *Moſchus* or *Mochus* a Phœnician, who, according to Strabo, flouriſhed before the Trojan war, was the author of the atomic philoſophy afterwards adopted by Leucippus, Democritus, and others among the Greeks; and that it was with ſome of the ſucceſſors of this ſage that Pythagoras, as Jamblichus tells us, converſed at Sidon, and from them received his doctrine of *Monads*. (See PYTHAGORAS.) Another proof of the early progreſs of the Phœnicians in philoſophy may be found in the fragments of their hiſtorian Sanchoniatho which have been preſerved by Euſebius. We are indeed aware that men of great celebrity have called in queſtion the authenticity of thoſe fragments, and even the very exiſtence of ſuch a writer as Sanchoniatho; but for this ſcepticiſm we can diſcover no foundation. (See SANCHONIATHO.) His hiſtory may have been interpolated in ſome places by the tranſlator Philo-Byblius; but Porphyry, Euſebius, and Theodoret ſpeak of it as a work of undoubted credit, and affirm that its author flouriſhed before the Trojan war. Now this ancient writer teaches that, according to the *wiſe men* of his country, all things aroſe at firſt from the neceſſary agency of an active principle upon a paſſive chaotic maſs which he calls *mot*. This chaos Cudworth thinks was the ſame with the elementary *water* of Thales, who was alſo of Phœnician extraction; but Moſheim juſtly obſerves that it was rather *dark air*, ſince Philo

tranſlates it αερα ζοφωδη. Be this as it may, nothing can be more evident than that the Phœnicians muſt have made ſome progreſs in what muſt ſurely be conſidered as philoſophy, however falſe, ſo early as the era of Sanchoniatho; for ſpeculations about the origin of the world never occur to untaught barbarians. Beſides Mochus and Sanchoniatho, Cadmus, who introduced letters into Greece, may undoubtedly be reckoned among the Phœnician philoſophers; for, though it is not pretended that the alphabet was of his invention, and though it is by no means certain that the Greeks, at the time of his arrival among them, were wholly deſtitute of alphabetic characters (ſee PHILOLOGY); yet the man who poſſeſſed ability to prevail with illiterate ſavages to adopt the uſe of ſtrange characters, muſt have been a great maſter of the ſcience of human nature. Several other Phœnician philoſophers are mentioned by Strabo; but as they flouriſhed at a later period, and philoſophiſed after the ſyſtematic mode of the Greeks, they fall not properly under our notice. We paſs on therefore to the philoſophy of Egypt.

It has been already obſerved that the Egyptians boaſted of being the firſt of nations, and the authors of all the ſcience which in ſeparate rays illuminated the reſt of the world. But though this claim was undoubtedly ill-founded, their high antiquity and early progreſs in the arts of civil life cannot be controverted. The Greeks with one voice confeſs that all their learning and wiſdom came from Egypt, either imported immediately by their own philoſophers, or brought through Phœnicia by the ſages of the eaſt; and we know from higher authority than the hiſtories of Greece, that at a period ſo remote as the birth of Moſes the wiſdom of the Egyptians was proverbially famous. Yet the hiſtory of Egyptian learning and philoſophy, though men of the firſt eminence both ancient and modern have beſtowed much pains in attempts to elucidate it, ſtill remains involved in clouds of uncertainty. That they had ſome knowledge of phyſiology, arithmetic, geometry, and aſtronomy, are facts which cannot be queſtioned; but there is reaſon to believe that even theſe ſciences were in Egypt puſhed no farther than to the uſes of life. That they believed in the exiſtence of incorporeal ſubſtances is certain; becauſe Herodotus aſſures us that they were the firſt aſſerters of the immortality, pre-exiſtence, and tranſmigration of human ſouls, which they could not have been without holding thoſe ſouls to be at leaſt *incorporeal*, if not *immaterial*.

The author of Egyptian learning is generally acknowledged to have been *Thoth*, *Theut*, or *Taaut*, called by the Greeks *Hermes*, and by the Romans *Mercury*; but of this perſonage very little is known. Diodorus Siculus ſays that he was chief miniſter to Oſiris, and that he improved language, invented letters, inſtituted religious rites, and taught aſtronomy, muſic, and other arts. The ſame thing is affirmed by *Sanchoniatho*, whoſe antiquity has been already mentioned; by *Manetho* an Egyptian prieſt, who flouriſhed during the reign of Ptolemy Philadelphus; and by Plato, whoſe authority, as he reſided long in Egypt, and was himſelf an eminent philoſopher, is perhaps more to be depended upon than that of the other two. In the Philebus we are told that Thoth was the inventor of letters; and leſt we ſhould ſuppoſe that by thoſe letters nothing more is meant than picture writing or ſymbolical hieroglyphics, it is added, that he diſtinguiſhed between *vowels* and *conſonants*, determining the number of each. The ſame philoſopher, in his Phædrus, attributes to Thoth the invention of *arithmetic*, *geometry*, *aſtronomy*, and *hieroglyphic* learning; and ſubjoins a diſputation, ſaid to have been held between him and *Thamus* then king of Egypt, concerning the advantage and diſadvantage of his newly invented letters. Thoth boaſted that the invention, by aiding memory, would greatly contribute to the progreſs of ſcience; whilſt the monarch contended, that it would enervate men's natural faculties by making them truſt to written characters without exerting the powers of their own minds.

All this, if real, muſt have happened before the era of Moſes; and ſince it is almoſt certain that alphabetical characters were in uſe prior to the *exod* of the Iſraelites from Egypt, we may as well allow the invention to Thoth, as give it to an earlier author of unknown name. That arithmetic, geometry and aſtronomy were cultivated in Egypt from the moſt remote antiquity, is affirmed by all the ancients, and made in the higheſt degree probable by the ſituation of the country. The firſt elements of aſtronomy have certainly been diſcovered by various nations, whoſe habits of life led them to the frequent obſervation of the heavens; and it is obſerved by Cicero, that the Egyptians and Babylonians, dwelling in open plains where nothing intercepted the view of the heavenly bodies, naturally devoted themſelves to the ſtudy of that ſcience. The annual overflowing of the Nile, which broke up the boundaries of their lands, would lay the Egyptians under the neceſſity of adopting ſome method of ſettling thoſe boundaries anew; and neceſſity we know to be the parent of invention. Hence their early acquaintance with practical geometry cannot well be doubted. Their cuſtom of embalming their dead, and the perfection to which they carried that art *, ſhows infallibly their knowledge of the properties of natural ſubſtances, and gives ſome reaſon to believe that they were not altogether ſtrangers to anatomy: but if we allow them to have been at this early period anatomiſts acquainted with the powers of drugs, we can hardly refuſe them ſome ſkill in the art of phyſic, which they themſelves traced up to their gods and demigods, to *Serapis*, *Iſis*, and her ſon *Horus* or *Apollo*.

The art of alchymy has been ſaid to have been known by the ancient Egyptians; and from the author of the Egyptian philoſophy it has been called the *Hermetic art*. But though this is unqueſtionably a fiction, there is evidence that they were poſſeſſed of one art which is even yet a *deſideratum* in the practice of chemiſtry. "Moſes (we are told, *Exod.* xxii. 20.) took the golden calf, which his brother had made for idolatrous purpoſes, and *burnt it in the fire*, and *ground it to powder*, and ſtrowed it on the water, and made the children of Iſrael drink of it." Had this fact been related by Herodotus or Diodorus Siculus, it would have been deemed ſufficient evidence that the Egyptians were even at that early period no ſtrangers to the art of chemiſtry: and ſurely the evidence ſhould not be the worſe for coming from the pen of the Hebrew lawgiver, who was himſelf educated in the court of Egypt.

But though it is thus evident that the rudiments of almoſt every uſeful ſcience were known in Egypt from the remoteſt antiquity, it does not appear that any of them was carried to a great degree of perfection, unleſs perhaps chemiſtry alone muſt be excepted. One would think that no ſcience could have been more indiſpenſably requiſite to them than geometry. And yet, though Pythagoras is ſaid to have ſpent 22 years in Egypt ſtudying that ſcience and aſtronomy, he himſelf diſcovered † the famous 47th Prop. of Euclid's firſt book after his return to Samos. This, though a very uſeful, is yet a ſimple theorem;

* It is true that the diſſection of ſome mummies has leſſened the high opinion long entertained of the ſkill of the ancient Egyptians in the art of embalming; yet it muſt be granted that their knowledge of antiſeptic drugs was great, ſince it is now certainly known even from theſe diſſections, that by means of ſuch drugs they contrived to preſerve rags of cloth from corruption for upwards of 3000 years.

† This diſcovery he claimed; and his claim was admitted by the Greek writers without having been *directly* controverted ſince. An excellent mathematician, however, has lately ſhown that the equality between the ſquare of the hypothenuſe of a

and ſince it was not reached by the Egyptian geometry, we cannot ſuppoſe that thoſe people had then advanced far in ſuch ſpeculations. The ſame concluſion muſt be drawn with reſpect to aſtronomy; for Thales is ſaid to have been the firſt that calculated an eclipſe of the ſun; and we nowhere read that the *Egyptians* pretended to diſpute that honour with him. To this it may be replied, that Pythagoras was in Egypt undoubtedly taught the true conſtitution of the ſolar ſyſtem, and, what is more extraordinary, the doctrine of comets in particular, and of their revolutions, like the other planets, round the ſun *. We grant that he was taught all this; but it was not ſcientifically, but dogmatically, as facts which the prieſts had received by tradition from their early anceſtors, and of which they had never queſtioned the truth nor inquired into the reaſons. Of this we need no better proof than that the Pythagorean ſyſtem of the ſun was totally neglected by the Greeks as ſoon as they began to frame hypotheſes and to ſpeculate in philoſophy †.

But it may ſeem ſtrange, and certainly is ſo, that the Egyptian prieſts, in the days of Pythagoras, ſhould have preſerved ſo great a diſcovery of their anceſtors, and at the ſame time have totally forgotten the principles and reaſoning which led to a concluſion apparently contrary to the evidence of ſenſe. This is a difficulty which we pretend not to remove, though the fact which involves it ſeems to be beyond the reach of controverſy. Perhaps the following obſervations may throw upon it a feeble light. According to Manetho, the written monuments of the firſt Thoth were loſt or neglected in certain civil revolutions or natural calamities which befel the kingdom of Egypt. After many ages, great part of them were recovered by an ingenious interpretation of the ſymbols which he had inſcribed upon ancient columns; and the man who made this interpretation was called the ſecond *Thoth*, or *Hermes Triſmegiſtus*. But *thrice illuſtrious* as this perſonage was, it is at leaſt poſſible that he may have been much inferior to the former Hermes, and have read his writings and tranſcribed his concluſions without being able to comprehend the principles or reaſoning which led to thoſe concluſions. Any man who underſtands Latin might tranſlate into his own tongue the concluſions of Newton; but much more would be requiſite to make him comprehend the demonſtrations of his ſublime geometry. By what mode of reaſoning the firſt Hermes ‡ was led to the true idea of the ſolar ſyſtem, or whether it was by reaſoning at all, cannot now be known; but it ſeems very evident, that when the intercourſe between the Egyptians and Greeks firſt commenced, the wiſdom of the former people conſiſted chiefly in the ſcience of legiſlation and civil policy, and that the philoſopher, the divine, the legiſlator, and the poet, were all united in the ſame perſon. Their coſmogony (for all the ancients who pretended to ſcience framed coſmogonies) differed little from that of the Phœnicians already mentioned. They held that the world was produced from chaos by the energy of an intelligent principle; and they likewiſe conceived that there is in nature a continual tendency towards diſſolution. In Plato's Timæus, an Egyptian prieſt is introduced deſcribing the deſtruction of the world, and aſſerting that it will be effected by means of water and fire. They conceived that the univerſe undergoes a periodical conflagration; after which all things are reſtored to their original form, to paſs again through a ſimilar ſucceſſion of changes.

"Of preceptive doctrine (ſays Dr. Enfield in his Hiſtory of Philoſophy,) the Egyptians had two kinds, the one ſacred, the other vulgar. The former, which reſpected the ceremonies of religion and the duties of the prieſts, was doubtleſs written in the ſacred books of Hermes, but was too carefully concealed to paſs down to poſterity. The latter conſiſted of maxims and rules of virtue, prudence, or policy. Diodorus Siculus relates many particulars concerning the laws, cuſtoms, and manners of the Egyptians; whence it appears that ſuperſtition mingled with and corrupted their notions of morals. It is in vain to look for accurate principles of ethics among an ignorant and ſuperſtitious people. And that the ancient Egyptians merited this character is ſufficiently evident from this ſingle circumſtance, that they ſuffered themſelves to be deceived by impoſtors, particularly by the profeſſors of the fanciful art of aſtrology; concerning whom Sextus Empiricus juſtly remarks, that they have done much miſchief in the world, by enſlaving men to ſuperſtition, which will not ſuffer them to follow the dictates of right reaſon." See EGYPT, MYSTERIES, MYTHOLOGY, &c.

From Egypt and Phœnicia philoſophy paſſed into Greece;

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right-angled triangle, and the ſum of the ſquares on the other two ſides, was known to the aſtronomers of India at a period long prior to that of Pythagoras. Notwithſtanding this, it is certainly poſſible that the ſage of Samos may have made the diſcovery himſelf, though we think the contrary much more probable; for we agree with the able writer already mentioned, that Pythagoras, who is generally believed to have converſed with Indian brachmans as well as Egyptian prieſts, may have derived from them "ſome of the ſolid as well as the viſionary ſpeculations with which he delighted to inſtruct or amuſe his diſciples." See *Tranſactions of the Royal Society of Edinburgh*, vol. ii. Memoir xiii. Phyſic Claſs.

* This is recorded by Ariſtotle and Plutarch; and thus expreſſed by Ammianus Marcellinus: "Stellas quaſdam, *ceteris ſimiles*, quarum *ortus orbituſque*, quibus ſint temporibus *præſtituti* humanis mentibus ignorari." Lib. xxv. cap. 10.

† *Fixas* in ſupremis mundi partibus immotas perſiſtere, et planetas his inferiores circa ſolem revolvi, terram pariter moveri curſu annuo, diurno vero circa axem propriam, et ſolem ceu focum univerſi in omnium centro quieſcere, antiquiſſima fuit philoſophantium ſententia. Ab Ægyptiis autem aſtrorum antiquiſſimis obſervationibus propagatam eſſe hanc ſententiam veriſimile eſt. Et etiam ab illis et a gentibus conterminis ad Græcos, gentem magis philologicam quam philoſophicam, philoſophia omnis antiquior juxta et ſenior manaſſe videtur. Subinde docuerunt Anaxagoras, Democritus, et alii nonnulli, terram in centro mundi immotam ſtare, et aſtra omnia in occaſum, aliqua celerius, alia tardius moveri, idque in ſpatiis liberrimis. Namque orbis ſolidi poſtea ab Eudoxo, Calippo, Ariſtotele, introducti ſunt; declinante indies philoſophia primitus introducta, et novis Græcorum commentis paulatim prævalentibus. Quibus *vinculis* ANTIQUI planetas in ſpatiis liberis retineri, deque curſu rectilineo perpetuo retractas in orbem regulariter agi docuere, non conſtat. *Newton. de Mundi Syſtemate.*

‡ Some authors, deeply ſkilled in the Hebrew language, have thought that the true ſyſtem of the ſun and planets may be perceived in the Scriptures of the Old Teſtament, and that it is only from the ignorance or careleſſneſs of the tranſlators that it does not appear in the Engliſh Bible and other verſions. The writer of this article confeſſes that his knowledge of the Hebrew is very limited, which is probably the reaſon that to him the arguments of theſe men appear weak and their criticiſms fanciful. No man, however, has a higher veneration than he for the ſacred volume, which he believes to have been given for nobler purpoſes than to teach its readers the ſcience of aſtronomy; but could the principles of that ſcience be found in it, he ſhould be ſtrongly inclined to think that the firſt Thoth was Joſeph, and that the monarch to whom he was miniſter was the far-famed Oſiris. Were there any ſolid foundation for this ſuppoſition, it would be eaſy to conceive how Thoth acquired his ſcience, and how the Egyptian prieſts might retain juſt notions of the ſolar ſyſtem in general, long after they had forgotten the evidence upon which he communicated thoſe notions to their anceſtors.

where it was long taught without ſyſtem, as in the countries from which it was derived. Phoroneus, Cecrops, Cadmus, and Orpheus, were among the earlieſt inſtructors of the Greeks; and they inculcated Egyptian and Phœnician doctrines in detached maxims, and enforced them, not by ſtrength of argument, but by the authority of tradition. Their coſmogonies were wholly Phœnician or Egyptian diſguiſed under Grecian names; and they taught a future ſtate of rewards and puniſhments. The planets and the moon Orpheus conceived to be habitable worlds, and the ſtars to be fiery bodies like the ſun: but he taught that they are all animated by divinities; an opinion which prevailed both in Egypt and the eaſt: and it does not appear that he gave any other proof of his doctrines than a confident aſſertion that they were derived from ſome god. See ORPHEUS.

Hitherto we have ſeen philoſophy in its ſtate of infancy and childhood, conſiſting only of a collection of ſententious maxims and traditionary opinions; but among the Greeks, an ingenious and penetrating people, it ſoon aſſumed the form of profound ſpeculation and ſyſtematic reaſoning. Two eminent philoſophers aroſe nearly at the ſame period, who may be conſidered as the parents not only of Grecian ſcience, but of almoſt all the ſcience which was cultivated in Europe prior to the era of the great lord Bacon: theſe were Thales and Pythagoras; of whom the former founded the Ionic ſchool and the latter the Italic: from which two ſprung the various ſects into which the Greek philoſophers were afterwards divided. A bare enumeration of theſe ſects is all that our limits will admit of; and we ſhall give it in the perſpicuous language and juſt arrangement of Dr. Enfield, referring our readers for a fuller account than we can give of their reſpective merits to his abridged tranſlation of Brucker's hiſtory.

Of the IONIC SCHOOL were, 1. The Ionic ſect proper, whoſe founder Thales had as his ſucceſſors Anaximenes, Anaxagoras, Diogenes Apolloniates, and Archelaus. 2. The Socratic ſchool, founded by Socrates, the principal of whoſe diſciples were Xenophon, Æſchines, Simon, Cebes, Ariſtippus, Phædo, Euclid, Plato, Antiſthenes, Critias, and Alcibiades. 3. The Cyrenaic ſect, of which Ariſtippus was the author: his followers were, his daughter Arete, Hegeſias, Anicerris, Theodorus, and Bion. 4. The Megaric or Eriſtic ſect, formed by Euclid of Megara; to whom ſucceeded Eubulides, Diodorus, and Stilpo, famous for their logical ſubtlety. 5. The Eliac or Eretriac ſchool, raiſed by Phædo of Elis, who, though he cloſely adhered to the doctrine of Socrates, gave name to his ſchool. His ſucceſſors were Pliſtanus and Menedemus; the latter of whom, being a native of Eretria, transferred the ſchool and name to his own country. 6. The Academic ſect, of which Plato was the founder. After his death, many of his diſciples deviating from his doctrine, the ſchool was divided into the old, new, and middle academies. 7. The Peripatetic ſect, founded by Ariſtotle, whoſe ſucceſſors in the Lyceum were Theophraſtus, Strato, Lycon, Ariſto, Critolaus, and Diodorus. Among the Peripatetics, beſides thoſe who occupied the chair, were alſo Dicæarchus, Eudemus, and Demetrius Phalereus. 8. The Cynic ſect, of which the author was Antiſthenes, whom Diogenes, Oneſicritus, Crates, Metrocles, Menippus, and Menedemus, ſucceeded. In the liſt of Cynic philoſophers muſt alſo be reckoned Hipparchia, the wife of Crates. 9. The Stoic ſect, of which Zeno was the founder. His ſucceſſors in the porch were Perſæus, Ariſto of Chios, Herillus, Sphærus, Cleanthes, Chryſippus, Zeno of Tarſus, Diogenes the Babylonian, Antipater, Panætius, and Poſidonius.

Of the ITALIC SCHOOL were, 1. The Italic ſect proper: it was founded by Pythagoras, a diſciple of Pherecydes. The followers of Pythagoras were Ariſtæus, Mneſarchus, Alcmæon, Ecphantus, Hippo, Empedocles, Epicharmus, Ocellus, Timæus, Archytas, Hippaſus, Philolaus, and Eudoxus. 2. The Eleatic ſect, of which Xenophanes was the author: his ſucceſſors, Parmenides, Meliſſus, Zeno, belonged to the metaphyſical claſs of this ſect; Leucippus, Democritus, Protagoras, Diagoras, and Anaxarchus, to the phyſical. 3. The Heraclitean ſect, which was founded by Heraclitus, and ſoon afterwards expired: Zeno and Hippocrates philoſophiſed after the manner of Heraclitus, and other philoſophers borrowed freely from his ſyſtem. 4. The Epicurean ſect, a branch of the Eleatic, had Epicurus for its author; among whoſe followers were Metrodorus, Polyænus, Hermachus, Polyſtratus, Baſilides, and Protarchus. 5. The Pyrrhonic or Sceptic ſect, the parent of which was Pyrrho: his doctrine was taught by Timon the Phliaſian; and after ſome interval was continued by Ptolemy a Cyrenean, and at Alexandria by Æneſidemus.

Of the peculiar doctrines of theſe ſects, the reader will in this work find a ſhort account either in the lives of their reſpective founders, or under the names of the ſects themſelves. We ſhall only obſerve at preſent, that though many of them were undoubtedly abſurd, and many wicked, it would yet perhaps be going too far to ſay with ſome, that the philoſophy of Greece became impious under Diagoras, vicious under Epicurus, HYPOCRITICAL UNDER ZENO, impudent under Diogenes, covetous under Democharés, voluptuous under Metrodorus, fantaſtical under Crates, ſcurrilous under Menippus, licentious under Pyrrho, and quarrelſome under Cleanthes. Of the truth of this heavy charge every reader muſt judge for himſelf. We are ſtrongly inclined to think, that there were virtues and vices peculiar to each ſect; "and that the ſects themſelves had an affinity more or leſs direct with the different temperaments of man; whence the choice of ſectators often depended on phyſical influence, or a peculiar diſpoſition of their organs. Nothing appears more natural than that thoſe men who were born with great force of mind and ſtrong nerves ſhould diſcover a predilection for ſtoicism; while mortals endowed by nature with more delicacy of fibres and keener ſenſibility fled for refuge to the myrtles of Epicurus. People whoſe temperaments partook of no extremes, were always inclined either for the Lyceum or the Academy. Such as poſſeſſed ſolidity of underſtanding ranged themſelves with Ariſtotle; and thoſe who had only genius, or even pretenſions to that endowment, went to augment the crowd of Platoniſts."

All the ſyſtematical philoſophers, however, purſued their inquiries into nature by nearly the ſame method. Of their philoſophy as well as of ours, the univerſe, with all that it contains, was the vaſt object: but the individual things which compoſe the univerſe are infinite in number and ever changing; and therefore, according to an eſtabliſhed maxim of theirs, incapable of being the ſubjects of human ſcience. To reduce this infinitude, and to fix thoſe fleeting beings, they eſtabliſhed certain definite arrangements or claſſes, to ſome of which every thing paſt, preſent, or to come, might be referred; and having aſcertained, as they thought, all that could be affirmed or denied of theſe claſſes, they proved, by a very ſhort proceſs of ſyllogiſtic reaſoning, that what is true of the claſs muſt be true of every individual comprehended under it. The moſt celebrated of theſe arrangements is that which is known by the name of *categories*; which Mr. Harris thinks at leaſt as old as the era of Pythagoras, and to the forming of which mankind would, in his opinion, be neceſſarily led by the following conſiderations: Every ſubject of human thought is either *ſubſtance* or *attribute*; but *ſubſtance* and *attribute* may each of them be modified under the different characters of *univerſal* or *particular*. Hence there ariſes a quadruple arrangement of things into *ſubſtance univerſal* and *ſubſtance particular*; into *attribute univerſal* and *attribute particular*; to ſome one of *which four* not only our words and ideas, but every individual of that immenſe multi-

tude of things which compoſe the univerſe, may be reduced. This arrangement, however, the learned author thinks too limited; and he is of opinion, that, by attending to the ſubſtances with which they were ſurrounded, the Grecian ſchools muſt ſoon have diſtinguiſhed between the attributes *eſſential* to all ſubſtances and thoſe which are only *circumſtantial*; between the attributes proper to *natural* ſubſtances or bodies, and thoſe which are peculiar to *intelligible* ſubſtances or minds. He likewiſe thinks, that the *time* and *place* of the exiſtence of ſubſtances not preſent, muſt ſoon have attracted their attention; and that, in conſidering the place of this or that ſubſtance, they could hardly avoid thinking of its *poſition* or *ſituation*. He is of opinion, that the ſuperinduction of one ſubſtance upon another would inevitably ſuggeſt the idea of *clothing* or *habit*, and that the variety of *co exiſting ſubſtances* and *attributes* would diſcover to them another attribute, viz. that of *relation*. Inſtead therefore of confining themſelves to the ſimple diviſion of *ſubſtance* and *attribute*, they divided *attribute* itſelf into nine diſtinct ſorts, ſome *eſſential* and others *circumſtantial*; and thus, by ſetting *ſubſtance* at their head, made ten *comprehenſive* and *univerſal genera*, called, with reference to their Greek name, *categories*, and with reference to their Latin name, *predicaments*. Theſe categories are, SUBSTANCE, QUALITY, QUANTITY, RELATION, ACTION, PASSION, WHEN, WHERE, POSITION, and HABIT; which, according to the ſyſtematic philoſophy of the Greeks, comprehend every human ſcience and every ſubject of human thought. *Hiſtory*, natural and civil, ſprings, ſays Mr. Harris, out of SUBSTANCE; *mathematics* out of QUANTITY; *optics* out of QUALITY and QUANTITY; *medicine* out of the *ſame*; *aſtronomy* out of QUANTITY and MOTION; *muſic* and *mechanics* out of the *ſame*; *painting* out of QUALITY and SITE; *ethics* out of RELATION; *chronology* out of WHEN; *geography* out of WHERE; *electricity, magnetiſm*, and *attraction*, out of ACTION and PASSION; and ſo in other inſtances.

To theſe categories, conſidered as a mere arrangement of ſcience, we are not inclined to make many objections. The arrangement is certainly not complete: but this is a matter of comparatively ſmall importance; for a complete arrangement of ſcience cannot, we believe, be formed. The greateſt objection to the categories ariſes from the uſe that was made of them by almoſt every philoſopher of the Grecian ſchools; for thoſe ſages having reduced the objects of all human ſcience to ten general heads or general terms, inſtead of ſetting themſelves to inquire by a painful induction into the nature and properties of the real objects before them, employed their time in conceiving what could be predicated of *ſubſtance* in general, of this or that *quality, quantity, relation*, &c. in the abſtract: and they ſoon found, that of ſuch general conceptions as the *categories* there are but five *predicables* or claſſes of *predicates* in nature. The firſt claſs is that in which the *predicate* is the *genus* of the *ſubject*; the ſecond, that in which it is the *ſpecies* of the *ſubject*; the third, is when the *predicate* is the *ſpecific difference* of the *ſubject*; the fourth, when it is a *property* of the *ſubject*; and the fifth, when it is ſomething *accidental* to the *ſubject*. (See LOGIC, Part II. chap. ii. and iii.) Having proceeded thus far in their ſyſtem, they had nothing to do with individuals but to arrange them under their proper categories, which was commonly done in a very arbitrary manner; and then, with the formality of a ſyllogiſm, to predicate of each the predicable of the genus or ſpecies to which it belonged. But by this method of proceeding, it is obvious that no progreſs whatever could be made in phyſical, metaphyſical, or ethical ſcience; for, if the individual truly belongs to the category under which it is arranged, we add nothing to our ſtock of knowledge by affirming or denying of it what we had before affirmed or denied of the whole genus: and if it belong not to the category under which we arrange it, our ſyllogiſing will only give the appearance of proof to what muſt, from the nature of things, be an abſolute falſehood. It is only by experiments made on various ſubſtances apparently of the ſame kind that they can be certainly known to belong to the ſame category; and when this is done, all ſyllogiſtic reaſoning from the genus to the ſpecies, and from the ſpecies to the individual, is but ſolemn trifling, as every propoſition in this retrograde courſe takes for granted the thing to be proved.

Yet this mode of philoſophizing ſpread from Greece almoſt over the whole world. It was carried by Alexander into Aſia, by his ſucceſſors into Egypt; and it found its way to Rome after Greece became a province of the empire. It was adopted by the Jews, by the fathers of the Chriſtian church, by the Mohammedan Arabs during the caliphate, and continued to be cultivated by the ſchoolmen through all Europe, till its futility was expoſed by lord Bacon*. The profeſſors of this philoſophy often diſplayed great acuteneſs; but their ſyſtems were built on mere hypotheſes, and ſupported by ſyllogiſtic wrangling. Now and then indeed a ſuperior genius, ſuch as Alhazen and our countryman Roger Bacon, broke through the trammels of the ſchools, and, regardleſs of the authority of the Stagyrite and his *Categories*, made real diſcoveries in phyſical ſcience by experiments judiciouſly conducted on individual ſubſtances (ſee BACON (*Roger*); and OPTICS; but the ſcience in repute ſtill continued to be that of *Generals*.

It was indeed a combination of abſurd metaphyſics with more abſurd theology; and that which is properly called *phyſics*, had in Europe no place in a liberal education from the end of the eighth century to the end of the fourteenth. Towards the beginning of this period of darkneſs, the whole circle of inſtruction, or the liberal arts as they were called, conſiſted of two branches, the *trivium* and the *quadrivium*; of which the former comprehended *grammar*, *rhetoric*, and *dialectics*; the latter *muſic*, *arithmetic*, *geometry*, and *aſtronomy*, to which was added about the end of the eleventh century the ſtudy of a number of *metaphyſical ſubtleties* equally uſeleſs and unintelligible.

Hitherto the works of the ancient Greek philoſophers had been read only in imperfect Latin tranſlations; and before the ſcholaſtic ſyſtem was completely eſtabliſhed, Plato and Ariſtotle had been alternately looked up to as the oracle in ſcience. The rigid ſchoolmen, however, univerſally gave the preference to the Stagyrite; becauſe his analyſis of body into matter and form is peculiarly calculated to keep in countenance the moſt incredible doctrine of the Romiſh church (ſee TRANSUBSTANTIATION): and upon the revival of Greek learning, this preference was continued after the ſchool philoſophy had begun to fall into contempt, on account of much uſeful information contained in ſome of his writings on ſubjects of natural hiſtory, and his ſuppoſed merit as a natural philoſopher. At laſt the intrepid ſpirit of Luther and his aſſociates ſet the minds of men free from the tyranny of ancient names, as well in human ſcience as in theology; and many philoſophers ſprung up in different countries of Europe, who profeſſed either to be *eclectics*, or to ſtudy nature, regardleſs of every authority but that of reaſon. Of theſe the moſt eminent beyond all compariſon was Francis lord Verulam.

This illuſtrious man having read with attention the writings of the moſt celebrated ancients, and made himſelf maſter of the ſciences which were then cultivated, ſoon diſcovered the abſurdity of pretending to account for the phenomena of nature by ſyllogiſtic reaſoning from hypothetical principles; and, with a boldneſs becoming a genius of the firſt order, undertook to give a new chart of human knowledge. This he did in his two ad-

* Scientiæ, quas habemus, fere a Græcis fluxerunt. Quæ enim ſcriptores Romani, aut Arabes, aut recentiores addiderunt, non multa, aut magni momenti ſunt: et qualiacunque ſint, fundata ſunt ſuper baſin eorum quæ inventa ſunt a Græcis. *Bacon.*

mirable works, entitled, 1. *De Dignitate et Augmentis Scientiarum*; and, 2. *Novum Organum Scientiarum, sive Judicia vera de Interpretatione Naturæ.* In the former of these works, he takes a very minute survey of the whole circle of human science, which he divides into three great branches, *history*, *poetry*, and *philosophy*, corresponding to the three faculties of the mind, *memory*, *imagination*, and *reason*. Each of these general heads is subdivided into minuter branches, and reflections are made upon the whole, which, though we can neither copy nor abridge them, will amply reward the perusal of the attentive reader. The purpose of the *Novum Organum* is to point out the proper method of interpreting nature; which the author shows can never be done by the logic which was then in fashion, but only by a painful and fair induction. "Homo naturæ minister (says he) et interpres tantum facit et intelligit, quantum de naturæ ordine re vel mente observaverit; nec amplius scit aut potest. Syllogismus ad principia scientiarum non adhibetur, ad media axiomata frustra adhibetur, cum sit subtilitati naturæ longe impar. Assensum itaque constringit, non res. Syllogismus ex propositionibus constat, propositiones ex verbis, verba notionum tesseræ sunt. Itaque si notiones ipsæ (id quod basis rei est) confusæ sint et temere a rebus abstractæ, nihil in iis quæ superstruuntur est firmitudinis. Itaque spes est una in *inductione vera*."

To hypotheses and preconceived opinions, which he calls *idola theatri*, this great man was not less inimical than to syllogisms; and since his days almost every philosopher of eminence, except Descartes and his followers (see DESCARTES and CARTESIANS), has professed to study nature according to the method of induction so accurately laid down in the *Novum Organum*. On this method a few improvements have perhaps been made; but notwithstanding these, lord Bacon must undoubtedly be considered as the author of that philosophy which is now cultivated in Europe, and which will continue to be cultivated as long as men shall have more regard for matters of fact than for hypothetical opinions. Of this mode of philosophizing we shall now give a short, though we hope not inaccurate, view, by stating its objects, comparing it with that which it superseded, explaining its rules, and pointing out its uses; and from this view it will appear, that its author shares with Aristotle the empire of science.

THE universe, that unbounded object of the contemplation, the curiosity and the researches of man, may be considered in two different points of view.

In the first place, it may be considered merely as a collection of existences, related to each other by means of resemblances and distinction, situation, succession, and derivation, as making parts of a whole. In this view it is the subject of pure description.

To acquire an acquaintance with, or a knowledge of, the universe in this point of view, we must enumerate all the beings in it, mention all their sensible qualities, and mark all these relations for each. But this would be labour immense; and, when done, an undistinguishable chaos. A book containing every word of a language would only give us the materials, so to speak, of this language. To make it comprehensible, it must be put into some form, which will comprehend the whole in a small compass, and enable the mind to pass easily from one word to another related to it. Of all relations among words, the most obvious are those of resemblance and derivation. An etymological dictionary, therefore, in which words are classed in consequence of their resemblances, and arranged by means of their derivative distinctions, will greatly facilitate the acquisition of the language.

Just so in nature: The objects around us may be grouped by means of their resemblance, and then arranged in those groups by means of their distinctions and other relations. In this classification we are enabled to proceed by means of our faculty of abstracting our attention from the circumstances in which things differ, and turning it to those only in which they agree. By the judicious employment of this faculty we are able not only to distribute the individuals into classes, but also to distribute those classes into others still more comprehensive, by discovering circumstances of resemblance among them: for, the fewer the circumstances are which concur to form that resemblance which has engaged our attention, the greater is the number of dissimilar circumstances which are neglected; and the more extensive will be the class of individuals in which the resemblance is observed. Thus, a number of individuals resembling each other in the single circumstance of life, composes the most extensive KINGDOM of ANIMALS. If it be required that they shall further resemble in the circumstance of having feathers, a prodigious number of animals are excluded, and we form the inferior *class* of BIRDS. We exclude a great number of birds, by requiring a further similarity of web feet, and have the *order* of ANSERES. If we add lingua citiata, we confine the attention to the *genus* of ANATES. In this manner may the whole objects of the universe be grouped and arranged into kingdoms, classes, orders, genera, and species.

Such a classification and arrangement is called NATURAL HISTORY; and must be considered as the only foundation of any extensive knowledge of nature. To the natural historian, therefore, the world is a collection of existences, the subject of descriptive arrangement. His aim is threefold.

1. To observe with care, and describe with accuracy, the various objects of the universe.

2. To determine and enumerate all the great classes of objects; to distribute and arrange them into all their subordinate classes, through all degrees of subordination, till he arrive at what are only accidental varieties, which are susceptible of no farther distribution; and to mark with precision the principles of this distribution and arrangement, and the characteristics of the various assemblages.

3. To determine with certainty the particular group to which any proposed INDIVIDUAL belongs.

DESCRIPTION therefore, ARRANGEMENT, and REFERENCE, constitute the whole of his employment; and in this consists all his science.

Did the universe continue unchanged, this would constitute the whole of our knowledge of nature: but we are witnesses of an uninterrupted succession of changes, and our attention is continually called to the EVENTS which are incessantly happening around us. These form a set of objects vastly more interesting to us than the former; being the sources of almost all the pleasures or pains we receive from external objects.

We are therefore much interested in the study of the events which happen around us, and strongly incited to prosecute it: but they are so numerous and so multifarious, that the study would be immense, without some contrivance for abbreviating and facilitating the task. The same help offers itself here as in the study of what may be called *quiescent nature*. Events, like existences, are susceptible of classification, in consequence of resemblances and distinction; and by attention to these, we can acquire a very extensive acquaintance with active nature. Our attention must be chiefly directed to those circumstances in which many events resemble each other, while they differ perhaps in a thousand others. Then we must attend to their most general distinctions; then to distinctions of smaller extent, and so on.

It is in this way accordingly that we have advanced in our knowledge of active nature, and are gradually, and by no means slowly, forming assemblages of events more and more extensive, and distributing these with greater and greater precision into their different classes.

In the zealous and attentive profecution of this taſk a very remarkable and intereſting obſervation occurs. In deſcribing thoſe circumſtances of ſimilarity among events, and particularly in diſtributing them according to thoſe ſimilarities, it is impoſſible for us to overlook that conſtancy which is obſerved in the changes of nature in the events which are the objects of our contemplation. Events which have once been obſerved to accompany each other are obſerved always to do ſo. The riſing of the ſun is always accompanied by the light of day, and his ſetting by the darkneſs of night. Sound argument is accompanied by conviction, impulſe by motion, kindneſs by a feeling of gratitude, and the perception of good by deſire. The unexcepted experience of mankind informs us, that the events of nature go on in certain regular trains; and if ſometimes exceptions ſeem to contradict this general affirmation, more attentive obſervation never fails to remove the exception. Moſt of the ſpontaneous events of nature are very complicated; and it frequently requires great attention and penetration to diſcover the ſimple event amidſt a crowd of uneſſential circumſtances which are at once exhibited to our view. But when we ſucceed in this diſcovery, we never fail to acknowledge the perfect uniformity of the event to what has been formerly obſerved.

But this is not all: We firmly *believe* that this uniformity will *ſtill continue*; that fire will melt wax, will burn paper, will harden clay, as we have formerly obſerved it to do: and whenever we have undoubted proofs that the circumſtances of ſituation are preciſely the ſame as in ſome former caſe, though but once obſerved, we expect with irreſiſtible and unſhaken confidence that the event will alſo be the ſame.

It is not ſurely neceſſary to adduce many proofs of the univerſality of this law of human thought. The whole language and actions of men are inſtances of the fact. In all languages there is a mode of conſtruction which is uſed to expreſs this relation as diſtinct from all others, and the converſation of the moſt illiterate never confounds them, except when the conceptions themſelves are confounded. The general employment of the active and paſſive verb is regulated by it. *Turris everſa eſt a militibus*; *turris everſa eſt terræ motu*, expreſs two relations, and no ſchoolboy will confound them. The diſtinction therefore is perceived or felt by all who can ſpeak grammatically. Nor is any language without general terms to expreſs this relation, cauſe—effect—to occaſion. Nay, it is a fact in the mind of brutes, who hourly ſhow that they expect the ſame uſes of every ſubject which they formerly made of it; and without this, animals would be incapable of ſubſiſtence, and man incapable of all improvement. From this alone memory derives all its value; and even the conſtancy of natural operation would be uſeleſs, if not matched or adapted to our purpoſes by this expectation of and confidence in that conſtancy.

After all the labours of ingenious men to diſcover the foundation of this irreſiſtible expectation, we muſt be contented with ſaying that ſuch is the conſtitution of the human mind. It is an *univerſal fact* in human thought; and for any thing that has been yet diſcovered, it is an *ultimate* fact, not included in any other ſtill more general. We ſhall ſoon ſee that this is ſufficient for making it the foundation of true human knowledge; all of which muſt in like manner be reduced to ultimate facts in human thought.

We muſt conſider this undoubted feeling, this perſuaſion of the conſtancy of nature, as an *inſtinctive* anticipation of events ſimilar to thoſe which we have already experienced. The general analogy of nature ſhould have diſpoſed philoſophers to acquieſce in this, however unwelcome to their vanity. In no inſtance of eſſential conſequence to our ſafety or well-being are we left to the guidance of our boaſted reaſon: God has given us the ſurer conduct of natural inſtincts. No caſe is ſo important as this: In none do we ſo much ſtand in need of a guide which ſhall be powerful, infallible, and rapid in its deciſions. Without it we muſt remain incapable of all inſtruction from experience, and therefore of all improvement.

Our ſenſations are undoubtedly feelings of our mind. But all thoſe feelings are accompanied by an inſtinctive reference of them to ſomething diſtinct from the feelings themſelves. Hence ariſes our perception of external objects, and our very notions of this externeity (pardon the term). In like manner, this anticipation of events, this irreſiſtible connection of the idea of fire with the idea of burning, is alſo a feeling of the mind: and this feeling is by a law of human nature referred, without reaſoning, to ſomething external as its cauſe; and, like our ſenſation, it is conſidered as a *ſign* of that external ſomething. It is like the conviction of the truth of a mathematical propoſition. This is referred by us to ſomething exiſting in nature, to a neceſſary and eternal relation ſubſiſting between the ideas which are the ſubjects of the propoſition. The conviction is the ſign or indication of this relation by which it is brought to our view. In preciſely the ſame manner, the irreſiſtible connection of ideas is interpreted as the ſenſation or ſign of a *neceſſary connection* of external things or events. Theſe are ſuppoſed to include ſomething in their nature which renders them inſeparable companions. To this bond of connection between external things we give the name of CAUSATION. All our knowledge of this relation of cauſe and effect, is the knowledge or conſciouſneſs of what paſſes in our own minds during the contemplation of the phenomena of nature. If we adhere to this view of it, and put this branch of knowledge on the ſame footing with thoſe called the *abſtract ſciences*, conſidering only the *relations* of ideas, we ſhall acquire *demonſtrative ſcience*. If we take any other view of the matter, we ſhall be led into inextricable mazes of uncertainty and error.

We ſee then, that the natural procedure of our faculty of abſtraction and arrangement, in order to acquire a more ſpeedy and comprehenſive knowledge of natural events, preſents them to our view in another form. We not only ſee them as *ſimilar* events, but as events naturally and neceſſarily *conjoined*. And the expreſſion of *reſemblance* among events is alſo an expreſſion of *concomitancy*; and this arrangement of events in conſequence of their reſemblance is in fact the *diſcovery* of thoſe accompaniments. The trains of natural appearance being conſidered as the appointments of the Author of Nature, has occaſioned them to be conſidered alſo as conſequences of *laws* impoſed on his works by their great author, and every thing is ſaid to be regulated by fixed laws. But this is the language of analogy. When a ſovereign determines on certain trains of conduct for his ſubjects, he iſſues his orders. Theſe orders are laws. He inforces the obſervance of them by his authority; and thus a certain regularity and conſtancy of conduct is produced. But ſhould a ſtranger, ignorant of the promulgation of theſe laws, and of the exerted authority of the magiſtrate, obſerve this uniformity of conduct, he would aſcribe it to the genius and diſpoſition of the people; and his obſervation would be as uſeful to him for directing the tenor of his own conduct, as the knowledge of the ſubject himſelf of the real ſource of this conſtancy is for directing his.

Juſt ſo in nature, while the theologian pretends, from his diſcoveries concerning the exiſtence and ſuperintendance of God, to know that the conſtant accompaniment of events is the conſequence of laws which the great Author and Governor of the univerſe has impoſed on his works, the ordinary philoſopher, a ſtranger to this ſcene, and to the unſearchable operations of the SUPREME MIND, muſt aſcribe this conſtancy to the nature of the things. There is a great reſemblance between the expreſſion *natural law* and *grammatical rule*. Rule in ſtrict language implies command; but in grammar it expreſſes merely a generality of *fact*, whether of flexion or conſtruction

In like manner, a LAW OF NATURE is to the philoſopher nothing but the expreſſion of a generality of fact. A natural or phyſical law is a generally obſerved fact; and whenever we treat any ſubject as a generally obſerved fact, we treat it phyſically. It is a phyſical law of the underſtanding that argument is accompanied by conviction; it is a phyſical law of the affection that diſtreſs is accompanied by pity; it is a phyſical law of the material world that impulſe is accompanied by motion.

And thus we ſee that the arrangement of events, or the diſcovery of thoſe general points of reſemblance, is in fact the diſcovery of the laws of nature; and one of the greateſt and moſt important is, that the laws of nature are conſtant.

There is no queſtion that this view of the univerſe is incomparably more intereſting and important than that which is taken by the natural hiſtorian; contemplating every thing that is of value to us, and, in ſhort, the whole life and movement of the univerſe. This ſtudy, therefore, has been dignified with the name of PHILOSOPHY and of SCIENCE; and natural hiſtory has been conſidered as of importance only in ſo far as it was conducive to the ſucceſsful proſecution of philoſophy.

But the philoſopher claims a ſuperiority on another account: he conſiders himſelf as employed in the diſcovery of cauſes, ſaying that philoſophy is the ſtudy of the objects of the univerſe as related by cauſation, and that it is by the diſcovery of theſe relations that he communicates to the world ſuch important knowledge. Philoſophy, he ſays, is the ſcience of cauſes. The vulgar are contented to conſider the prior of two inſeparably conjoined events as the cauſe of the other; the ſtroke on a bell, for inſtance, as the cauſe of ſound. But it has been clearly ſhown by the philoſopher, that between the blow on the bell and the ſenſation of ſound there are interpoſed a long train of events. The blow ſets the bell a-trembling; this agitates the air in contact with the bell; this agitates the air immediately beyond it; and thus between the bell and the ear may be interpoſed a numberleſs ſeries of events, and as many more between the firſt impreſſion on the ear and that laſt impreſſion on the nerve by which the mind is affected. He can no longer therefore follow the nomenclature of the vulgar. Which of the events of this train therefore is the cauſe of this ſenſation? None of them: It is that *ſomething* which inſeparably connects any two of them, and conſtitutes their bond of union. Theſe bonds of union or cauſes he conſiders as reſiding in one or both of the connected objects: diverſities in this reſpect muſt therefore conſtitute the moſt important diſtinctions between them. They are therefore with great propriety called the *qualities*, the *properties*, of theſe reſpective ſubjects.

As the events from which we infer the exiſtence of theſe qualities of things reſemble in many reſpects ſuch events as are the conſequences of the exertion of our own powers, theſe qualities are frequently denominated POWERS, forces, energies. Thus, in the inſtance juſt now given of the ſound of a bell, we infer the powers of impulſe, elaſticity, nervous irritability, and animal ſenſibility.

In conſequence of this inference of a neceſſary connection between the objects around us, we not only infer the poſterior event from the prior, or, in common language, the effect from the cauſe, but we alſo infer the prior from the poſterior, the cauſe from the effect. We not only expect that the preſence of a magnet will be followed by certain motions in iron-filings, but, when we obſerve ſuch motions, we infer the preſence and agency of a magnet. Joy is inferred from merriment, poiſon from death, fire from ſmoke, and impulſe from motion. And thus the appearances of the univerſe are the indications of the powers of the objects in it. Appearances are the language of nature, informing us of their cauſes. And as all our knowledge of the ſentiments of others is derived from our confidence in their veracity; ſo all our knowledge of nature is derived from our confidence in the conſtancy of natural operations. A veracity and credulity neceſſarily reſulting from that law of our mental conſtitution by which we are capable of ſpeech, conduct us in the one caſe; and the conſtancy of nature, and the principle of induction, by which we infer general laws from particular facts, conduct us in the other. As human ſentiment is inferred from language, and the exiſtence of external things from ſenſation; ſo are the laws of nature, and the powers of natural objects, inferred from the phenomena. It is by the ſucceſsful ſtudy of this language of nature that we derive uſeful knowledge. The knowledge of the influence of motives on the mind of man enables the ſtateſman to govern kingdoms, and the knowledge of the powers of magnetiſm enables the mariner to pilot a ſhip through the pathleſs ocean.

Such are the loſty pretenſions of philoſophy. It is to be wiſhed that they be well founded; for we may be perſuaded that a miſtake in this particular will be fatal to the advancement of knowledge. An author of great reputation gives us an opportunity of deciding this queſtion in the way of experiment. He ſays that the ancients were philoſophers, employed in the diſcovery of cauſes, and that the moderns are only natural hiſtorians, contenting themſelves with obſerving the laws of nature, but paying no attention to the cauſes of things. If he ſpeaks of their *profeſſed* aim, we apprehend that the aſſertion is pretty juſt in general. With very few exceptions, indeed, it may be affirmed of his favourite Ariſtotle, the philoſopher κατ' εξοχην, and of Sir Iſaac Newton. We ſelect theſe two inſtances, both becauſe they are ſet in continual oppoſition by this author, and becauſe it will be allowed that they were the moſt eminent ſtudents of nature (for we muſt not yet call them philoſophers) in ancient and modern times. Ariſtotle's profeſſed aim, in his moſt celebrated writings, is the inveſtigation of cauſes; and in the opinion of this author, he has been ſo ſucceſsful that he has hardly left any employment for his ſucceſſors beſide that of commenting upon his works. We muſt on the other hand acknowledge that Newton makes no ſuch pretenſions, at leaſt in that work which has immortaliſed his name, and that his profeſſed aim is merely to inveſtigate the *general* laws of the planetary motions, and to apply theſe to the explanation of particular phenomena. Nor will we ſay that he has left no employment for ſucceeding inquirers; but, on the contrary, confeſs that he has only begun the ſtudy, has diſcovered but one law, and has enabled us to explain only the phenomena comprehended in it alone. But he has not been unſucceſsful; his inveſtigation has been complete; and he has diſcovered beyond all poſſibility of contradiction a *fact* which is obſerved through the whole extent of the ſolar ſyſtem; namely, that every body, nay that every particle in it, is continually DEFLECTED toward every other body; and that this deflection is, in every inſtance, proportional to the quantity of matter in that body toward which the deflection is directed, and to the reciprocal of the ſquare of the diſtance from it. He has therefore diſcovered a phyſical law of immenſe extent. Nor has he been leſs ſucceſsful in the explanation of particular phenomena. Of this there cannot be given a better inſtance than the explanation of the lunar motions from the theory of gravity begun by Newton "Matheſi ſua facem præferente;" and now brought to ſuch a degree of perfection, that if the moon's place be computed from it for any moment within the period of two thouſand years back, it will not be found to differ from the place on which ſhe was actually obſerved by one hundredth part of her own breadth.

Diſcimus hinc tandem quâ cauſa argentea Phœbe
Paſſibus haud æquis eat, et cur, ſubdita nulli

Hactenus aſtronomo, numerorum frena recuſat.
Quæ toties animos veterum torſere ſophorum,
Quæque ſcholas hodie rauco certamine vexant,
Obvia conſpicimus, nubè pellente mathеſi;
Quæ ſuperos penetrare domos, et ardua cœli
Newtoni auſpiciis jam dat contingere templa.

We may now deſire the champions of the ſcience of cauſes to name any one cauſe which has really been diſcovered by their great maſter, whether in the operations of mind or of body. But they muſt not on this occaſion adduce the inveſtigation of any natural law in which he has ſometimes ſucceeded. With ſtill greater confidence may we challenge them to produce any remarkable inſtance of the explanation of natural phenomena either of mind or body. By explanation, we mean an account of the production, and an appreciation of all the circumſtances, ſuſceptible of a ſcrupulous compariſon with fact, and perfectly conſiſtent with it. It is here that the weakneſs of this philoſopher's pretenſions is moſt conſpicuous; and his followers candidly acknowledge, that in the inquiries which proceed by experiment, we have not derived great aſſiſtance from Ariſtotle's philoſophy. But this, ſay they, does not derogate from the pre-eminence of his philoſophy, becauſe he has ſhown that the *particular* fields of obſervation are to be cultivated only by means of experiment. But ſurely every field of *obſervation* is particular. There is no *abſtract* object of philoſophical reſearch, the ſtudy of which ſhall terminate in the philoſophy of univerſals. In every kind of inquiry, that cauſe alone muſt be ſuppoſed to act which we underſtand ſo far as to be able to appreciate its effects in particular circumſtances, and compare them with fact, and ſee their perfect coincidence. If we have diſcovered cauſes, they are *known* as far as they are diſcovered. Their genuine effects are known, and therefore the phenomena which reſult from their agency are underſtood. When therefore it is acknowledged, as it muſt be acknowledged, that mankind have made but little advances in the knowledge of nature, notwithſtanding the pretended diſcovery of cauſes by Ariſtotle, and the conducting clue of his philoſophy, till of late years; and when it is alſo allowed that *now*, while we are every day making great additions to this ſubordinate knowledge, the cauſes which Ariſtotle has diſcovered are forgotten, and his philoſophy is neglected; there is great room for ſuſpecting (to ſay the leaſt), that either the cauſes which philoſophy pretends to have diſcovered are not real, or that Ariſtotle and his followers have not aimed at the diſcovery of cauſes, but only at the diſcovery of natural laws, and have failed in the attempt.

There ſeems here to be a previous queſtion: *Is it poſſible to diſcover a philoſophical cauſe*, that ſomething which is neither the prior nor the poſterior of the two *immediately* adjoining events, but their bond of union, and this diſtinct from the union itſelf? It is evident that this is an inquiry purely experimental. It is of *human knowledge* we ſpeak. This muſt depend on the nature of the human mind. This is a matter of contingency, known to us only by experiment and obſervation. By obſerving all the feelings and operations of the mind, and claſſing and arranging them like any other object of ſcience, we diſcover the general laws of human thought and human reaſoning; and this is all the knowledge we can ever acquire of it, or of any thing elſe.

Much has been written on this ſubject. The moſt acute obſervation and ſound judgment have been employed in the ſtudy; and we may venture to ſay, that conſiderable progreſs has been made in pneumatology. Many laws of human thought have been obſerved, and very diſtinctly marked; and philoſophers are buſily employed, ſome of them with conſiderable ſucceſs, in the diſtribution of them into ſubordinate claſſes, ſo as to know their comparative extent, and to mark their diſtinguiſhing characters with a preciſion ſimilar to what has been attained in botany and other parts of natural hiſtory; ſo that we may hope that this ſtudy will advance like others. But in all theſe reſearches, no phenomena have occurred which look like the perception or contemplation of theſe ſeparate objects of thought, theſe philoſophical cauſes, this POWER in abſtracto. No philoſopher has ever pretended to ſtate ſuch an object of the mind's obſervation, or attempted to group them into claſſes.

We may ſay at once, without entering into any detail, that thoſe cauſes, thoſe bonds of neceſſary union between the naturally conjoined events or objects, are not only perceived *by means* of the events alone, but are perceived ſolely *in* the events, and cannot be diſtinguiſhed from the conjunctions themſelves. They are neither the objects of ſeparate obſervation, nor the productions of memory, nor inferences drawn from reflection on the laws by which the operations of our own minds are regulated; nor can they be derived from other perceptions in the way of argumentative inference. We cannot infer the paroxyſm of terror from the appearance of impending deſtruction, nor the fall of a ſtone when not ſupported, as we infer the incommenſurability of the diagonal and ſide of a ſquare. This laſt is *implied* in the very conception or notion of a ſquare; not as a conſequence of its other properties, but as one of its eſſential attributes: and the contrary propoſition is not only falſe, but incapable of being diſtinctly conceived. This is not the caſe with the other phenomenon, or any matter of fact. The proofs which are brought of a mathematical propoſition, are not the reaſon of its being true, but the ſteps by which this truth is brought into our view; and frequently, as in the inſtance now given, this truth is perceived, not directly, but conſequentially, by the inconceivableneſs of the contrary propoſition.

Mr. Hume derives this irreſiſtible expectation of events from the known effect of cuſtom, the aſſociation of ideas. The corelated event is brought into the mind by this well-known power of cuſtom, with that vivacity of conception which conſtitutes belief or expectation. But without inſiſting on the futility of his theory of belief, it is ſufficient to obſerve, that this explanation begs the very thing to be proved, when it aſcribes to cuſtom a *power* of any kind. It is the origin of this very power which is the ſubject in diſpute. Beſides, on the genuine principles of ſcepticiſm, this cuſtom involves an acknowledgment of paſt events, of a ſomething different from preſent impreſſions, which, in this doctrine (if doctrine it can be called), are the only certain exiſtences in nature: and, laſtly, it is known that *one* clear experience is a ſufficient foundation for this unſhaken confidence and anticipation. General cuſtom can never, on Mr. Hume's principles, give ſuperior vivacity to any particular idea.

This certain nonentity of it as a ſeparate object of obſervation, and this impoſſibility to derive this notion of neceſſary and cauſal connection between the events of the univerſe from any ſource, have induced two of the moſt acute philoſophers of Europe, Mr. Leibnitz and Father Malebranche, to deny that there is any ſuch connection, and to aſſert that the events of the univerſe go on in correſponding trains, but without any cauſal connection, juſt as a well-regulated clock will keep time with the motions of the heavens without any kind of dependence on them. This harmony of events was pre-eſtabliſhed by the Author of the univerſe, in ſubſerviency to the purpoſes he had in view in its formation.

All thoſe purpoſes which are cogniſable by us, may certainly be accompliſhed by this perfect adjuſtment. But without inſiſting on the fantaſtic wildneſs of this ingenious whim, it is quite enough to obſerve, that it alſo is a begging of the queſtion, becauſe it ſuppoſes cauſation when it aſcribes all to the agency of the Deity.

Thus have we ſearched every quarter, without being able to find a ſource from which to derive this perception of a neceſſary connection among the events of the univerſe, or of this confident expectation of the continuance of phyſical laws; and yet we are certain of the feeling, and of the perſuaſion, be its origin what it may: for we ſpeak intelligibly on this ſubject; we ſpeak familiarly of cauſe, effect, power, energy, neceſſary connection, motives and their influence, argument and conviction, reaſons and perſuaſion, allurements and emotions, of gravity, magnetiſm, irritability, &c.; and we carry on converſations on theſe ſubjects with much entertainment and ſeeming inſtruction. Language is the expreſſion of thought, and every word expreſſes ſome notion or conception of the mind; therefore it muſt be allowed that we have ſuch notions as are expreſſed by cauſe, power, energy. But it is here, as in many caſes, we perceive a diſtinction without being able to expreſs it by a definition; and that we do perceive the relation of cauſation as diſtinct from all others, and in particular as diſtinct from the relation of contiguity in time and place; or the relation of agent, action, and patient, muſt be concluded from the uniformity of language, which never confounds them except on purpoſe, and when it is perceived. But even here we ſhall find, that none of the terms uſed for expreſſing thoſe powers of ſubſtance which are conceived as the cauſes of their characteriſtic phenomena, really expreſs any thing different from the phenomena themſelves. Let any perſon try to define the terms gravity, elaſticity, ſenſibility, and the like, and he will find that the definition is nothing but a deſcription of the phenomenon itſelf. The words are all derivatives, moſt of them verbal derivatives, implying action, gravitation, &c. As the general reſemblances in ſhape, colour, &c. are expreſſed by the natural hiſtorian by generic terms, ſo the general reſemblances in event are expreſſed by the philoſopher in generic propoſitions, which, in the progreſs of cultivation, are alſo abbreviated into generic terms.

This abundantly explains the conſiſtency of our language on this ſubject, both with itſelf and with the operations of nature, without however affording any argument for the truth of the aſſumption, that cauſes are the objects of philoſophic reſearch as ſeparate exiſtences; or that this ſuppoſed neceſſary connection is a *neceſſary truth*, whether ſupreme or ſubordinate. But ſince the perception of it has its foundation in the conſtitution of the human mind, it ſeems entitled to the name of a *firſt principle*. We are hardly allowed to doubt of this, when we conſider the importance of it, and the care of nature to ſecure us in all things eſſential to our ſafety and well-being, from all danger, from inattention, ignorance, or indolence, by an inſtinct infallible in its information, and inſtantaneous in its deciſions. "It would not be like her uſual care (ſays Hume), if this operation of the mind, by which we infer like effects from like cauſes, and *vice verſa*, were entruſted to the fallacious deduction of our reaſon, which is ſlow in its operations, appears not in any degree during the firſt years of infancy, and in every age and period of human life is extremely liable to error. It is more conformable to her *ordinary caution* (mark the acknowledgment) to ſecure ſo neceſſary an act of the mind by ſome inſtinct, or blind tendency, which may be infallible and rapid in all its operations, may diſcover itſelf at the firſt appearance of life, and may be independent of all the laboured deductions of reaſon. As ſhe has taught us the uſe of our limbs, without giving us any knowledge of the nerves and muſcles by which they are actuated; ſo ſhe has implanted in us an inſtinct, which carries forward the thought in a courſe conformable to that eſtabliſhed among external objects, though we be ignorant of the powers and forces on which this regularity depends."

Such a knowledge is quite unneceſſary, and therefore cauſes are no more cognoſcible by our intellectual powers than colours by a man born blind: nay, whoever will be at the pains to conſider this matter agreeably to the received rules and maxims of logic, will find that neceſſary connection, or the bond of cauſation, can no more be the ſubject of philoſophical diſcuſſion by man, than the ultimate nature of truth. It is preciſely the ſame abſurdity or incongruity, as to propoſe to examine light with a microſcope. Other rational creatures may perceive them as eaſily as we hear ſounds. All that we can ſay is, that their exiſtence is probable, but by no means certain. Nay, it may be (and we may never know it) that we are not the efficient cauſes of our own actions, which may be effected by the Deity or by miniſtering ſpirits; and this may even be true in the material world. But all this is indifferent to the real occupation of the philoſopher, and does not affect either the certainty, the extent, or the utility of the knowledge which he may acquire.

We are now able to appreciate the high pretenſions of the philoſopher, and his claim to ſcientific ſuperiority. We now ſee that this can neither be founded on any ſcientific ſuperiority of his object, nor of his employment. His object is not cauſes; and his diſcoveries are nothing but the diſcovery of general facts, the diſcovery of phyſical laws: and his employment is the ſame with that of the deſcriptive hiſtorian. He obſerves and deſcribes with care and accuracy the events of nature; and then he groups them into claſſes, in conſequence of reſembling circumſtances, detected in the midſt of many others which are diſſimilar and occaſional. By gradually throwing out more circumſtances of reſemblance, he renders his claſſes more extenſive; and, by carefully marking thoſe circumſtances in which the reſemblance is obſerved, he characteriſes all the different claſſes: and, by a compariſon of theſe with each other, in reſpect to the number of reſembling circumſtances, he diſtributes his claſſes according to their generality and ſubordination; thus exhauſting the whole aſſemblage, and leaving nothing unarranged but accidental varieties. In this procedure it is to be remarked, that every grouping of ſimilar events is, *ipſo facto*, diſcovering a general fact, a phyſical law; and the expreſſion of this aſſemblage is the expreſſion of the phyſical law. And as every obſervation of this conſtancy of fact affords an opportunity for exerting the inſtinctive inference of natural connection between the related ſubjects, every ſuch obſervation is the diſcovery of a power, property, or quality, of natural ſubſtance. And from what has been ſaid, this obſervation of event is all we know of the connection, all we know of the natural power. And when the philoſopher proceeds further to the arrangement of events, according to their various degrees of complication, he is, *ipſo facto*, making an arrangement of all natural powers according to their various degrees of ſubordinate influence. And thus his occupation is perfectly ſimilar to that of the deſcriptive hiſtorian, claſſification and arrangement; and this conſtitutes all the ſcience attainable by both.

PHILOSOPHY may therefore be defined the ſtudy of the phenomena of the univerſe, with a view to diſcover the general laws which indicate the powers of natural ſubſtances, to explain ſubordinate phenomena, and to improve art: Or, in compliance with that natural inſtinct ſo much ſpoken of, Philoſophy is the ſtudy of the phenomena of the univerſe, with a view to diſcover their cauſes, to explain ſubordinate phenomena, and to improve art.

The taſk is undoubtedly difficult, and will exerciſe our nobleſt powers. The employment is manly in itſelf, and the reſult of it important. It therefore juſtly merits the appellation of *philoſophy*, although its objects are nowiſe different from what occupy the attention of other men.

The employment of the philoſopher, like that of the natural hiſtorian, is threefold; DESCRIPTION, ARRANGEMENT, and REFERENCE; while the objects are not *things* but *events*.

The deſcription, when employed about events, may be more properly termed *hiſtory*. A philoſophical hiſtory of nature conſiſts in a complete or copious enumeration and narration of facts, properly ſelected, cleared of all unneceſſary or extraneous circumſtances, and accurately narrated. This conſtitutes the materials of philoſophy. We cannot give a better example of this branch of philoſophical occupation than aſtronomy.

From the beginning of the Alexandrian ſchool to this day, aſtronomers have been at immenſe pains in obſerving the heavenly bodies, in order to detect their true motions. This has been a work of prodigious difficulty: for the appearances are ſuch as might have been exhibited although the real motions had been extremely different. Not that our ſenſes give us falſe information; but we form haſty and frequently falſe judgments from theſe informations; and call thoſe things deceptions of ſenſe, which are in fact errors of judgment. But the true motions have at laſt been diſcovered, and have been deſcribed with ſuch accuracy, that the hiſtory may be conſidered as nearly complete. This is to be found in the uſual ſyſtems of aſtronomy, where the tables contain a moſt accurate and ſynoptical account of the motion; ſo that we can tell with preciſion in what point of the heavens a planet *has been* ſeen at any inſtant that can be named.

Sir Iſaac Newton's Optics is ſuch another perfect model of philoſophical hiſtory, as far as it goes. This part of philoſophy may be called PHENOMENOLOGY.

Having in this manner obtained the materials of philoſophical deſcription, we muſt put them into a compendious and perſpicuous form, ſo that a general knowledge of the univerſe may be eaſily acquired and firmly retained. This is to be done by claſſification and arrangement, and this claſſification muſt proceed on reſemblances *obſerved* in the events; and the ſubſequent arrangement muſt be regulated by the diſtinctions of which thoſe reſemblances are ſtill ſuſceptible. This aſſemblage of events into groups muſt be expreſſed. They are facts; therefore the expreſſion muſt be propoſitions. Theſe propoſitions muſt be what the logicians call *general* or *abſtract propoſitions*; for they expreſs, not any individual fact of the aſſemblage, but that circumſtance in which they all reſemble. Such propoſitions are the following: Proof is accompanied by belief; kindneſs is accompanied by gratitude; impulſe is accompanied by motion. Theſe are uſually called *general facts*: but there are none ſuch; every fact is individual. This language, however inaccurate, is very ſafe from miſconſtruction, and we may uſe it without ſcruple. Theſe propoſitions are NATURAL or PHYSICAL LAWS; and then the detecting and marking thoſe reſemblances in event, is the inveſtigation of phyſical laws; and we may denominate this employment of the philoſopher INVESTIGATION.

In the proſecution of this taſk, it will be found that the ſimilarities of fact are of various extent: and thus we ſhall form phyſical laws of various extent; and we ſhall alſo find that ſome are ſubordinate to others; for the reſemblance of a number of facts in one circumſtance does not hinder a part of them from alſo reſembling in another circumſtance: and thus we ſhall find ſubordinations of fact in the ſame way as of quieſcent qualities. And it is found here, as in natural hiſtory, that our aſſemblage of reſembling events will be the more extenſive as the number of reſembling circumſtances is ſmaller; and thus we ſhall have kingdoms, claſſes, orders, genera, and ſpecies of phenomena, which are expreſſed by phyſical laws of all thoſe different ranks.

It has been already obſerved, that this obſervation of phyſical laws is always accompanied by a reference of that uniformity of event to a natural bond of union between the concomitant facts, which is conceived by us as the *cauſe* of this concomitancy; and therefore this procedure of the philoſopher is conſidered as the diſcovery of thoſe cauſes, that is, the diſcovery of thoſe powers of natural ſubſtances which conſtitute their phyſical relations, and may juſtly be called their diſtinguiſhing *qualities* or *properties*. This view of the matter gives riſe to a new nomenclature and language. We give to thoſe powers generic names, ſuch as *ſenſibility, intelligence, irritability, gravity, claſticity, fluidity, magnetiſm*, &c. Theſe terms, without exception, mark reſembling circumſtances of event; and no other definition can be given of them but a deſcription of theſe circumſtances. In a few caſes which have been the ſubjects of more painful or refined diſcuſſion, we have proceeded farther in this abbreviation of language.

We have framed the verb "to gravitate," and the verbal noun "gravitation," which purely expreſſes the fact, the phenomenon; but is conceived to expreſs the *operation* or energy of the cauſe or natural power. It is of importance to keep in mind this metaphyſical remark on theſe terms; for a want of attention to the pure meaning of the words has frequently occaſioned very great miſtakes in philoſophical ſcience.

We may with propriety call this part of the philoſopher's employment AITIOLOGY.

We ſhall give an inſtance of its moſt ſucceſsful application to the claſs of events already adduced as an example of philoſophic hiſtory or phenomenology.

Kepler, a celebrated Pruſſian aſtronomer, having maturely conſidered the phenomena recorded in the tables and obſervations of his predeceſſors, diſcovered, amidſt all the varieties of the planetary motions, three circumſtances of reſemblance, which are now known by the name of *Kepler's laws*.

1. All the planets deſcribe ellipſes, having the ſun in one focus.

2. The elliptic areas deſcribed by a planet in the different parts of its orbit, are proportional to the times of deſcription.

3. The ſquares of the periodic times are proportional to the cubes of the mean diſtances from the ſun.

By this obſervation or diſcovery, the ſtudy of the planetary motions was greatly promoted, and the calculation of their appearances was now made with a facility and an accuracy which ſurpaſſed all hopes: for the calculation of the place of a planet at any propoſed inſtant was reduced to the geometrical problem of cutting off an area from an ellipſe of known dimenſions, which ſhould bear the ſame proportion to the whole area, as the time for whoſe duration the motion is required has to the known time of a complete revolution.

Long after this diſcovery of Kepler, Sir Iſaac Newton found that theſe laws of Kepler were only particular caſes of a fact or law ſtill more general. He found that the deflections of the planets from uniform rectilineal motion were all directed to the ſun; and that the ſimultaneous deflections were inverſely proportional to the ſquares of the diſtances from him.

Thus was eſtabliſhed a phyſical law of vaſt extent: but further obſervation ſhowed him, that the motion of every body of the ſolar ſyſtem was compounded of an original motion of projection, combined with a deflection towards every other body: and that the ſimultaneous deflections were proportional to the quantity of matter in the body towards which they were directed, and to the reciprocal of the ſquare of the diſtance from it. Thus was the law made ſtill more general. He did not ſtop here. He compared the deflection of the moon in her orbit with the ſimultaneous deflection of a ſtone thrown from the hand, and deſcribing a parabola; and he found that they followed the ſame law; that is, that the deflection of the moon in a ſecond, was to that of the ſtone in the ſame time, as the ſquare of the ſtone's diſtance from the centre of the earth, to the ſquare of the moon's diſtance from it. Hence he concluded, that the

deflection of a ſtone from a ſtraight line was juſt a particular inſtance of the deflections which took place through the whole ſolar ſyſtem.

The deflection of a ſtone is one of the indications it gives of its being *gravis* or heavy; whence he calls it *gravitation*. He therefore expreſſes the phyſical law which obtains through the whole ſolar ſyſtem, by ſaying, that "every body *gravitates* to every other body; and the gravitations are proportional to the quantity of matter in that other body, and inverſely proportional to the ſquare of the diſtance from it."

Thus we ſee how the arrangement of the celeſtial phenomena terminated in the diſcovery of phyſical laws; and that the expreſſion of this arrangement is the law itſelf.

Since the fall of a heavy body is one inſtance of the phyſical law, and ſince this fall is conſidered by all as the effect of its *weight*, and this weight is conſidered as the cauſe of the fall, the ſame cauſe is aſſigned for all the deflections obſerved in the ſolar ſyſtem; and all the matter in it is found to be under the influence of this cauſe, or to be heavy; and thus his doctrine has been denominated the *ſyſtem of univerſal gravitation*.

Philoſophers have gone farther, and have ſuppoſed that gravity is a power, property, or quality, reſiding in all the bodies of the ſolar ſyſtem. Sir Iſaac Newton does not expreſsly ſay ſo, at leaſt in that work where he gives an account of theſe diſcoveries. He contents himſelf with the immediate conſequence of the firſt axiom in natural philoſophy, viz. that every body remains in a ſtate of reſt, or of uniform rectilineal motion, unleſs affected by ſome moving force. Since the bodies of the ſolar ſyſtem are neither in a ſtate of reſt, nor of uniform rectilineal motion, they muſt be conſidered as ſo affected; that is, that there operates on every one of them a moving force, directed towards all the others, and having the proportions obſerved in the deflection.

Other philoſophers have endeavoured to ſhow, that this general fact, detected by Sir Iſaac Newton, is included in another ſtill more general, viz. that every body moves which is impelled by another body in motion. They aſſert, that all the bodies of the ſolar ſyſtem are continually impelled by a fluid which they call *ether*, which is moving in all places, and in all directions, or in circular vortices, and hurries along with it the planets and all heavy bodies. It would ſeem that the familiarity of motion produced by impulſe, at leaſt in thoſe inſtances in which our own exertions are moſt employed, has induced philoſophers to adopt ſuch notions; perhaps, too, they are influenced by an obſcure and indiſtinct notion affixed to the term action, as applied to changes in the material world, and which has given riſe to an axiom, "that a body cannot act at a diſtance, or where it is not;" and thus have thought themſelves obliged to look out for an immediate and contiguous agent in all thoſe phenomena.

But the philoſophers who profeſs to be moſt ſcrupulous in their adherence to the rules of philoſophic diſcuſſion, deny the legitimacy of this pretended inveſtigation of cauſes, ſaying that this doctrine is in direct oppoſition to the procedure of the mind in acquiring the knowledge of cauſes. Since the *fact* of impulſe is not really *obſerved* in the celeſtial deflections, nor in the motions of heavy bodies, the law cannot be *inferred*. They ſay that it is not even neceſſary to ſhow that the phenomena of the celeſtial motions are unlike the phenomena of impulſe, although this can be done in the completeſt manner. It is enough that neither the fluid nor the impulſe are obſerved; and therefore they are in the right when they aſſert, that there is inherent in, or accompanies, all the bodies of the ſyſtem, a power by which they deflect to one another. See Optics.

The debate is foreign to our preſent purpoſe, which is only to ſhow how the obſervation and arrangement of phenomena terminates in the diſcovery of their cauſes, or the diſcovery of the powers or properties of natural ſubſtances.

This is a taſk of great difficulty, as it is of great importance. There are two chief cauſes of this difficulty.

1. In moſt of the ſpontaneous phenomena of nature there is a complication of many events, and ſome of them eſcape our obſervation. Attending only to the moſt obvious or remarkable, we conjoin theſe only in our imagination, and are apt to think theſe the concomitant events in nature, the proper indication of the cauſe, and the ſubjects of this philoſophical relation, and to ſuppoſe that they are always conjoined by nature. Thus, it was thought that there reſided in a vibrating chord a power by which the ſenſation of ſound was excited, or that a chord had a ſounding quality. But late obſervations have ſhown clearly, that there is an inconceivable number of events interpoſed between the vibration of the chord and the ſenſitive affection of our ear; and therefore, that ſound is not the effect of the vibration of the chord, but of the very laſt event of this ſeries: and this is completely demonſtrated by ſhowing that the vibration and the ſound are *not neceſſarily* connected, becauſe they are not *always* connected, but require the interpoſition of air or of ſome other elaſtic body.

Theſe obſervations ſhow the neceſſity of the moſt accurate and minute obſervation of the phenomena, that none of thoſe intermediate events may eſcape us, and we be thus expoſed to the chance of imaginary connections between events which are really far aſunder in the procedure of nature. As the ſtudy has improved, miſtakes of this kind have been corrected; and philoſophers are careful to make their trains of events under one name as ſhort as poſſible. Thus, in medicine, a drug is no longer conſidered as a *ſpecific* remedy for the diſeaſe which is ſometimes cured when it has been uſed, but is denominated by its moſt immediate operation on the animal frame: it is no longer called a *febrifuge*, but a *ſudorific*.

2. When many natural powers combine their influence in a ſpontaneous phenomenon of nature, it is frequently very difficult to diſcover what part of the complicated effect is the effect of each; and to ſtate thoſe circumſtances of ſimilarity which are the foundation of a phyſical law, or entitle us to infer the agency of any natural power. The moſt likely method for inſuring ſucceſs in ſuch caſes is to get rid of this complication of event, by putting the ſubject into ſuch a ſituation that the operation of all the known powers of nature ſhall be ſuſpended, or ſo modified as we may perfectly underſtand *their* effects. We can thus appreciate the effects of ſuch as we could neither modify nor ſuſpend, or we can diſcover the exiſtence of a new law, the operation of a new power.

This is called *making an experiment*; and is, of all, the moſt effectual way of advancing in the knowledge of nature, and has been called Experimental Philosophy.

It ſeems, however, at firſt ſight, in direct oppoſition to the procedure of nature in forming general laws. Theſe are formed by induction from multitudes of individual facts, and muſt be affirmed to no greater extent than the induction on which they are founded. Yet it is a matter of fact, a phyſical law of human thought, that one ſimple, clear, and unequivocal experiment gives us the moſt complete confidence in the truth of a general concluſion from it to every ſimilar caſe. Whence this anomaly? It is not an anomaly or contradiction of the general maxim of philoſophical inveſtigation, but the moſt refined application of it. There is no law more general than this, that "Nature is conſtant in all her operations." The judicious and ſimple form of our experiment inſures us (we imagine) in the complete knowledge of all the circumſtances of the event. Upon this ſuppoſition, and this alone, we conſider the experiment as

the faithful repreſentative of every poſſible caſe of the conjunction. This will be more minutely conſidered afterwards.

The laſt branch of philoſophic occupation is the explanation of ſubordinate phenomena. This is nothing more than the referring any particular phenomenon to that claſs in which it is included; or, in the language of philoſophy, it is the pointing out the general law, or that general fact of which the phenomenon is a particular inſtance. Thus, the feeling of the obligations of virtue is thought to be explained, when it is ſhown to be a particular caſe of that regard which every perſon has for his deareſt intereſts. The riſe of water in pumps is explained, when we ſhow it to be a particular caſe of the preſſure of fluids, or of the air. The general law under which we ſhow it to be properly arranged is called the PRINCIPLE of the explanation, and the explanation itſelf is called the THEORY of the phenomenon. Thus, Euler's explanation of the lunar irregularities is called a theory of the lunar motions on the principle of gravitation.

This may be done either to advance our own knowledge of nature, or to communicate it to others. If done with the firſt view, we muſt examine the phenomenon minutely, and endeavour to detect every circumſtance in it, and thus diſcover all the known laws of nature which concur in its production; we then appreciate the operation of each according to the circumſtances of its exertion; we then combine all theſe, and compare the reſult with the phenomenon. If they are ſimilar, we have explained the phenomenon. We cannot give a better example than Franklin's explanation of the phenomena of thunder and lightning. See LIGHTNING, and ELECTRICITY *Index*.

If we explain a phenomenon from known principles, we proceed ſynthetically from the general law already eſtabliſhed and *known* to exert its influence in the preſent inſtance. We ſtate this influence both in kind and degree according to the circumſtances of the caſe; and having combined them, we compare the reſult with the phenomenon, and ſhow their agreement: and thus it is explained. Thus, becauſe all the bodies of the ſolar ſyſtem mutually gravitate, the moon gravitates to the ſun as well as to the earth, and is continually, and in a certain determinate manner, deflected from that path which ſhe would deſcribe did ſhe gravitate only to the earth. Her motion round the earth will be retarded during the firſt and third quarters of her orbit, and accelerated during the ſecond and fourth. Her orbit and her period will be increaſed during our winter, and diminiſhed during our ſummer. Her apogee will advance, and her nodes will recede; and the inclination of her orbit will be greateſt when the nodes are in ſyzigee, and leaſt when they are in quadrature. And all theſe variations will be in certain preciſe degrees. Then we ſhow that all theſe things actually obtain in the lunar motions, and they are conſidered as explained.

This ſummary account of the object and employment in all philoſophical diſcuſſion is ſufficient for pointing out its place in the circle of the ſciences, and will ſerve to direct us to the proper methods of proſecuting it with ſucceſs. Events are its object; and they are conſidered as connected with each other by cauſation, which may therefore be called the philoſophical relation of things. The following may be adopted as the fundamental propoſition on which all philoſophical diſcuſſion proceeds, and under which every philoſophical diſcuſſion or diſcovery may be arranged:

"*Every change that we obſerve in the ſtate or condition of things is* CONSIDERED BY US *as an effect, indicating the agency, characteriſing the kind, and determining the degree of its* INFERRED *cauſe.*"

As thus enounced, this propoſition is evidently a phyſical law of human thought. It may be enounced as a neceſſary and independent truth, by ſaying, *every change in the ſtate and condition of things* IS AN EFFECT, &c. And accordingly it has been ſo announced by Dr. Reid, in his *Eſſays on the Intellectual Powers of Man*, and its title to this denomination has been abundantly ſupported by him. But we have no occaſion to conſider it as poſſeſſing this quality. We are ſpeaking of philoſophy, which is ſomething contingent, depending on the exiſtence and conſtitution of an intellectual being ſuch as man; and, in conformity to the view which we have endeavoured to give of human knowledge in the ſubjects of philoſophical relation, it is quite ſufficient for our purpoſe that we maintain its title to the rank of an univerſal law of human thought. This will make it a firſt principle, even although it may not be a neceſſary truth.

All the proof neceſſary for this purpoſe is univerſality of fact; and we believe this to be without exception. We are not to expect that all mankind have made, or will ever make, a formal declaration of their opinion; but we may venture to ſay that all have made it, and continually do make it, virtually. What have the philoſophers of all ages been employed about but the diſcovery of the cauſes of thoſe changes that are inceſſantly going on? *Nil turpius phyſico* (ſays Cicero) *quam fieri ſine cauſâ quidquam dicere.* Human curioſity has been directed to nothing ſo powerfully and ſo conſtantly as to this. Many abſurd cauſes have been aſſigned for the phenomena of the univerſe; but no ſet of men have ever ſaid that they happened without a cauſe. This is ſo repugnant to all our propenſities and inſtincts, that even the atheiſtical ſect, who, of all others, would have profited moſt by the doctrine, have never thought of advancing it. To avoid ſo ſhocking an abſurdity, they have rather allowed that chance, that the concourſe of atoms, are the cauſes of the beautiful arrangements of nature. The thoughtleſs vulgar are no leſs ſolicitous than the philoſophers to diſcover the cauſe of things; and the poet expreſſes the natural and inſtinctive paſſion of all men, when he ſays,

Felix qui potuit rerum cognoſcere cauſas.

And this anxiety is not to nouriſh, but to get rid of ſuperſtitious fears: for thus

—— metus omnes, et inexorabile fatum
Subjecit pedibus, ſtrepitumque Acherontis avari.

Had men never ſpeculated, their conduct alone gives ſufficient evidence of the univerſality of the opinion. The whole conduct of man is regulated by it, nay almoſt wholly proceeds upon it, in the moſt important matters, and where experience ſeems to leave us in doubt: and to act otherwiſe, as if any thing whatever happened without a cauſe, would be a declaration of inſanity. Dr. Reid has beautifully illuſtrated this truth, by obſerving, that even a child will laugh at you if you try to perſuade him that the top, which he miſſes from the place where he left it, was taken away by nobody. You may perſuade him that it was taken away by a fairy or a ſpirit; but he believes no more about this nobody, than the maſter of the houſe when *he* is told that nobody was the author of any piece of theft or miſchief. What opinion would be formed, ſays Dr. Reid, of the intellects of the juryman, on a trial for murder by perſons unknown, who ſhould ſay that the fractured ſkull, the watch and money gone, and other like circumſtances, might poſſibly have no cauſe? He would be pronounced inſane or corrupted.

We believe that Mr. Hume is the firſt author who has ventured to call the truth of this opinion in queſtion; and even *he* does it only in the way of mere poſſibility. He acknowledges the *generality* of the opinion; and he only objects to the foundation of this generality: and he objects to it merely becauſe it does not quadrate with his theory of belief; and therefore it *may* happen that ſome men may have no ſuch opinion. But it muſt be obſerved on this occaſion, that the opinion of a philoſopher is of no greater weight in a caſe like this than that of

a ploughboy. If it be a firſt principle, directing the opinions and actions of all, it muſt operate on the minds of all. The philoſopher is the only perſon who may chance to be without it: for it requires much labour, and long habits reſolutely maintained, to warp our natural ſentiments; and experience ſhows us that they may be warped if we are at ſufficient pains. It is alſo worthy of remark, that this philoſopher ſeems as much under the influence of this law as ordinary mortals. It is only when he is aware of its not tallying with his other doctrines that his ſcruples appear. Obſerve how he ſpeaks when off his guard: "As to thoſe impreſſions which ariſe from the ſenſes, their ultimate cauſe is, in my opinion, perfectly inexplicable by human reaſon; and it will always be impoſſible to decide with certainty whether they ariſe immediately from the object, are produced by the creative power of the mind, or are derived from the Author of our being."

Among theſe alternatives he never thought of their not being derived from any cauſe.

But it is not enough to ſhow that this is a phyſical law of the human mind: we have aſſumed it as a firſt principle, the foundation of a whole ſcience; therefore not included in or derived from any thing more general. Mr. Hume's endeavours to ſhow that it is not a neceſſary truth, ſhow with ſufficient evidence that moſt attempts to derive it in the way of argument are *petitiones principii*; a thing very commonly met with in all attempts to prove firſt principles. It cannot be proved by induction of facts that every event has a cauſe, becauſe induction always ſuppoſes an *obſerved fact* or event. Now, in by far the greateſt number of events the cauſes are unknown. Perhaps in no event whatever do we know the real cauſe, or that power or energy which, without any intervention, produces the effect. No man can ſay, that in the ſimpleſt event which he ever obſerved, he was fully appriſed of every circumſtance which concurred to its production. We ſuppoſe that no event in nature can be adduced more ſimple than the motion of a ſuſpended glaſs ball when gently ſtruck by another glaſs ball; and we imagine that moſt of our readers will ſay that he perfectly ſees every thing which happens in this phenomenon. We believe, too, that moſt of our readers are of opinion that a body is never put in motion but by the impulſe of another, except in the caſes of animal motion; and that they are diſpoſed to imagine that magnets put iron in motion, and that an electrified body moves another by means of an interpoſed though inviſible fluid ſomehow circulating round them. Now we muſt inform ſuch readers, that unleſs the ſtroke has been very ſmart, ſo ſmart indeed as to ſhatter the glaſs balls, the motion of the ſuſpended ball was produced without impulſe: that is, the two balls were not in contact during the ſtroke; and the diſtance between them was not leſs than the 9000th part of an inch, and probably much greater. We muſt ſay farther, that it is not certain that even the moſt violent ſtroke, ſuch as would ſhatter them to pieces, is enough to bring them into real contact. The proofs of this ſingular poſition are too long for this place; but the evidence will be ſufficiently ſeen by conſulting the article Optics.

Unleſs, therefore, our readers are willing to allow that the ſuſpended ball was put in motion by a repulſive force inherent in one or both balls, they muſt acknowledge that they *do not* fully know all the circumſtances of this ſo ſimple phenomenon, or all the train of events which happen in it; and therefore they are reduced to the neceſſity of *ſuppoſing*, although they do not ſee it, an intervening fluid or matter, by the immediate action of whoſe *adjoining* particles the motion is produced.

This being the caſe in the ſimpleſt phenomenon that we can pitch upon, what ſhall we ſay of the numberleſs multitudes which are incomparably more complex? Muſt we not acknowledge that the efficient cauſes, even in the vulgar ſenſe of the word, the immediately preceding events, are unknown, becauſe the conjunctions are not obſerved? and therefore it cannot be ſaid that it is from experimental induction that this truth gains univerſal belief. Experience, ſo far from ſupporting it as a direct proof, ſeems rather the ſtrongeſt argument againſt it; for we have no experiment of unqueſtionable authority but the narrow circle of our own power exerted on our thoughts and actions. And even here there are perhaps caſes of change where we cannot ſay with certainty that we perceive the efficient cauſe.

Nothing ſeems to remain, therefore, but to allow that this phyſical law of human judgment is inſtinctive, a conſtituent of the human ſoul, a firſt principle; and incapable of any other proof than the appeal to the feelings of every man.

Simply to ſay, that every change is conſidered as an effect, is not giving the whole characters of this phyſical law. The cauſe is not always, perhaps never, *obſerved*, but is *inferred* from the phenomena. The inference is therefore in every inſtance dependent on the phenomenon. The phenomenon is to us the language of nature: It is therefore the ſole indication of the cauſe and of its agency: It is therefore the indication of the very cauſe, and of no other. The obſerved change therefore characteriſes the cauſe, and marks its kind. This is confirmed by every word of philoſophical language, where, as has already been obſerved, the names of the inferred powers of nature are nothing but either abbreviated deſcriptions of the phenomena, or terms which are defined ſolely by ſuch deſcriptions. In like manner, the phenomenon determines the cauſe in a *particular degree*, and in no other; and we have no immediate meaſure of the degree of the cauſe but the phenomenon itſelf. We take many meaſures of the cauſe, it is true; but on examination they will be found not to be immediate meaſures of the cauſe, but of the effect. Aſſuming gravitation as the cauſe of the planetary deviations from uniform rectilineal motion, we ſay that the gravitation of the moon is but $\frac{1}{3600}$th part of the gravitation of a ſtone thrown from the hand: but we ſay this only from obſerving that the deflection of the ſtone is 3600 times greater than the ſimultaneous deflection of the moon. In ſhort, our whole knowledge of the cauſe is not only *founded* on our knowledge of the phenomenon, but *it is the ſame*. This will be found a remark of immenſe conſequence in the proſecution of philoſophical reſearches; and a ſtrict attention to it will not only guard us againſt a thouſand miſtakes into which the reaſoning pride of man would continually lead us, but will alſo enable us fully to detect many egregious and fatal blunders made in conſequence of this philoſophical vanity. Nothing can be more evident than that, whenever we are puzzled, it would be folly to continue groping among thoſe obſcure beings called *cauſes*, when we have their prototypes, the phenomena themſelves, in our hands.

Such is the account which may be given of philoſophy, the ſtudy of the works of God, as related by cauſation. It is of vaſt extent, reaching from an atom to the glorious Author of the Univerſe, and contemplating the whole connected chain of intelligent, ſenſitive, and inanimate beings. The philoſopher makes uſe of the deſcriptions and arrangements of the natural hiſtorian, as of mighty uſe to himſelf in the beginning of his career; confiding in the uniformity of nature, and expecting that ſimilarity in the quieſcent properties of things will be accompanied by ſome reſemblances in thoſe more important properties which conſtitute their mutual dependences, linking them together in a great and endleſsly ramified chain of events.

We have endeavoured to aſcertain with preciſion the peculiar province of philoſophy, both by means of its object and its mode of procedure. After this it will not require many words to point out the methods for proſecuting the ſtudy with expedition and with ſucceſs. The rules of philoſophizing, which

Newton premiſes to his account of the planetary motions, which he ſo ſcrupulouſly followed, and with a ſucceſs which gives them great authority, are all in ſtrict conformity to the view we have now given of the ſubject.

The chief rule is, that ſimilar cauſes are to be aſſigned to ſimilar phenomena. This is indeed the ſource of all our knowledge of connected nature; and without it the univerſe would only preſent to us an incomprehenſible chaos. It is by no means, however, neceſſary to enjoin this as a maxim for our procedure: it is an inſtinctive propenſity of the human mind. It is abſolutely neceſſary, on the contrary, to caution us in the application of this propenſity. We muſt be extremely confident in the certainty of the reſemblance before we venture to make any inference. We are prone to reaſon from analogy: the very employment is agreeable; and we are ever diſpoſed to embrace opportunities of engaging in it. For this reaſon we are ſatisfied with very ſlight reſemblances, and eagerly run over the conſequences, as if the reſemblances were complete; and our reſearches frequently terminate in falſehood.

This propenſity to analogical reaſoning is aided by another equally ſtrong, and equally uſeful, when properly directed; we mean the propenſity to form general laws: it is in fact a propenſity to diſcover *cauſes*, which is equivalent to the eſtabliſhing of general laws. It appears in another form, and is called a love of, or taſte for, ſimplicity; and this is encouraged or juſtified as agreeable to the uniformity and ſimplicity of nature. "Natura ſemper ſibi ſimilis et conſona," ſays Newton; "Fruſtra fit per plura, quod fieri poteſt per pauciora," ſays another. The beautiful, the wiſe, economy of nature, are phraſes in every body's mouth; and Newton enjoins us to adopt no more cauſes than are ſufficient to explain the phenomena. All this is very well, and is true in its own degree; but it is too frequently the ſubterfuge of human vanity and ſelf-love. This inordinate admiration of the economy and ſimplicity of nature is generally conjoined with a manifeſt love of ſyſtem, and with the actual production of ſome new ſyſtem, where from one general principle ſome extenſive theory or explanation is deduced and offered to the world. The author ſees *a ſort* of reſemblance between a certain ſeries of phenomena and the conſequences of ſome principle, and thinks the principle adequate to their explanation. Then, on the authority of the acknowledged ſimplicity of nature, he roundly excludes all other principles of explanation; becauſe, ſays he, this principle is ſufficient, "et fruſtra fit per plura," &c. We could point out many inſtances of this kind in the writings of perhaps the firſt mathematician and the pooreſt philoſopher of this century; where extenſive theories are thus cavalierly exhibited, which a few years examination have ſhown to be nothing but analogies indiſtinctly obſerved, and, what is worſe, inaccurately applied.

To regulate theſe hazardous propenſities, and keep philoſophers in the right path, Newton inculcates another rule, or rather gives a modification of this injunction of ſimplicity. He enjoins, that no cauſe ſhall be admitted but what is real. His words are, that *no cauſes ſhall be admitted but ſuch as are true, and ſufficient to account for the phenomena.* We apprehend that the meaning of this rule has been miſtaken by many philoſophers, who imagine that by *true* he means cauſes which really exiſt in nature, and are not mere creatures of the imagination. We have met with ſome who would boggle at the doctrines of Ariſtotle reſpecting the planetary motions, *viz.* that they are carried along by conducting intelligent minds, becauſe we know of *none ſuch* in the univerſe; and who would nevertheleſs think the doctrine of the Carteſian vortices deſerving of at leaſt an examination, becauſe we ſee ſuch vortices exiſt, and produce effects which have ſome reſemblance to the planetary motions, and have juſtly rejected them, *ſolely* becauſe this reſemblance has been very imperfect. We apprehend Newton's meaning by theſe words is, that no cauſe of any event ſhall be admitted, or even conſidered, which we *do not know* to be actually concurring or exerting ſome influence *in that very event.* If this be his meaning, he would reject the Carteſian vortices, and the conducting ſpirits of Ariſtotle, for one and the ſame reaſon; not becauſe they were not adequate to the explanation, nor becauſe ſuch cauſes did not exiſt in nature, but becauſe we did not *ſee them* anyhow concerned in the phenomenon under conſideration. We neither ſee a ſpirit nor a vortex, and therefore need not trouble ourſelves with inquiring what effects they would produce. Now we know that this was his very conduct, and what has diſtinguiſhed him from all philoſophers who preceded him, though many, by following his example, have alſo been rewarded by ſimilar ſucceſs. This has procured to Newton the character of the *modeſt* philoſopher; and modeſt his procedure may, for diſtinction's ſake, be called, becauſe the contrary procedure of others did not originate ſo much from ignorance as from vanity. Newton's conductor in this was not modeſty, but ſagacity, prudence, caution; and, to ſay it purely, it was ſound judgment.

For the bonds of nature, the ſuppoſed philoſophical cauſes are not *obſerved*; they are *inferred* from the phenomena. When two ſubſtances are obſerved, and only when they are obſerved, to be connected in any ſeries of events, we *infer* that they are connected by a natural power: but when one of the ſubſtances is not ſeen, but fancied, no law of human thought produces any inference whatever. For this reaſon alone Newton ſtopped ſhort at the laſt FACT which he could diſcover in the ſolar ſyſtem, that all bodies were deflected to all other bodies, according to certain regulations of diſtance and quantity of matter. When told that he had done nothing in philoſophy, that he had diſcovered no cauſe, and that to merit any praiſe he muſt ſhow how this deflection was produced;—he ſaid, that he knew no more than he had told them; that he ſaw nothing cauſing this deflection; and was contented with having deſcribed it ſo exactly, that a good mathematician could now make tables of the planetary motions as accurate as he pleaſed, and with hoping in a few years to have every purpoſe of navigation and of philoſophical curioſity completely anſwered; and he was not diſappointed. And when philoſophers on all ſides were contriving hypothetical fluids and vortices which would produce theſe deflections, he contented himſelf with ſhowing the total inconſiſtency of theſe explanations with the mechanical principles acknowledged by their authors; ſhowing that they had tranſgreſſed both parts of his rule, their cauſes neither being real, nor ſufficient for explaining the phenomena. A cauſe is ſufficient for explaining a phenomenon only when its legitimate conſequences are perfectly agreeable to theſe phenomena.

Newton's diſcoveries remain without any diminution or change: no philoſopher has yet advanced a ſtep farther.

But let not the authority or even the ſucceſs of Newton be our guide. Is his rule founded in reaſon? It ſurely is. For, if philoſophy be only the interpretation of nature's language, the inference of cauſes from the phenomena, a fancied or hypothetical phenomenon can produce nothing but a fanciful cauſe, and can make no addition to our knowledge of real nature.

All hypotheſes therefore muſt be baniſhed from philoſophical diſcuſſion as frivolous and uſeleſs, adminiſtering to vanity alone. As the explanation of any appearance is nothing but the pointing out the general fact, of which this is a particular inſtance, a hypotheſis can give no explanation: knowing nothing of cauſe and effect but the conjunction of two events, we ſee ne-

thing of cauſation where one of the events is hypothetical. Although all the legitimate conſequences of a hypothetical principle ſhould be perfectly ſimilar to the phenomenon, it is extremely dangerous to aſſume this principle as the real cauſe. It is illogical to make uſe of the economy of nature as an argument for the truth of any hypotheſis: for, if true, it is a phyſical truth, a matter of fact, and true only to the extent in which it is obſerved, and we are not entitled to ſay that it is ſo one ſtep farther; therefore not in *this* caſe *till it be obſerved.* But the propoſition that nature is ſo economical is falſe; and it is aſtoniſhing that it has been ſo lazily acquieſced in by the *readers* of hypotheſes: for it is not the *authors* who are deceived by it, they are generally led by their own vanity. Nothing is more obſervable than the prodigious variety of nature. That the ſame phenomena may be produced by different means is well known to the aſtronomers, who muſt all grant, that the appearances of motion will be preciſely the ſame whether the earth moves round the ſun like the other planets, or whether the ſun with his attendant planets moves round the earth; and that the demonſtration of the firſt opinion is had from a fact totally unconnected with all the deflections or even with their cauſes: for it may be aſſerted, that Dr. Bradley's diſcovery of the aberration of the fixed ſtars, in conſequence of the progreſſive motion of light, was the firſt thing which put the Copernican ſyſtem beyond queſtion; and even this is ſtill capable of being explained in another way. The Author of Nature ſeems to delight in variety; and there cannot be named a ſingle purpoſe in which the moſt inconceivable fertility in reſource is not obſerved. It is the muſt delightful occupation of the curious mind and the ſenſible heart to contemplate the various contrivances of nature in accompliſhing ſimilar ends.

As a principle therefore on which to found any maxim of philoſophical procedure, this is not only injudicious, becauſe imprudent and *apt* to miſlead, but as falſe, and almoſt ſure to miſlead. In conformity to this obſervation, it muſt be added, that nothing has done ſo much harm in philoſophy as the introduction of hypotheſes.

Authors have commonly been ſatisfied with very ſlight reſemblances, and readers are eaſily miſled by the appearances of reaſoning which theſe reſemblances have countenanced. The ancients, and above all Ariſtotle, were much given to this mode of explanation, and have filled philoſophy with abſurdities. The ſlighteſt reſemblances were with them ſufficient foundations of theories. It has been by very ſlow degrees that men have learned caution in this reſpect; and we are ſorry to ſay that we are not yet cured of the diſeaſe of hypothetical ſyſtematizing, and to ſee attempts made by ingenious men to bring the frivolous theories of antiquity again into credit. Nay, modern philoſophers even of the greateſt name are by no means exempted from the reproach of hypothetical theories. Their writings abound in ethers, nervous fluids, animal ſpirits, vortices, vibrations, and other inviſible agents. We may affirm that all theſe attempts may be ſhown to be either unintelligible, fruitleſs, or falſe. Either the hypotheſis has been ſuch that no conſequence can be diſtinctly drawn from it, on account of its obſcurity and total want of reſemblance to any thing we know; or the juſt and legitimate conſequences of the hypotheſis are inconſiſtent with the phenomena*. This is remarkably the caſe in the hypotheſes which have been introduced for the explanation of the mechanical phenomena of the univerſe. Theſe can be examined by accurate ſcience, and the conſequences compared without any miſtake; and nothing elſe but a perfect agreement ſhould induce us even to liſten to any hypotheſis whatever.

It may here be aſked, Whether, in the caſe of the moſt perfect agreement, after the moſt extenſive compariſon, the hypotheſis ſhould be admitted? We believe that this muſt be left to the feelings of the mind. When the belief is irreſiſtible, we can reaſon no more. But as there is no impoſſibility of as perfect an agreement with ſome other hypotheſis, it is evident that it does not convey an irrefragable title to our hypotheſis. It is ſaid, that ſuch an agreement authoriſes the reception of the hypothetical theory in the ſame manner as we *muſt* admit that to be the *true* cypher of a letter which will make perfect ſenſe of it. But this is not true: in decyphering a letter we know the ſounds which *muſt* be repreſented by the characters, and that they are really the conſtituents of ſpeech; but in hypothetical explanations the firſt principle is not known to exiſt; nay, it is poſſible to make two cyphers, each of which ſhall give a meaning to the letter. Inſtances of this are to be ſeen in treatiſes on the art of decyphering; and there has been lately diſcovered a national character (the *ogam* diſcovered in Ireland) which has this property.

We conclude our criticiſm on hypothetical explanations with this obſervation, that it is *impoſſible* that they can give any addition of knowledge. In every hypotheſis we thruſt in an intermediate event between the phenomenon and ſome general law; and this event is not ſeen, but ſuppoſed. Therefore, according to the true maxims of philoſophical inveſtigation, we give no explanation; for we are not by this means enabled to aſſign the general law in which this particular phenomenon is included: nay, the hypotheſis maks no addition to our liſt of general laws; for our hypotheſes muſt be *ſelected,* in order to tally with all the phenomena. The hypotheſis therefore is underſtood only *by* and *in* the phenomena; and it muſt not be made more general than the phenomena themſelves. The hypotheſis gives no generaliſation of facts. Its very application is founded on a great coincidence of facts; and the hypothetical fact is thruſt in between two which we really obſerve to be united by nature. The applicability therefore of the hypotheſis is not more extenſive than the ſimilarity of facts which we obſerve, and the hypothetical law is not more general than the obſerved law. Let us then throw away entirely the hypothetical law, and inſert the obſerved one in our liſt of general

* It has often been matter of amuſement to us to examine the hypothetical theories of ingenious men, and to obſerve the power of nature even when we are tranſgreſſing her commands: *Naturam expellat furca, tamen uſque revertitur.* The hypotheſis of an ingenious man is framed in perfect conformity to nature's dictates: for you will find that the hypothetical cauſe is touched and retouched, like the firſt ſitting of a picture, till it is made to reſemble the phenomena, and the cauſe is ſtill inferred, nay, explained, in ſpite of all his ingenuity, from the phenomenon: and then, inſtead of deſiring the ſpectators to pay him his due praiſe, by ſaying that the picture is like the man, he inſiſts that they ſhall ſay, what gives him no credit, that the man is like the picture. But, alas! this is ſeldom the caſe: the picture is generally an anamorphoſis, unlike any thing extant in nature, and having parts totally incongruous. We have ſeen ſuch pictures, where a wood is ſtanding on the ſea, and an eye is on the end of an elephant's trunk; and yet, when this was viewed through a proper glaſs, the wood became an eyebrow to the eye, and the proboſcis was a very pretty ringlet of hair. We beg indulgence for this piece of levity, becauſe it is a moſt appoſite illuſtration of a hypothetical theory. The reſemblance between the principle and phenomenon is true only in detached unconnected ſcraps, and the principle itſelf is an incongruous patchwork. But, by a perverſion of the rules of logic, all theſe inconſiſtencies are put out of view, and the explanation is ſomething like the phenomenon.

laws: it will be in different language from the hypothetical law, but it will expreſs the ſame facts in nature.

It is in experimental philoſophy alone that hypotheſes can have any juſt claim to admiſſion; and here they are not admitted as explanations, but as conjectures ſerving to direct our line of experiments.

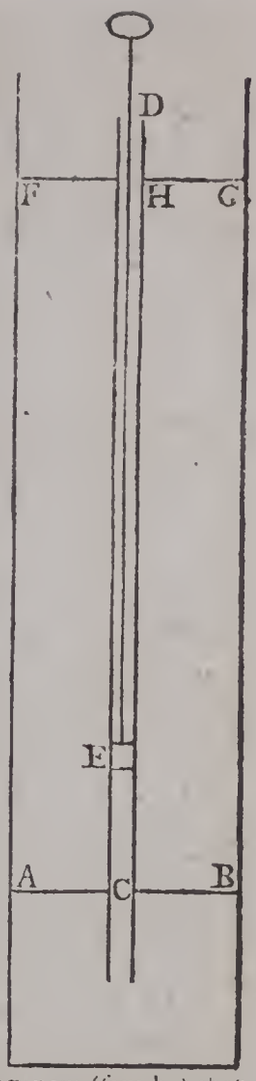
Effects only appear; and by their appearance, and the previous information of experience, cauſes are immediately aſcertained by the perfect ſimilarity of the whole train of events to other trains formerly obſerved: Or they are ſuggeſted by more imperfect reſemblances of the phenomena; and theſe ſuggeſtions are made with ſtronger or fainter evidence, according as the reſemblance is more or leſs perfect. Theſe ſuggeſtions do not amount to a confidential inference, and only raiſe a conjecture. Wiſhing to verify or overturn this conjecture, we have recourſe to experiment; and we put the ſubject under conſideration in ſuch a ſituation, that we can ſay what will be the effect of the conjectural cauſe if real. If this tallies with the appearance, our conjecture has more probability of truth, and we vary the ſituation, which will produce a new ſet of effects of the conjectured cauſe, and ſo on. It is evident that the probability of our conjecture will increaſe with the increaſe of the conformity of the legitimate effects of the ſuppoſed cauſe with the phenomena, and that it will be entirely deſtroyed by *one* diſagreement. In this way conjectures have their great uſe, and are the ordinary means by which experimental philoſophy is improved. But conjectural ſyſtems are worſe than nonſenſe, filling the mind with falſe notions of nature, and generally leading us into a courſe of improper conduct when they become principles of action. This is acknowledged even by the abettors of hypothetical ſyſtems themſelves, when employed in overturning thoſe of their predeceſſors, and eſtabliſhing their own: witneſs the ſucceſſive maintainers of the many hypothetical ſyſtems in medicine, which have had their ſhort-lived courſe within theſe two laſt centuries.

Let every perſon therefore who calls himſelf a philoſopher reſolutely determine to reject all temptations to this kind of ſyſtem-making, and let him never conſider any compoſition of this kind as any thing better than the amuſement of an idle hour.

After theſe obſervations, it cannot require much diſcuſſion to mark the mode of procedure which will inſure progreſs in all philoſophical inveſtigations.

The ſphere of our intuitive knowledge is very limited; and we muſt be indebted for the greateſt part of our intellectual attainments to our rational powers, and it muſt be deductive. In the ſpontaneous phenomena of nature, whether of mind or body, it ſeldom happens that the energy of that natural power, which is the principle of explanation, is ſo immediately connected with the phenomenon that we ſee the connection at once. Its exertions are frequently concealed, and in all caſes modified, by the joint exertions of other natural powers: the particular exertion of each muſt be conſidered apart, and their mutual connection traced out. It is only in this way that we can diſcover the perhaps long train of intermediate operations, and alſo ſee in what manner and degree the real principle of explanation concurs in the oſtenſible proceſs of nature.

In all ſuch caſes it is evident that our inveſtigation (and inveſtigation it moſt ſtrictly is) muſt proceed by ſteps, conducted by the ſure hand of logical method. To take an inſtance from the material world, let us liſten to Galileo while he is teaching his friends the cauſe of the riſe of water in a pump. He ſays that it is owing to the preſſure of the air. This is his principle: and he announces it in all its extent. All matter, ſays he, is heavy, and in particular air is heavy. He then points out the connection of this general principle with the phenomenon. Air being heavy, it muſt be ſupported: it muſt lie and preſs on what ſupports it: it muſt preſs on the ſurface AB of the water in the ciſtern ſurrounding the pipe CD of the pump; and alſo on the water C within this pipe. He then takes notice of another general principle which exerts its ſubordinate influence in this proceſs. Water is a fluid; a fluid is a body whoſe parts yield to the ſmalleſt impreſſion; and, by yielding, are eaſily moved among themſelves; and no little parcel of the fluid can remain at reſt unleſs it be equally preſſed in every direction, but will recede from that ſide where it ſuſtains the greateſt preſſure. In conſequence of this fluidity, *known* to be a property of water, if any part of it is preſſed, the preſſure is propagated through the whole; and if not reſiſted on every ſide, the water will move to that ſide where the propagated preſſure is not reſiſted. All theſe ſubordinate or collateral propoſitions are ſuppoſed to be previouſly demonſtrated or allowed. Water therefore muſt yield to the preſſure of the air unleſs preſſed by it on every ſide, and muſt move to that ſide where it is not withheld by ſome oppoſite preſſure. He then proceeds to ſhow, from the ſtructure of the pump, that there is no oppoſing preſſure on the water in the inſide of the pump. "For (ſays he) ſuppoſe the piſton thruſt down till it touches the ſurface of the water in the pipe; ſuppoſe the piſton now drawn up by a power ſufficient to lift it, and all the air incumbent on it; and ſuppoſe it drawn up a foot or a fathom—there remains nothing now (ſays he) that I know of, to preſs on the ſurface of the water. In ſhort (ſays he), gentlemen, it appears to me, that the water in the pump is in the ſame ſituation that it would be in were there no air at all, but water poured into the ciſtern to a height AF; ſuch that the column of water FABG preſſes on the ſurface AB as much as the air does. Now in this caſe we know that the water at C is preſſed upwards with a force equal to the weight of a column of water, having the ſection of the pipe for its baſe and CH for its height. The water below C therefore will be preſſed up into the pipe CD, and will riſe to G, ſo that it is on a level with the external water FG; that is, it will riſe to H. This is a neceſſary conſequence of the weight and preſſure of the incumbent column FABG, and the fluidity of the water in the ciſtern. Conſequences perfectly ſimilar muſt neceſſarily follow from the weight and preſſure of the air; and therefore, on drawing up the piſton from the ſurface C of the water, with which it was in contact, the water muſt follow it till it attain that height which will make its own weight a balance for the preſſure of the circumambient air. Accordingly, gentlemen, the Italian plumbers inform me, that a pump will not raiſe water quite fifty palms; and from their information I conclude, that a pillar of water fifty palms high is ſomewhat heavier than a pillar of air of the ſame baſe, and reaching to the top of the atmoſphere."



Thus is the phenomenon explained. The riſe of the water in the pump is ſhown to be a particular caſe of the general fact in hydroſtatics, that fluids in communicating veſſels will ſtand

at heights which are inverſely as their denſities, or that columns of equal weights are in equilibrio.

This way of proceeding is called arguing *à priori*, the ſynthetic method. It is founded on juſt principles; and the great progreſs which we have made in the mathematical ſciences by this mode of reaſoning ſhows to what length it may be carried with irreſiſtible evidence. It has long been conſidered as the only inlet to true knowledge; and nothing was allowed to be known with certainty which could not be demonſtrated in this way to be true. Accordingly logic, or the art of reaſoning, which was alſo called the art of diſcovering truth, was nothing but a ſet of rules for ſucceſsfully conducting this mode of argument.

Under the direction of this infallible guide, it is not ſurely unreaſonable to expect that philoſophy has made ſure progreſs towards perfection; and as we know that the brighteſt geniuſes of Athens and of Rome were for ages ſolely occupied in philoſophical reſearches in every path of human knowledge, it is equally reaſonable to ſuppoſe that the progreſs has not only been ſure but great. We have ſeen that the explanation of an appearance in nature is nothing but the arrangement of it into that general claſs in which it is comprehended. The claſs has its diſtinguiſhing mark, which, when it is found in the phenomenon under conſideration, fixes it in its claſs, there to remain for ever an addition to our ſtock of knowledge. Nothing can be loſt any other way but by forgetting it; and the doctrines of philoſophers muſt be ſtable like the laws of nature.

We have ſeen, however, that the very reverſe of all this is the caſe; that philoſophy has but very lately emerged from worſe than total darkneſs and ignorance; that what paſſed under the name of philoſophy was nothing but ſyſtems of errors (if ſyſtems they could be called), which were termed doctrines, delivered with the moſt impoſing apparatus of logical demonſtration, but belied in almoſt every inſtance by experience, and affording us no aſſiſtance in the application of the powers of nature to the purpoſes of life. Nor will this excite much wonder in the mind of the enlightened reader of the preſent day, who reflects on the uſe that in this dialectic proceſs was made of the *categories*, and the method in which thoſe categories were formed. From firſt principles ſo vague in themſelves, and ſo gratuitouſly aſſumed, ingenious men might deduce many different concluſions all equally erroneous: and that this was actually done, no ſurer evidence can be given, than that hardly a lifetime elapſed in which the whole ſyſtem of doctrines which had captivated the minds of the moſt penetrating, have been oftener than once exploded aad overturned by another ſyſtem, which flouriſhed for a while, and then was ſupplanted by a third which ſhared the ſame fate. Here was an infallible proof of their error, for inſtability is incompatible with truth.

It is allowed by all that this has been the caſe in thoſe branches of ſtudy at leaſt which contemplate the philoſophical relations of the material world, in aſtronomy, in mechanical philoſophy, in chemiſtry, in phyſiology, in medicine, in agriculture. It is alſo acknowledged, that in the courſe of leſs than two centuries back we have acquired much knowledge on theſe very ſubjects, call it philoſophy, or by what name you will, ſo much more conformable to the natural courſe of things, that the deductions made from it by the ſame rules of the ſynthetic method are more conformable to fact, and therefore better fitted to direct our conduct and improve our powers. It is alſo certain that theſe bodies of doctrine which go by the name of philoſophical ſyſtems, have much more ſtability than in antient times; and, though ſometimes in part ſuperſeded, are ſeldom or never wholly exploded. This cannot perhaps be affirmed with equal confidence with reſpect to thoſe ſpeculations which have our intellect or propenſities for their object: and we have not perhaps attained ſuch a repreſentation of human nature as will bear compariſon with the original; nor will the legitimate deductions from ſuch doctrines be of much more ſervice to us for directing our conduct than thoſe of antient times: and while we obſerve this difference between theſe two general claſſes of ſpeculations, we may remark, that it is conjoined with a difference in the manner of conducting the ſtudy. We have proceeded in the old Ariſtotelian method when inveſtigating the nature of mind; but we ſee the material philoſophers running about, paſſing much of their time away from books in the ſhop of the artiſan, or in the open fields engaged in obſervation, labouring with their hands, and buſy with experiments. But the ſpeculatiſt on the intellect and the active powers of the human ſoul ſeems unwilling to be indebted to any thing but his own ingenuity, aud his labours are confined to the cloſet. In the firſt claſs, we have met with ſomething like ſucceſs, and we have improved many arts: in the other, it is to be feared that we are not much wiſer, or better, or happier, for all our philoſophic attainments.

Here, therefore, muſt ſurely have been ſome great, ſome fatal miſtake. There has indeed been a material defect in our mode of procedure, in the employment of this method of reaſoning as an inlet to truth. The fact is, that philoſophers have totally miſtaken the road of diſcovery, and have pretended to ſet out in their inveſtigation from the very point where this journey ſhould have terminated.

The Ariſtotelian logic, the ſyllogiſtic art, that art ſo much boaſted of as the only inlet to true knowledge, the only means of diſcovery, is in direct oppoſition to the ordinary procedure of nature, by which we every day, and in every action of our lives, acquire knowledge and diſcover truth. It is not the art of diſcovering truth, it is the art of communicating knowledge, and of detecting error: it is nothing more than the application of this maxim, "Whatever is true of a whole claſs of objects, is true of each individual of that claſs." This is not a juſt account of the art of diſcovering truth, nor is it a complete account of the art of reaſoning. Reaſoning is the producing belief; and whatever mode of argumentation invariably and irreſiſtibly produces belief, is reaſoning. The antient logic ſuppoſes that all the firſt principles are already known, and that nothing is wanted but the application of them to particular facts. But were this true, the application of them, as we have already obſerved, can hardly be called a diſcovery: but it is not true; and the fact is, that the firſt principles are generally the chief objects of our reſearch, and that they have come into view only now and then as it were by accident, and never by the labour of the logician. He indeed can tell us whether we have been miſtaken; for, if our general principle be true, it muſt influence *every* particular caſe. If, therefore, it be falſe in any one of theſe, it is not a true principle. And it is here that we diſcover the ſource of that fluctuation which is ſo much complained of in philoſophy. The authors of ſyſtems give a ſet of conſecutive propoſitions logically deduced from a firſt principle, which has been haſtily adopted, and has no foundation in nature. This does not hinder the amuſement of framing a ſyſtem from it, nor this ſyſtem from pleaſing by its ſymmetry; and it takes a run: but when ſome officious follower thinks of making ſome uſe of it, which requires the compariſon with experience and obſervation, they are found totally unlike, and the whole fabric muſt be abandoned as unſound: and thus the ſucceſſive ſyſtems were continually puſhing out their predeceſſors, and preſently met with the ſame treatment.

How was this to be remedied? The ratiocination was ſeldom egregiouſly wrong; the ſyllogiſtic art had ere now attained a degree of perfection which left little room for improvement, and was ſo familiarly underſtood by the philoſophical practi-

tioners, that they ſeldom committed any great blunders. Muſt we examine the firſt principles? This was a taſk quite new in ſcience; and there were hardly any rules in the received ſyſtems of logic to direct us to the ſucceſsful performance of it. Ariſtotle, the ſagacious inventor of thoſe rules, had not totally omitted it; but in the ſervour of philoſophic ſpeculation he had made little uſe of them. His fertile genius never was at a loſs for firſt principles, which anſwered the purpoſe of verbal diſquiſition without much riſk of being belied on account of its diſſimilitude to nature; for there was frequently no prototype with which his ſyſtematic doctrine could be compared. His enthuſiaſtic followers found abundant amuſement in following his example; and philoſophy, no longer in the hands of men acquainted with the world, converſant in the great book of nature, was now confined almoſt entirely to recluſe monks, equally ignorant of men and of things. But curioſity was awakened, and the men of genius were fretted as well as diſguſted with the diſquiſitions of the ſchools, which one moment raiſed expectations by the ſymmetry of compoſition, and the next moment blaſted them by their inconſiſtency with experience.

They ſaw that the beſt way was to begin *de novo*, to throw away the firſt principles altogether, without exception or examination, and endeavour to find out new ones, which ſhould ſtand the teſt of logic; that is, ſhould in every caſe be agreeable to fact.

Philoſophers began to reflect, that under the unnoticed tuition of kind nature we have acquired much uſeful knowledge. It is therefore highly probable, that her method is the moſt proper for acquiring knowledge, and that by imitating her manner we ſhall have the like ſucceſs. We are too apt to ſlight the occupations of children, whom we may obſerve continually buſy turning every thing over and over, putting them into every ſituation, and at every diſtance. We excuſe it, ſaying that it is an innocent amuſement; but we ſhould ſay, with an ingenious philoſopher (Dr. Reid), that they are moſt ſeriouſly and rationally employed: they are acquiring the habits of obſervation; and by merely indulging an undetermined curioſity, they are making themſelves acquainted with ſurrounding objects: they are ſtruck by ſimilitudes, and amuſed with mere claſſification. If ſome new effect occurs from any of their little plays, they are eager to repeat it. When a child has for the firſt time tumbled a ſpoon from the table, and is pleaſed with its jingling noiſe on the floor, if another lies within its reach, it is ſure to ſhare the ſame fate. If the child is indulged in this diverſion, it will repeat it with a greedineſs that deſerves our attention. The very firſt eager repetition ſhows a confidence in the conſtancy of natural operations, which we can hardly aſcribe wholly to experience; and its keenneſs to repeat the experiment ſhows the intereſt which it takes in the exerciſe of this moſt uſeful propenſity. It is beginning the ſtudy of nature; and its occupation is the ſame with that of a Newton comparing the motions of the moon by his ſublime theory, and computing his calculus with obſervation. The child and the philoſopher are equally employed in the contemplation of a ſimilarity of event, and are anxious that this ſimilarity ſhall return. The child, it is true, thinks not of this abſtract object of contemplation, but throws down the ſpoon again to have the pleaſure of hearing it jingle. The philoſopher ſuſpects that the conjunction of events is the conſequence of a general law of nature, and tries an experiment where this conjunction recurs. The child is happy and eager to enjoy a pleaſure which to us appears highly frivolous; but it has the ſame foundation with the pleaſure of the philoſopher, who rejoices in the ſucceſs of his experiment: and the fact, formerly a trifle to both, now acquires importance. Both go on repeating the experiment till the fact ceaſes to be a novelty to either; the child is ſatisfied, and the philoſopher has now eſtabliſhed a new law of nature.

Such (ſays this amiable philoſopher) is the education of kind nature, who from the beginning to the end of our lives makes the play of her ſcholars their moſt inſtructive leſſons, and has implanted in our mind the curioſity and the inductive propenſity by which we are enabled and diſpoſed to learn them. The exerciſe of this inductive principle, by which nature prompts us to infer general laws from the obſervation of particular facts, gives us a ſpecies of logic new in the ſchools, but old as human nature. It is certainly a method of diſcovery; for by theſe means general principles, formerly unknown, have come into view.

It is a juſt and rational logic, for it is founded on, and indeed is only the habitual application of, this maxim, "That whatever is true with reſpect to every individual of a claſs of events, is true of the whole claſs." This is juſt the inverſe of the maxim on which the Ariſtotelian logic wholly proceeds, and is of equal authority in the court of reaſon. Indeed the expreſſion of the general law is only the abbreviated expreſſion of every particular inſtance.

This new logic, therefore, or the logic of induction, muſt not be conſidered as ſubordinate to the old, or founded on it. See LOGIC, Part III. chap. 5. In fact, the uſe and legitimacy of the Ariſtotelian logic is founded on the inductive,

All animals are mortal;
All men are animals: therefore
All men are mortal.

This is no argument to any perſon who chooſes to deny the mortality of man: even although he acknowledges his animal nature, he will deny the major propoſition.

It is beſide our purpoſe to ſhow, how a point ſo general, ſo congenial to man, and ſo familiar, remained ſo long unnoticed, although the diſquiſition is curious and ſatisfactory. It was not till within theſe two centuries that the increaſing demand for practical knowledge, particularly in the arts, made inquiſitive men ſee how uſeleſs and inſufficient was the learning of the ſchools in any road of inveſtigation which was connected with life and buſineſs; and obſerve that ſociety had received uſeful information chiefly from perſons actually engaged in the arts which the ſpeculatiſts were endeavouring to illuſtrate; and that this knowledge conſiſted chiefly of experiments and obſervations, the only contributions which their authors could make to ſcience.

The *Novum Organum* of Bacon, which points out the true method of forming a body of real and uſeful knowledge, namely, the ſtudy of nature in the way of deſcription, obſervation, and experiment, is undoubtedly the nobleſt preſent that ſcience ever received. It may be conſidered as the grammar of nature's language, and is a counter-part to the logic of Ariſtotle; not exploding it, but making it effectual.

As the logic of Ariſtotle had its rules, ſo has the Baconian or inductive; and this work, the *Novum Organum Scientiarum*, contains them all. The chief rule, and indeed the rule from which all the reſt are but derivations, is, that "the induction of particulars muſt be carried as far as the general affirmation which is deduced from them." If this be not attended to, the mind of man, which from his earlieſt years ſhows great eagerneſs in ſearching for firſt principles, will frequently aſcribe to the operation of a general principle events which are merely accidental. Hence the popular belief in omens, palmiſtry, and all kinds of fortune-telling.

This rule muſt evidently give a new turn to the whole track of philoſophical inveſtigation. In order to diſcover firſt principles, we muſt make extenſive and accurate obſervations, ſo as to have copious inductions of facts, that we may not be de-

ceived as to the extent of the principle inferred from them. We muſt extend our acquaintance with the phenomena, paying a minute attention to what is going on all around us; and we muſt ſtudy nature, not ſhut up in our cloſet drawing the picture from our own fancy, but in the world, copying our lines from her own features.

To delineate human nature, we muſt ſee how men act. To give the philoſophy of the material world, we muſt notice its phenomena.

This method of ſtudying nature has been proſecuted during theſe two laſt centuries with great eagerneſs and ſucceſs. Philoſophers have been buſy in making accurate obſervations of facts, and copious collections of them. Men of genius have diſcovered points of reſemblance, from which they have been able to infer many general powers both of mind and body; and reſemblances among theſe have ſuggeſted powers ſtill more general.

By theſe efforts inveſtigation became familiar; philoſophers ſtudied the rules of the art, and became more expert; hypotheſes were baniſhed, and nothing was admitted as a principle which was not inferred from the moſt copious induction. Concluſions from ſuch principles became every day more conformable to experience. Miſtakes ſometimes happened; but recourſe being had to more accurate obſervation or more copious induction, the miſtakes were corrected. In the preſent ſtudy of nature, our ſteps are more ſlow, and heſitating and painful; our concluſions are more limited and modeſt, but our diſcoveries are more certain and progreſſive, and the reſults are more applicable to the purpoſes of life. This pre-eminence of modern philoſophy over the ancient is ſeen in every path of inquiry. It was firſt remarkable in the ſtudy of the material world; and there it ſtill continues to be moſt conſpicuous. But it is no leſs to be ſeen in the later performances of philoſophers in metaphyſics, pneumatology, and ethics, where the mode of inveſtigation by analyſis and experiment has been greatly adopted; and we may add, that it is this juſter view of the employment which has reſtored philoſophers to the world, to ſociety. They are no longer to be found only in the academies of the ſophiſts and the cloiſters of a convent, but in the diſcharge of public and private duty. A philoſophic genius is a genius for obſervation as well as reflection, and he ſays, *Homo ſum, humani a me nihil alienum puto.*

After ſaying ſo much on the nature of the employment, and the mode of procedure, it requires no deep penetration to perceive the value of the philoſophical character. If there is a propenſity in the human mind which diſtinguiſhes us from the inferior orders of ſentient beings, without the leaſt circumſtance of interference, a propenſity which alone may be taken for the characteriſtic of the ſpecies, and of which no trace is to be found in any other, it is diſintereſted intellectual curioſity, a love of diſcovery for its own ſake, independent of all its advantages.

We think highly (and with great juſtice do we think ſo) of our rational powers; but we may carry this too far, as we do every ground of ſelf-eſtimation. To every man who enjoys the cheering thought of living under the care of a wiſe Creator, this boaſted prerogative will be viewed with more modeſty and diffidence; and He has given us evident marks of the rank in which He eſteems the rational powers of man. In no caſe that is of eſſential importance, of indiſpenſable neceſſity, not only to our well-being but to our very exiſtence, has He left man to the care of his reaſon alone; for, in the firſt inſtance, He has given us reaſon

To guide the helm, while paſſion blows the gale.

God has not truſted either the preſervation of the individual or the continuance of the race to man's notions of the importance of the taſk, but has committed them to the ſurer guards of hunger and of ſexual deſire. In like manner, He has not left the improvement of his nobleſt work, the intellectual powers of the ſoul of man, to his own notions how important it is to his comfort that he be thoroughly acquainted with the objects around him. No; He has committed this alſo to the ſure hand of curioſity: and He has made this ſo ſtrong in a few ſuperior ſouls, whom he has appointed to give light and knowledge to the whole ſpecies, as to abſtract them from all other purſuits, and to engage them in intellectual reſearch with an ardour which no attainment can ever quench, but, on the contrary, inflames it the more by every draught of knowledge.

——————— But what needs words
To paint its power? For this the daring youth
Breaks from his weeping mother's fondling arms
In foreign climes to rove. The penſive ſage,
Heedleſs of ſleep, or midnight's hurtful vapour,
Hangs o'er the ſickly taper. Hence the ſcorn
Of all familiar proſpects, though beheld
With tranſport once. Hence th' attentive gaze
Of young aſtoniſhment.
Such is the bounteous providence of Heaven,
In every breaſt implanting the deſire
Of objects new and ſtrange, to urge us on
With unremitting labour to attain
The ſacred ſtores that wait the rip'ning ſoul
In Truth's exhauſtleſs boſom. *Akenſide.*

But human life is not a ſituation of continual neceſſity; this would ill ſuit the plans of its beneficent Author: and it is from induction or phenomena totally oppoſite to this, and from ſuch induction alone, that we have ever thought of a wiſe Creator. His wiſdom appears only in his beneficence. Human life is a ſcene filled with enjoyment; and the ſoul of man is ſtored with propenſities and powers which have *pleaſure in direct terms* for their object. Another ſtriking diſtinction of our nature is a continual diſpoſition to refinement, of which few traces are to be found in the actions of other animals. There is hardly a gift of nature ſo grateful in itſelf as to pleaſe the freakiſh mind of man till he has moulded it to his fancy. Not contented with food, with raiment, and with ſhelter, he muſt have nice cookery, ornamental dreſs, and elegant houſes. He hunts when he is not hungry, and he refines ſexual appetite into a moſt elegant paſſion. In like manner he has improved this anxious deſire of the knowledge of the objects round him, ſo as to derive from them the means of ſubſiſtence and comfort, into the moſt elegant and pleaſing of all gratifications, the accumulation of intellectual knowledge, independent of all conſideration of its advantages. And as every man has a title to the enjoyment of ſuch pleaſures as he can attain without injuring his neighbour, ſo it is allowable to ſuch as have got the means of intellectual improvement, without relinquiſhing the indiſpenſable ſocial duties, to puſh this advantage as far as it will go: and, in all ages and countries, it has been conſidered as forming the greateſt diſtinction between men of eaſy fortune and the poor, who muſt earn their ſubſiſtence by the ſweat of their brow. The plebeian muſt learn to work, the gentleman muſt learn to think; and nothing can be a ſurer mark of a groveling ſoul than for a man of fortune to have an uncultivated mind.

Let us then cheriſh to the utmoſt this diſtinguiſhing propenſity of the human ſoul: but let us do even this like philoſophers. Let us cultivate it as it is; as the handmaid to the arts and duties of life; as the guide to ſomething yet more excellent. A character is not to be eſtimated from what the perſon knows, but from what he can perform. The accumulation of intellec-

tual knowledge is too apt to create an inordinate appetite for it; and the man habituated to ſpeculation is, like the miſer, too apt to place that pleaſure in the mere *poſſeſſion*, which he ought to look for only or chiefly in the *judicious uſe* of his favourite object. Like the miſer, too, his habits of hoarding up generally unfit him for the very enjoyment which at ſetting-out he propoſed to himſelf. Seldom do we find the man, who has devoted his life to ſcientific purſuits for their own ſake, poſſeſſed of that ſuperiority of mind which the active employ to good purpoſe in times of perplexity; and much ſeldomer do we find him poſſeſſed of that promptitude of apprehenſion, and that deciſion of purpoſe, which are neceſſary for paſſing through the difficult ſcenes of human life.

But we may uſe the good things of this life without abuſing them; and by moderation here, as in all other purſuits, derive thoſe ſolid advantages which philoſophy is able to beſtow. And theſe advantages are great. To enumerate and deſcribe them would be to write a great volume. We may juſt take notice of one, which is an obvious conſequence of that ſtrict and ſimple view which we have given of the ſubject; and this is a modeſt opinion of our attainments. Appearances are all that we know; cauſes are for ever hid from our view; the powers of our nature do not lead us ſo far. Let us therefore, without heſitation, relinquiſh all purſuits which have ſuch things as ultimate principles for *objects of examination*. Let us attend to the ſubordinations of things which it is our great buſineſs to explore. Among theſe there is ſuch a ſubordination as that of means to ends, and of inſtruments to an operation. All will acknowledge the abſurdity of the project of viewing light with a microſcope. It is equally abſurd for us to examine the nature of knowledge, of truth, of infinite wiſdom, by our intellectual powers. We have a wide field of acceſſible knowledge in the works of God; and one of the greateſt advantages, and of the moſt ſublime pleaſures, which we can derive from the contemplation, is the view which a judicious philoſophical reſearch will moſt infallibly give us of a world, not conſiſting of a number of detached objects, connected only by the fleeting tie of co-exiſtence, but an *univerſe*, a *ſyſtem* of beings, all connected together by cauſation, with innumerable degrees of ſubordination and ſubſerviency, and all co-operating in the production of one great and glorious purpoſe. The heart which has but a ſpark of ſenſibility muſt be warmed by ſuch a proſpect, muſt be pleaſed to find itſelf an important part of this ſtupendous machine; and cannot but adore the incomprehenſible Artiſt who contrived, created, and directs the whole. Let us not liſten then to the timid admonitions of theological ignorance, which ſhrinks with ſuperſtitious horror from the thoughts of accounting for every thing by the powers of nature, and conſiders theſe attempts as an approach to atheiſm. Philoſophical diſquiſition will, on the contrary, exhibit theſe general laws of the univerſe, that wonderful concatenation and adjuſtment of every thing both material and intellectual, as the moſt ſtriking inſtance of incomprehenſible wiſdom; which, by means ſo few and ſo ſimple, can produce effects, which by their grandeur dazzle our imagination, and by their multiplicity elude all poſſibility of enumeration. Of all the obſtacles which the weakneſs, the folly, or the ſinful vanity of men have thrown in the way of the theologians, there is none ſo fatal, ſo hoſtile to all his endeavours, as a cold and comfortleſs ſyſtem of materialiſm, which the reaſoning pride of man firſt engendered, which made a figure among a few ſpeculatiſts in the laſt century, but was ſoon forgotten by the philoſophers really buſy with the obſervation of nature and of nature's God. It has of late reared up its head, being now cheriſhed by all who wiſh to get rid of the ſtings of remorſe, as the only opinion compatible with the peace of the licentious and the ſenſual: for we may ſay to them, as Henry IV. ſaid to the Prince of Wales, "Thy wiſh was father, Harry, to that thought." In vain will the divine attempt to lay this devil with the metaphyſical exorciſms of the ſchools; it is philoſophy alone that can detect the cheat. Philoſophy ſingles out the characteriſtic phenomena which diſtinguiſh every ſubſtance; and philoſophy never will heſitate in ſaying that there is a ſet of phenomena which characteriſe mind and another which characteriſe body, and that theſe are *toto cœlo* different. Continually appealing to fact, to the phenomena, for our knowledge of every cauſe, we ſhall have no difficulty in deciding that thought, memory, volition, joy, hope, are not compatible attributes with bulk, weight, elaſticity, fluidity. *Tuta ſub ægide Pallas*; philoſophy will maintain the dignity of human nature, will detect the ſophiſms of the materialiſts, confute their arguments; and ſhe alone will reſtore to the countenance of nature that ineffable beauty of which thoſe would deprive her who would take away the ſupreme Mind which ſhines from within, and gives life and expreſſion to every feature.

PHI

Natural PHILOSOPHY. See NATURAL *Philoſophy*, PHILOSOPHY, and PHYSICS.

Experimental PHILOSOPHY. See EXPERIMENTAL *Philoſophy*.

Moral PHILOSOPHY. See MORAL *Philoſophy*.

PHILOSTORGIUS, an eccleſiaſtical hiſtorian of the 4th century, was born in Cappadocia, and wrote an abridgment of eccleſiaſtical hiſtory, in which he treats Athanaſius with ſome ſeverity. This work contains many curious and intereſting particulars. The beſt edition is that of Henry de Valois in Greek and Latin. There is alſo attributed to him a book againſt Porphyry.

PHILOSTRATUS (FLAVIUS), was an ancient Greek author. He wrote the Life of Apollonius Tyanenſis, and ſome other things which have come down to our time. Euſebius againſt Hierocles calls him an Athenian, becauſe he taught at Athens; but Eunapius and Suidas always ſpeak of him as a Lemnian: and he hints, in his Life of Apollonius, that he uſed to be at Lemnos when he was young. He frequented the ſchools of the ſophiſts; and he mentions his having heard Damianus of Epheſus, Proclus Naucratitas, and Hippodromus of Lariſſa. This ſeems to prove that he lived in the reign of the emperor Severus, from 193 to 212, when thoſe ſophiſts flouriſhed. He became known afterwards to Severus's wife, Julia Auguſta, and was one of thoſe learned men whom this philoſophic empreſs had continually about her. It was by her command that he wrote the Life of Apollonius Tyanenſis, as he relates himſelf in the ſame place where he informs us of his connections with that learned lady. Suidas and Heſychius ſay that he was a teacher of rhetoric, firſt at Athens and then at Rome, from the reign of Severus to that of Philippus, who obtained the empire in 244.

Philoſtratus's celebrated work is his Life of Apollonius; which has erroneouſly been attributed to Lucian, becauſe it has been printed with ſome of that author's pieces. Philoſtratus endeavours, as Cyril obſerves, to repreſent Apollonius as a wonderful and extraordinary perſon; rather to be admired and adored as a god than to be conſidered as a mere man. Hence Eunapius, in the preface to his Lives of the Sophiſts, ſays that the proper title of that work would have been, *The Coming of a*

God to Men; and Hierocles, in his book againſt the Chriſtians, which was called *Philalethes*, and which was refuted by Euſebius in a work ſtill extant, among other things drew a compariſon between Apollonius and Jeſus Chriſt. It has always been ſuppoſed that Philoſtratus compoſed his work with a view to diſcredit the miracles and doctrines of our Lord, by ſetting up other miracles and other doctrines againſt them, and this ſuppoſition may be true; but that Apollonius was really an impoſtor and magician may not be ſo certain. He may, for what we know, have been a wiſe and excellent perſon; and it is remarkable that Euſebius, though he had the worſt opinion of Philoſtratus's hiſtory, ſays nothing ill of Apollonius. He concluded that that hiſtory was written to oppoſe the hiſtory of Jeſus; and the uſe which the ancient infidels made of it juſtifies his opinion; but he draws no information from it with regard to Apollonius. It would have been improper to have done ſo; ſince the ſophiſtical and affected ſtyle of Philoſtratus, the ſources from whence he owns his materials to have been drawn, and, above all, the abſurdities and contradictions with which he abounds, plainly ſhow his hiſtory to be nothing but a collection of fables, either invented or at leaſt embelliſhed by himſelf.

The works of Philoſtratus, however, have engaged the attention of critics of the firſt claſs. Grævius had intended to have given a correct edition of them, as appears from the preface of Meric Cauſabon to a diſſertation upon an intended edition of Homer, printed at London in 1658, 8vo. So had Bentley, who deſigned to add a new Latin verſion of his notes; and Fabricius ſays that he ſaw the firſt ſheet of Bentley's edition printed at Leipſic in 1691. Both theſe deſigns were dropped. A very exact and beautiful edition was publiſhed at length at Leipſic, 1709, in folio, by Olearius, profeſſor of the Greek and Latin tongues in that univerſity; who has proved himſelf perfectly qualified for the work he undertook, and ſhown all the judgment, learning, and induſtry, that are required in an excellent editor.

At the end of Apollonius's Life there are 95 Letters which go under his name. They are not, however, believed to be his; the ſtyle of them being very affected, and like that of a ſophiſt, while they bear in other reſpects all the marks of a forgery. Philoſtratus ſays that he ſaw a collection of Apollonius's Letters in Hadrian's library at Antium, but had not inſerted them all among theſe. They are ſhort, and have in them little elſe than moral ſentences. The Lives of the Sophiſts contain many things which are to be met with nowhere elſe. The Heroics of Philoſtratus are only a dialogue between a vintner of Thracian Cherſoneſus and a Phenician, in which the former draws characters of Homer's heroes, and repreſents ſeveral things differently from that poet; and this upon the faith of Proteſilaus's ghoſt, who had lately viſited his farm, which was not far from the tomb of this hero. Olearius conjectures, with much probability, that Philoſtratus's deſign in this dialogue was ſecretly to criticiſe ſome things in Homer, which he durſt not do openly on account of the great veneration then paid to him, and for fear of the odium which Zoilus and others had incurred by cenſuring him too freely. The images are elegant deſcriptions and illuſtrations of ſome ancient paintings and other particulars relating to the fine arts: to which Olearius has ſubjoined the deſcription of ſome ſtatues by Calliſtratus; for the ſame reaſon that he ſubjoined Euſebius's book againſt Hierocles to the Life and Letters of Apollonius, namely, becauſe the ſubjects of theſe reſpective works are related to each other. The laſt piece is a collection of Philoſtratus's Letters; but ſome of theſe, though it is not eaſy to determine which, were written by a nephew to our Philoſtratus, of the ſame name, as were alſo the laſt eighteen in the book of images. This is the reaſon why the title runs not *Philoſtrati*, but *Philoſtratorum quæ ſuperſunt omnia*.

There were many perſons of the name of Philoſtratus among the ancients; and there were many other works of the Philoſtratus here recorded, but no others are extant beſides thoſe we have mentioned.

PHILOTIS, a ſervant-maid at Rome, ſaved her countrymen from deſtruction. After the ſiege of Rome by the Gauls, the Fidenates aſſembled an army, and marched againſt the capital, demanding all the wives and daughters in the city as the only conditions of peace. This demand aſtoniſhed the ſenators; and when they refuſed to comply, Philotis adviſed them to ſend all their female ſlaves diſguiſed in matrons clothes, and ſhe offered to march herſelf at the head. Her advice was followed; and when the Fidenates had feaſted late in the evening, and were quite intoxicated and fallen aſleep, Philotis lighted a torch as a ſignal for her countrymen to attack the enemy. The whole was ſucceſsful; the Fidenates were conquered; and the ſenate, to reward the fidelity of the female ſlaves, permitted them to appear in the dreſs of the Roman matrons.

PHILOXENUS, an officer of Alexander, who received Cilicia at the general diviſion of the provinces.——A ſon of Ptolemy, who was given to Pelopidas as an hoſtage.——A dythyrambic poet of Cythera. He enjoyed the favour of Dionyſius, tyrant of Sicily, for ſome time, till he offended him by ſeducing one of his female ſingers. During his confinement Philoxenus compoſed an allegorical poem called *Cyclops*; in which he had delineated the character of the tyrant, under the name of Polyphemus, and repreſented his miſtreſs under the name of Galatæa, and himſelf under that of Ulyſſes. The tyrant, who was fond of writing poetry, and of being applauded, removed Philoxenus from his dungeon; but the poet refuſed to purchaſe his liberty by ſaying things unworthy of himſelf, and applauding the wretched verſes of Dionyſius, and therefore he was ſent to the quarries. Being ſet at liberty, he ſome time after was aſked his opinion at a feaſt about ſome verſes which Dionyſius had juſt repeated, and which the courtiers had received with the greateſt applauſe. Philoxenus gave no anſwer, but he ordered the guards that ſurrounded the tyrant's table to take him back to the quarries. Dionyſius was pleaſed with his pleaſantry and with his firmneſs, and immediately forgave him. Philoxenus died at Epheſus about 380 years before Chriſt.

Printed by J. Davis, Chancery-lane.

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